HealthRise Evaluation

Final Report

Prepared by the Institute for Health Metrics and Evaluation

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IHME

Contents

Abbreviations

Abt	Abt Associates
ANM	Auxiliary nurse midwife
ASHA	Accredited social health activist
BMI	Body mass index
BP	Blood pressure
CBO	Community-based organization
CCG	Community care giver
CCMDD	Central Chronic Medicine Dispensing and Distribution
CHAI	Catholic Health Association of India
CHC	Community health center
CHW	Community health worker
CI	Confidence interval
CP	Community paramedic
CVD	Cardiovascular disease
DBP	Diastolic blood pressure
DM	Diabetes
ED	Emergency department
EMR	Electronic medical record
FGD	Focus group discussion
FPG	Fasting plasma glucose
Hb1c, A1c	Hemoglobin A1c
HFC	HealthFinders Collaborative
HMIS	Health management information system
HR	HealthRise
HSRC	Human Sciences Research Council
HTN	Hypertension
ICD	International Classification of Disease
IEP	Instituto Sírio-Libanês de Ensino e Pesquisa
IHME	Institute for Health Metrics and Evaluation
IPAQ	International Physical Activity Questionnaire

KII	Key informant interview
MAMTA	MAMTA Health Institute for Mother and Child
NCD	Non-communicable disease
NGO	Non-governmental organization
NPCDCS	National Program for Prevention and Control of Cancer, Diabetes, CVD and Stroke
PriHC	Primary health center
ProvHC	Provincial health center
PUC	Pillsbury United Communities
RBS	Random blood sugar
SALT	Stimulate, Appreciate, Learn, Transfer
SESI	Serviço Social da Indústria
SBP	Systolic blood pressure
TNMG	Telehealth Network of Minas Gerais
TO	Teófilo Otoni
UESB	Universidade Estadual do Sudoeste da Bahia
UFBA	Universidade Federal da Bahia
UFMG	Universidade Federal de Minas Gerais
UFVJM	Universidade Federal dos Vales do Jequitinhonha e Mucuri
VC	Vitória da Conquista
WBOT	Ward-based outreach team
WSCHS	West Side Community Health Services

Executive Summary

Overview

HealthRise was a five-year global program funded by the Medtronic Foundation, designed to improve access to chronic care for individuals in underserved communities suffering from hypertension and diabetes. Its primary objectives were to increase screening, diagnosis, management, and control of cardiovascular disease and diabetes. The program was implemented in eleven communities in Brazil (two sites), India (two sites), South Africa (two sites), and the United States (three sites), and grantees in each location developed programs uniquely tailored to each local context. Despite substantial variation in program design, all shared the same core principles: empowering individuals living with cardiovascular disease and diabetes, enabling frontline health workers to better address the needs of these individuals and communities, and supporting advocacy and policy that promote effective care for non-communicable diseases.

The Institute for Health Metrics and Evaluation (IHME) at the University of Washington was contracted as the independent evaluation partner and carried out three primary activities: establishing baseline measurements and conducting a needs assessment, managing program monitoring, and conducting an endline evaluation. The findings from the needs assessment have been previously published, and monitoring data were reviewed periodically throughout the course of the program; this report focuses primarily on the endline evaluation. This report provides a short description of the nine demonstration projects; details of the monitoring and evaluation framework; methods and key findings of the baseline measurements, needs assessment, and monitoring activities; and detailed methods and results from the endline evaluation. Specific results and conclusions are presented for each country, as well as cross-country themes and conclusions applicable to the HealthRise project as a whole.

Project description

HealthRise project activities spanned five years. The needs assessments were conducted in 2014–2016; intervention planning, which included grantee selection, occurred in 2015–2016; implementation and monitoring took place from 2016–2018; and the endline evaluation was completed at the end of 2018.

In Brazil, HealthRise was active in two locations. One was Teófilo Otoni, in the state of Minas Gerais, where program implementation was led by Universidade Federal dos Vales do Jequitinhonha e Mucuri (UFVJM) and the Telehealth Network of Minas Gerais (TNMG), a network of universities led by the Universidade Federal de Minas Gerais (UFMG). Interventions in this site focused on improving the technological capacity of basic health clinics, developing and promoting instructional courses for all primary care providers and community-based health worker roles, and engaging with representatives from local government and health departments to ensure buy-in and coordination. The second site in Brazil, in Vitória da Conquista, was led by the Universidade Federal da Bahia (UFBA) with support from the Universidade Estadual do Sudoeste da Bahia (UESB), and Serviço Social da Indústria (SESI). In this site, key activities included promoting and publicizing the newly founded municipal association for individuals with diabetes and hypertension, implementing web-based electronic medical record systems in public basic health units, and assisting public basic health units with planning and workflows to support resource allocation for non-communicable diseases.

In India, HealthRise was active in two locations. In Udaipur, HealthRise activities were led by the Catholic Health Association of India (CHAI). This program focused on screening and clinical and home-based follow-up, incorporating community mobilization campaigns, telephone and SMS messaging outreach efforts, and piloting patient support groups in five villages. In Shimla, the local HealthRise partner was the MAMTA Health Institute for Mother and Child (MAMTA). Interventions in this site included screening camps, developing e-clinics to provide virtual consultations, and facilitating community support groups.

In South Africa, HealthRise was active in two districts. In uMgungundlovu district of the KwaZulu-Natal Province, the HealthRise implementing partner was Expectra Health Solutions. Interventions in this location focused on building the capacity of community care givers (CCGs) through extensive trainings; screening for hypertension and diabetes through household and workplace visits and health education campaigns; and coordinating patient support and adherence groups. Project HOPE led HealthRise activities in the Emthanjeni sub-district of Pixley ka Seme, in the Northern Cape province. Key activities were promoting awareness and screening for diabetes and hypertension through the training of community health workers (CHWs); providing follow-up support targeted at diagnosed patients who failed to maintain engagement with the health system; and developing and recruiting for holistic, post-diagnosis support programs for patients.

All three HealthRise sites in the United States were in the state of Minnesota. In Rice County, HealthRise was implemented by HealthFinders Collaborative (HFC). In this site, interventions focused on integrating clinical and community-based care networks; training CHWs and community paramedics (CPs); and expanding community-based education and counseling. In Hennepin County, the local partner was Pillsbury United Communities (PUC). Key components of this program included training CHWs and providing holistic care focused on home visits. In Ramsey County, HealthRise was led by Regions Hospital Foundation. Here, the HealthRise program entailed integrating CPs and CHWs into traditional clinic-based care and utilizing an electronic medical record and documentation platform to promote care coordination.

Evaluation components

The global framework for needs assessment and monitoring and evaluation was designed to align with Medtronic Foundation's continuum of care. The specific objectives of the needs assessments were to (i) estimate the prevalence of diseases and risk factors, (ii) identify major gaps along the continuum of care, and (iii) identify supply- and demand-side barriers that contribute to these gaps.

The monitoring and evaluation activities conducted by IHME can be broadly grouped into two categories: the process evaluation and the endline evaluation. The process evaluation, which had substantial overlap with the monitoring phase, offered insights into the various activities being executed across each of the implementation programs, and the endline evaluation measured changes in target health outcomes. Key outcome indicators for HealthRise included the number of individuals diagnosed with diabetes with their most recent blood glucose measurement below the threshold for controlled disease and the number of individuals diagnosed with hypertension with a decrease of 10% or more between their first and last blood pressure measurement.

For the endline evaluation, a mixed methods quasi-experimental approach was implemented in which both quantitative and qualitative data captured the different types of needs, barriers, and opportunities. A combination of quantitative and/or qualitative data were collected at each site, and when possible, data were collected from both intervention and comparison areas. These data were compared with data collected at

baseline to assess changes in patient outcomes, knowledge, and behaviors; provider knowledge and practices; the quality and availability of health services; and the reach of HealthRise programs.

Key findings

The needs assessment found that risk factors for cardiovascular disease and diabetes are common in all four countries and that many at-risk individuals are unaware of their likelihood of developing disease. Diagnosis was typically delayed until after the emergence of symptoms. Once diagnosed, a majority of patients were found to initiate treatment; however, many failed to reach treatment targets. Patients cited lifestyle modifications and the time and cost required to attend follow-up appointments and refill medications as major challenges to controlling their disease. Other key challenges included a lack of coordination between providers at facilities and frontline health workers, and overburdened tertiary centers as a result of patients bypassing care at lower-level facilities. In South Africa and India specifically, primary health care facilities were described as lacking needed diagnostics and pharmaceuticals. Across the four countries, providers reported not having enough time to counsel patients on lifestyle modification and medication adherence. Community-level screening for hypertension and diabetes was characterized as very limited. These gaps and barriers identified during the needs assessment phase were taken into consideration in the design of programs and selection of interventions in all HealthRise locations.

During the monitoring phase, several key indicators were tracked from each site to continuously assess the progress of HealthRise programs. In Teófilo Otoni, Brazil, 384 health workers were trained and nine public screening events were held for the general population. A total of 9,244 individuals were screened for hypertension and 190 individuals were newly diagnosed with hypertension. For diabetes, 40 new patients were identified out of 5,396 individuals without a previous diagnosis who were screened. In Vitória da Conquista, Brazil, almost 600 health workers were trained and 23 public screening events were organized. A total of 4,323 individuals were screened; by the end of the program, 233 new hypertension patients and 44 new diabetes patients were identified. In India, both grantees introduced an appreciative listening technique, called SALT, which was implemented in nearly 20 villages across Shimla and Udaipur. In addition, in Udaipur, 258 patient support groups and NCD club meetings were organized. In Shimla, 336 screening events were held, where a total of 22,053 individuals were screened. In uMgungundlovu, South Africa, 269 community caregivers were provided training on treatment and care for diabetes and hypertension. A mixed approach was used to screen nearly 8,500 individuals for hypertension and more than 6,000 individuals for diabetes. In Pixley ka Seme, 3,789 individuals were screened for hypertension, 3,872 individuals were screened for diabetes, and 94 support groups were initiated, including five-step groups, village saving and loans groups, and gardening groups. In the US, in Ramsey County, cumulative enrollment was 78 patients, with 33 enrolled for hypertension and 69 enrolled for diabetes (some patients had both conditions). In Hennepin County, the combined enrollment was 121 patients: 102 for hypertension and 100 for diabetes, with substantial rates of comorbidity. At the newly established NorthMarket grocery store, a total of 214 classes were offered, with 1,965 participants. In Rice County, 208 patients were enrolled.

A few key summary indicators demonstrate the scale of HeatlthRise's global work over the five years of the program. Across the nine sites, nearly 60,000 previously undiagnosed people were screened for hypertension, and over 55,000 previously undiagnosed people were screened for diabetes. This resulted in the identification of 6,441 cases of high blood pressure and 2,563 cases of high blood sugar among previously undiagnosed persons. Across all nine sites, according to their most recent available measurement, 3,139 enrolled

hypertensive patients had their blood pressure under control, and 1,034 enrolled patients with diabetes had their blood sugar controlled. Across all nine sites, 3,637 health workers were trained, and from four sites reporting, 710 support groups or NCD meetings were held.

In the endline evaluation, a major challenge HealthRise faced was the relatively short time frame to observe meaningful changes in patients' clinical outcomes, which usually take years to significantly change and particularly, to reach treatment targets. Despite the short implementation period, measurable clinical improvements were found among HealthRise patients in Brazil and in the US. In Brazil, enrolled patients in both sites had statistically significant declines in blood pressure and blood glucose levels between baseline and endline. Even though these changes cannot be attributed to HealthRise exclusively, as there did not exist a comparison group, the fact that the indicators of interest showed improvement is encouraging and warrants further study. In the US, in two of the three locations (Hennepin County and Ramsey County), there was a significant increase in the proportion of patients with A1c levels lower than 8%, while the comparison group showed no statistically detectable changes in this measure during the same time period. Across HealthRise sites, impacts were generally more positive for females than males, suggesting alternative strategies may be required to most effectively encourage screening and care-seeking among different subpopulations. One possible interpretation of the observed effects is that the HealthRise model, focused largely on home visits and delivered through health facilities, was more effective for females, who in many communities are more likely to be at home during the day and generally face fewer work-related constraints to attending health facilities during normal operating hours. In addition to impacts on patient outcomes, there were important observable differences in the quantity and quality of health services offered as a result of HealthRise. For example, in Shimla, India, facilities in HealthRise blocks had higher rates of e-clinic and HealthCard application availability than facilities in comparison blocks. Results from Pixley ka Seme in South Africa suggest that the implementation of HealthRise was associated with an increase in facility staff, particularly community caregivers. However, the demand on health services due to increased utilization related to HealthRise also had some unintended impacts that may have strained health services, emphasizing the importance of a health system that is equipped to respond to surges in demand. For example, in Shimla, HealthRise facilities were found on average to have lower stocks of hypertension and diabetes medications at endline than at baseline.

Several important themes emerged from the qualitative data collected at endline across the four countries. A primary theme was the essential role of frontline health workers in the HealthRise model and their unique contribution to patient care, particularly their ability to overcome linguistic, cultural, and geographic barriers. A second theme was patient empowerment. Patients participating in HealthRise described many ways the program increased their knowledge about NCDs and empowered them to manage their illness more effectively. Third, various challenges emphasized the importance of a strong underlying health system and that program success may ultimately be constrained by the capacity of the health system to provide the needed staff, facilities, and services. Innovation was a fourth theme. The structure of HealthRise as a whole was innovative – global, focused on NCDs, with learning built into the design – but within this overall structure, each grantee was also able to tailor the program and develop further innovations. Novel services and structures were explored in each of the four countries. In India, testing selected innovations helped build support among government officials to incorporate these into broader health system improvements. Fifth, care coordination was paramount in the design of HealthRise programs – linking different types of providers, various locations, and diverse information systems – to provide more efficient and effective care for patients,

particularly by linking clinic-based with in-home providers. Sixth, the social determinants of health were a pervasive underlying theme. In all four countries, the populations served by HealthRise faced many persistent challenges to their health and access to health care, including poverty, lack of education, poor housing conditions, and limited access to affordable and nutritious food, among others, and many of the services that HealthRise offered sought to overcome or were designed to accommodate these known barriers. Lastly, sustainability was a common concern as grantees looked to the future and considered how the work of HealthRise could continue or whether it should be expanded to new populations or conditions. As a grant-funded program, each site faces the challenge to identify new sources of financing.

Conclusions and Implications

The data collected through HealthRise and the identified successes and challenges in providing a wide range of programs for NCD prevention and treatment point to several key areas for future research. These include examining the best ways to train and utilize frontline health workers; continuing to advance technologies for care coordination; developing meaningful measures of patient empowerment; and refining and tailoring the various intervention components explored during HealthRise to be most effective and best suited to different populations. The valuable new information generated by HealthRise can also inform facility-level and local policies in the nine communities where HealthRise programs were active, and national priorities for the prevention and treatment of the growing burden of NCDs, as well as help to improve the design of NCD initiatives globally. In all four countries, high rates of NCDs and key risk factors were found at baseline, reaffirming the need to continue developing and implementing policies aimed at preventing and controlling NCDs. In Brazil, India, and South Africa, persistent weaknesses in the health system were encountered; staff shortages, medication stock-outs, long wait times, and difficulty accessing health facilities are priorities for health policy in these countries. In the United States, the findings from HealthRise suggest that greater use of community health workers and community paramedics has the potential to be a cost-effective component of care for NCDs. At the global level, the overwhelming success of including home-based providers in NCD care strongly supports the wider use of frontline health workers as a component of a wide range of health programs in a diverse set of countries. A second major implication for global policy is the need for greater emphasis in donor funding on strengthening health systems so they are better equipped to provide NCD care, as development assistance for health remains substantially skewed toward infectious diseases.

HealthRise had a vast footprint through its various programs in Brazil, India, South Africa, and the United States. Tens of thousands of people were screened for NCDs, well over 3,000 health workers received additional training, and hundreds of patients in each of the nine sites were placed on pharmacotherapy. HealthRise helped over 3,000 hypertension patients and more than 1,000 diabetes patients meet clinical targets and bring their condition under control. HealthRise confirms the major contribution of NCDs to the global disease burden; the need for strong and well-functioning health systems to support complex and ongoing NCD care; the particular benefits of home visits and well-coordinated care; and the vital role of communities in supporting patients and families coping with complex illnesses.

Introduction to the HealthRise Evaluation

Overview and Objectives

HealthRise was a five-year, $17 million global program funded by the Medtronic Foundation specifically designed to improve access to chronic care for individuals suffering from hypertension and diabetes in underserved communities. The program focused on target communities in Brazil, India, South Africa, and the United States, with the goal of contributing to a 25% reduction in premature mortality due to non-communicable diseases, particularly cardiovascular disease (CVD) and diabetes. Its primary objectives were to 1) increase screening and diagnosis of CVD and diabetes; and 2) increase management and control of CVD and diabetes.

In each country, HealthRise worked with several partners and across multiple sites to support innovative demonstration projects. Each HealthRise country program was uniquely tailored to the local context in which it was implemented. However, all programs shared the same core principles: seeking to achieve increased screening, diagnosis, management, and control of diabetes and hypertension by empowering individuals living with these conditions, enabling frontline health workers to better address the needs of those individuals and communities, and supporting advocacy and policy that promote effective care for non-communicable diseases.

Additionally, Medtronic Foundation contracted the Institute for Health Metrics and Evaluation (IHME) at the University of Washington to serve as the independent evaluation partner. In this capacity, IHME was tasked with the following three primary objectives, each at a different phase of the life cycle of the project:

- **Establish baseline measurements and conduct a needs assessment**: This phase was vital to understanding existing conditions with regard to the prevalence, detection, and treatment of diabetes and hypertension in HealthRise program areas prior to the implementation of any interventions. The needs assessment identified key gaps and barriers to reducing diabetes and hypertension, mapped gaps to the continuum of care, and provided recommendations for targeting interventions.
- **Manage program monitoring**: The monitoring portion of the evaluation process was conducted in tandem with project implementation and in close cooperation with the implementation partners. During this phase, timely information was provided to implementation partners on the progress of program execution, and longitudinal information was compiled for the evaluation of program impact.
- **Conduct an endline evaluation**: The final phase of the evaluation occurred after the conclusion of project interventions. This portion of the project addressed the fundamental questions of whether or not improved health outcomes were observed in areas in which the HealthRise program operated, and whether or not those changes can be attributed to HealthRise activities.

This report, prepared by IHME, describes the structure, methods, and key results of the monitoring and evaluation activities undertaken as part of the HealthRise project. Following this general introduction, we provide a short description of the individual demonstration projects and a more detailed view of the monitoring and evaluation framework. Next, we describe the methods and key findings of the baseline measurements and needs assessment, monitoring activities, and endline evaluation. Finally, we summarize cross-country results and conclusions that reflect the HealthRise project as a whole.

Organizational structure

The HealthRise "Global Team" included the Medtronic Foundation, the implementation and managing partners – Abt Associates (Abt), Human Sciences Research Council (HSRC), Instituto Sírio-Libanês de Ensino e Pesquisa (IEP) – and the evaluation partner, IHME. Abt oversaw the coordination of the HealthRise program at the global level and managed country-level programs in India and the United States. HSRC oversaw the program in South Africa, and the IEP managed Brazil's program. Across the four countries, nine distinct implementation partners received grants from the HealthRise program and worked in coordination with relevant country- and global-level partners to design and implement demonstration programs.

The IHME HealthRise team consisted of researchers, data analysts, and project management staff skilled in evaluation methods, survey development, qualitative assessment, in-country capacity building, impact analysis, and NCD prevention, treatment, and care. IHME subcontracted and established partnerships with key organizations in Brazil, India, and South Africa to collect data for the needs assessment and endline evaluation. Specifically, IHME subcontracted the following organizations: Dinamica Cursos, Tesla Gestao, and Press Consultoria in Brazil; Indira Gandhi Medical College Shimla, GfK (Growth from Knowledge) Mode, and Development Solutions in India; and Social Surveys Africa in South Africa. IHME conducted all qualitative interviews in the United States.

In order to comply with ethical standards regarding research involving human subjects, IHME secured ethical approval through the Human Subjects Division at the University of Washington for all activities it conducted related to the evaluation of the HealthRise program. All individual-level data received and analyzed by IHME were de-identified and complied with Institutional Review Board clearance. Additionally, all data-collection partners subcontracted by IHME obtained ethical clearance through local institutions for their activities related to the HealthRise evaluation.

Timeline

IHME was involved as the HealthRise evaluation partner from the onset of the project in early 2014. The activities undertaken by IHME over the course of the evaluation were numerous and varied. During the initial years of the project, IHME largely focused on conducting the needs assessment across the nine HealthRise locations. This culminated in the development of a set of recommendations, released in 2015 and 2016, on how to best target HealthRise interventions and allocate program resources. During this time period, IHME also carried out baseline data-collection activities in a subset of the locations and began developing long-term monitoring and evaluation structures.

Beginning in 2016 and continuing through the completion of the project, IHME worked in close communication and collaboration with country-level partners to refine and implement a monitoring framework aimed at tracking program activities through detailed indicator measurement. The majority of the final year of the project was devoted to the development and completion of endline data collection and the synthesis and analysis of a broad array of data sources into a cohesive endline evaluation.

Figure 1 below summarizes the timeline and roles and responsibilities assumed by IHME for the evaluation of the HealthRise project.

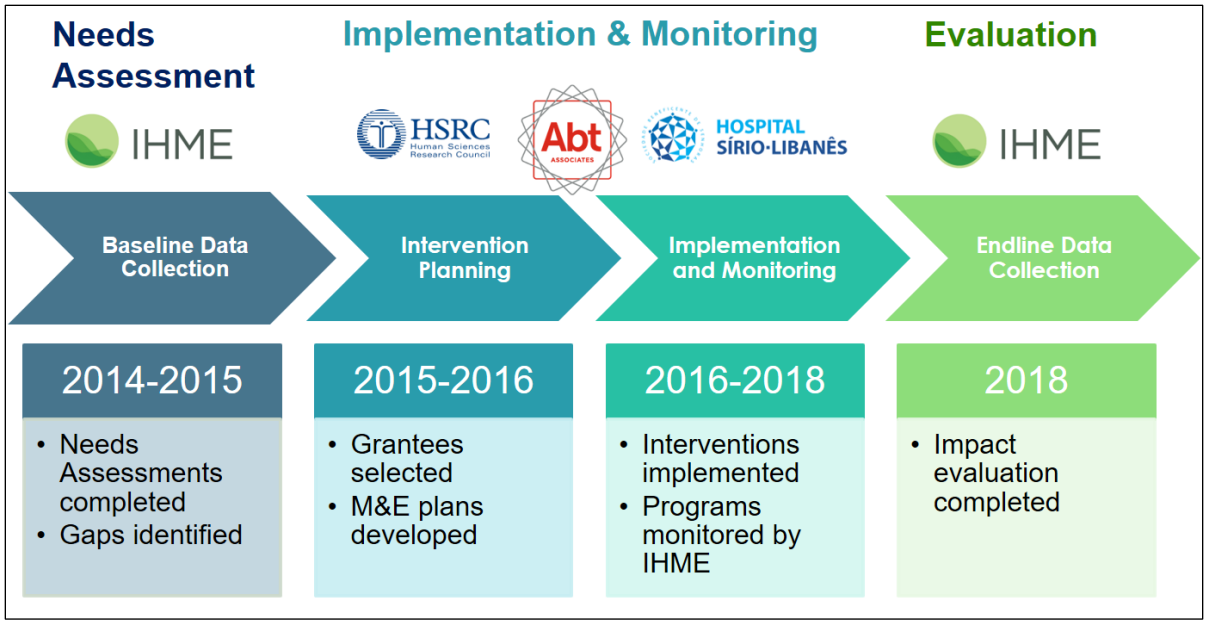

Figure 1. HealthRise timeline

Grantee program descriptions

HealthRise collaborated with nine local partners across Brazil, India, South Africa, and the United States that implemented a variety of interventions aimed at increasing screening for and diagnosis of cardiovascular disease and diabetes and improving the management and control of these conditions. Each of the nine demonstration programs emphasized empowering patients, strengthening frontline health workers, and supporting advocacy and policy. However, the specific interventions implemented assumed a variety of forms in order to address the specific needs of each location and complement existing care platforms.

Below is a brief description of the local context and highlights of the interventions for the nine implementation partners; however, this is not a comprehensive description of HealthRise activities. A more detailed and comprehensive account of these programs can be found in the *HealthRise Project Descriptions* report developed by Abt Associates, from which this section borrows heavily.[1]

[1] *HealthRise Project Descriptions*, Abt Associates.

Figure 2 displays the geographic locations of the nine projects.

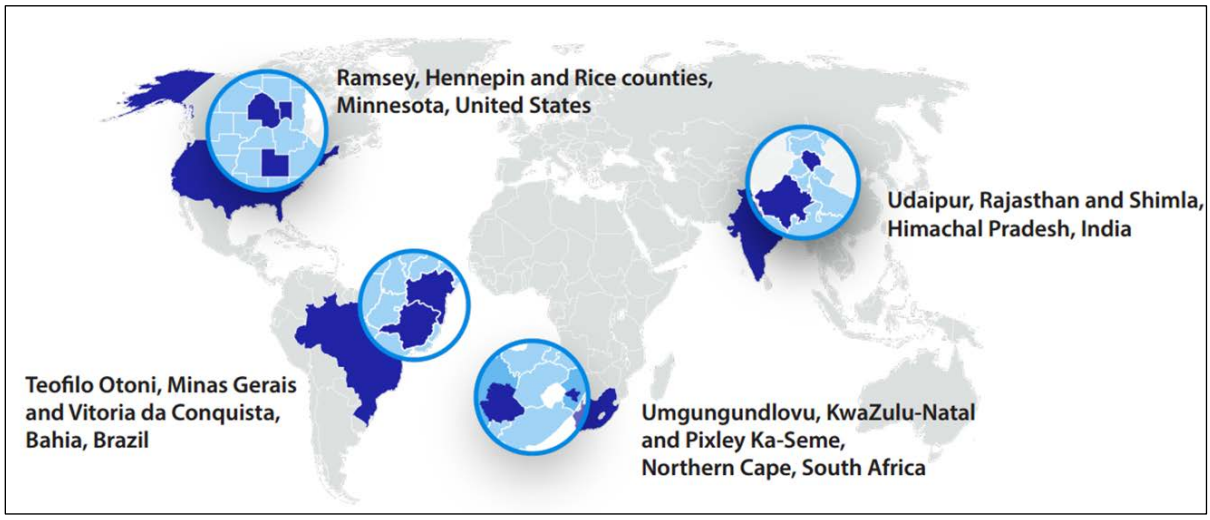

Figure 2. Map of HealthRise sites

Brazil

Teófilo Otoni – UFMG, UFVJM, TNMG

The HealthRise program in the Teófilo Otoni region of Minas Gerais, Brazil, was implemented by a collaborative team composed of the Universidade Federal dos Vales do Jequitinhonha e Mucuri (UFVJM) and the Telehealth Network of Minas Gerais (TNMG), a network of universities led by the Universidade Federal de Minas Gerais (UFMG).

The region of Teófilo Otoni, in the state of Minas Gerais, has low literacy and low per capita income relative to other regions in Brazil. While primary health care covers essentially all patients within the HealthRise area in Teófilo Otoni, access to laboratory testing is often limited, frontline health workers are not always well integrated with primary care service, and many patients do not feel empowered to manage their health conditions.

The HealthRise efforts in Teófilo Otoni largely focused on the following areas:

- Improving the technological capacity of basic health clinics through the provision of WiFi-connected computers, notebooks, and tablets; facilitating data sharing; and furthering integration with the Central TeleHealth Unit.
- Developing and promoting web-based and in-person instructional courses for all primary care providers and community-based health workers, which addressed topics such as strategies to manage chronic diseases and the importance of risk factors such as diet and exercise.
- Engaging with representatives from local government and health departments at the municipal level to ensure buy-in and coordination with the public sector.
- Developing a clinical support system promoting the utilization of updated guidelines for the treatment of hypertension and diabetes among frontline health workers.

Vitória da Conquista – UFBA, UESB, SESI

The HealthRise program in Vitória da Conquista, in the Brazilian state of Bahia, was led by the Universidade Federal da Bahia (UFBA) with additional support from the Universidade Estadual do Sudoeste da Bahia (UESB) and Serviço Social da Indústria (SESI).

An estimated 40% of Vitória da Conquista's approximately 350,000 inhabitants live below the poverty line. Among the primary challenges encountered in this region with regard to treatment of diabetes and hypertension are the frequent prioritization of acute care over chronic care and a lack of electronic medical records.

In Vitória da Conquista, interventions aimed at the following:

- Promoting and publicizing the newly founded municipal association for people with diabetes and hypertension in order to empower individuals to engage with helpful resources and manage their condition.
- In coordination with the Brazilian Ministry of Health, implementing web-based electronic medical record systems in public basic health units.
- Assisting public basic health units with strategic planning and restructuring of workflows to help ensure sufficient resource allocation for patients with non-communicable diseases.
- Testing the impact and cost-effectiveness of HbA1c point-of-care and home blood pressure monitoring in primary healthcare facilities.

India

Udaipur - Catholic Health Association of India

The Catholic Health Association of India operated as the local implementation partner for the HealthRise Program in the Udaipur District of Rajasthan, India.

Much of Udaipur's population lives in a rural setting, with long travel times and limited transportation options often inhibiting access to public health facilities. Lagging socioeconomic development in Udaipur contributes to low levels of health literacy. Financial and other constraints, both for individuals seeking care and within the health system, often result in the prioritization of acute over chronic care.

Hallmark features of the interventions implemented by CHAI in Udaipur, in addition to screening efforts and clinical and home-based follow-up, include the following:

- Community mobilization campaigns aimed at educating the population on diabetes and hypertension, recruiting for screening camps, and introducing individuals to the HealthRise program; mobilization efforts included a wide array of mediums, including household visits, street plays, wall paintings, radio campaigns, and public announcements.
- Telephone and SMS messaging outreach efforts focused on encouraging individuals suspected of suffering from diabetes or hypertension to seek follow-up care, and serving as a resource for counseling existing patients on topics including risk factors, treatment options, complications, and lifestyle changes.

- Collaboration with Constellation to pilot the appreciative learning technique "Stimulate, Appreciate, Learn, Transfer" (SALT) support groups in five villages; SALT groups promote community-developed and community-driven initiatives that empower patients to undertake collective action to better understand and address their health status.

Shimla - MAMTA Health Institute for Mother and Child

MAMTA Health Institute for Mother and Child served as the local HealthRise partner in the district of Shimla, in Himachal Pradesh, India.

Among the challenges that individuals and the health system in Shimla must address in the search for and provision of high-quality care for non-communicable disease are an overburdened public health system that struggles to provide sufficient human resources and equipment for confirmatory diagnosis and treatment of hypertension and diabetes, distrust in the public health system, and seasonal inclement weather that prevents individuals from accessing health facilities and impedes community-based health workers' ability to contact and support patients.

MAMTA's HealthRise interventions included the following efforts and activities:

- Hosting screening camps aimed at identifying individuals who may suffer from hypertension and diabetes without being aware of their condition, in addition to providing education and counseling for the general population on non-communicable diseases.
- The development of e-clinics, in partnership with local health facilities and the Indira Gandhi Medical College, to provide virtual consultations using Skype. These consultations allowed patients to access specialty care that may not have been otherwise available.
- Facilitation of community support groups that brought individuals with hypertension and diabetes together with outreach workers to discuss experiences, challenges, and advice related to disease management. This included SALT groups in 14 villages aimed at encouraging community-driven collective action in combating diabetes and hypertension, often focusing on lifestyle changes such as diet, physical exercise, and adherence to medication and treatment plans.

South Africa

uMgungundlovu - Expectra Health Solutions

Expectra Health Solutions conducted HealthRise activities in the uMgungundlovu district of the KwaZulu-Natal Province in South Africa. Specifically, interventions were carried out in the three sub-districts of Msunduzi, uMshwathi, and Mkhambathini.

In addition to hypertension and diabetes, other significant health challenges in this area include HIV and tuberculosis – the latter is the leading cause of death in uMgungundlovu. Traveling long distances is often required to visit health facilities, which contributes to missed appointments. This can be compounded by a patient's inability to afford transport to a health facility. Poor adherence to care programs and prescribed medications are also challenges faced in this region.

Expectra's intervention program largely focused on the following areas:

- Building the capacity of community care givers (CCGs) through extensive trainings on screening and referral practices for hypertension and diabetes. Trainings were provided for CCGs employed by Expectra for HealthRise, as well as for CCGs from the KwaZulu-Natal Department of Health. Additional trainings on confirmatory diagnosis, clinical support, and follow-up care for patients with diabetes and hypertension were also provided for clinicians and health professionals at public health facilities.
- Screening individuals for hypertension and diabetes through household and workplace visits and health education campaigns. Patient identification was further targeted through the use of "War Rooms," in which governmental departments, non-governmental organizations, and other stakeholders convened to discuss challenges in the local community.
- Coordinating support and adherence groups in which patients with similar conditions met on a regular basis, often at a health facility, to discuss challenges and difficulties in managing their conditions and treatment programs with providers.

Pixley ka Seme - Project Hope

Project HOPE undertook HealthRise activities in the Emthanjeni sub-district of Pixley ka Seme, in the Northern Cape province of South Africa.

Pixley ka Seme is a largely rural district with high levels of unemployment, crime, and substance abuse relative to other regions in South Africa. Economic growth in Pixley ka Seme is low, in part hampered by a scarcity of water. Patients often experience difficulty accessing health care in the sprawling region with limited transportation infrastructure, and public health facilities are not always adequately equipped or prepared to address the chronic care needs of patients who may suffer from socioeconomic challenges such as poverty or addiction.

In order to address these challenges, Project HOPE targeted interventions in the following areas:

- Promotion of awareness and screening for diabetes and hypertension through the training of community health workers (CHWs) in coordination with the National Department of Health and local community-based health organizations.
- Provision of follow-up support targeted at diagnosed patients who failed to maintain engagement with the health system, often focused on removing barriers to care such as lack of transportation or conflicts with work schedules.
- Development of and active recruiting for holistic, post-diagnosis support programs for patients. Support structures included a five-step program aimed at empowering patients, a savings and loan program to provide patients and their families with financial support and stability, and gardening groups to promote a healthy diet and lifestyle.

United States

Rice County - HealthFinders Collaborative

HealthFinders Collaborative implemented the HealthRise program in Minnesota's Rice County, in the United States of America. HealthFinders' focus is on improving chronic care for individuals who are uninsured or covered under public insurance programs. Much of HealthFinders' services are utilized by Latino immigrant

and Somali refugee populations, who represent a large share of the population in this area and who face unique socioeconomic challenges.

The HealthRise program implemented by HealthFinders centered on the following themes:

- Integrating clinical and community-based care networks by strengthening communication and knowledge-sharing platforms. This strengthening of networks was aimed at generating synergy, leveraging the expertise of clinical providers with the personalized care and attention of community-based health professionals.
- Developing and expanding community-based care through the training of CHWs and community paramedics (CPs). Individuals in these roles focused on bridging cultural divides between patients and the health system.
- Expanding community-based education and counseling programs, including regular exercise and cooking and nutrition programs.

Hennepin County - Pillsbury United Communities

Pillsbury United Communities implemented the HealthRise program in Hennepin County, Minnesota. This area is composed of a racially diverse population and suffers from high levels of poverty, unemployment, and violence relative to surrounding areas. Limited access to high-quality education or health care is a challenge experienced by many residents of this area.

Pillsbury implemented a series of interventions focused on the following areas:

- Training CHWs, with a focus on providing culturally sensitive care and counseling.
- Holistic care, focused on home visits, that recognizes the need for flexibility in attending to the varied circumstances of individual patients and their needs. Examples of services provided include coordinating transportation, housing, and employment; cooking and shopping demonstrations; and home safety checks.

Ramsey County - Regions Hospital Foundation

Regions Hospital Foundation conducted HealthRise activities in Ramsey County, Minnesota. This area is home to many non-English-speaking communities. Many individuals and families experience depressed economic opportunities and other socioeconomic hardships.

The Regions HealthRise program addressed these challenges through interventions aimed at the following:

- Integration of CPs and CHWs with traditional clinical-based care to provide in-home support. Services provided to patients included regular monitoring of patients' health status, reinforcing clinical education, language support, and assistance with other social needs.
- Utilization of an electronic medical record and documentation platform, the *Pathways* tool, to promote the coordination of care across different community-based caregivers.

Evaluation Framework

The global framework for needs assessment and monitoring and evaluation was designed to align with Medtronic Foundation's continuum of care. Through systematic data collection and analysis, the objective was to provide reliable information to support program implementation and offer meaningful insights to understand best practices for non-communicable disease interventions, specifically for cardiovascular disease and diabetes care. While the global framework served as a skeleton for the study design, specific adjustments were made in each country to tailor the framework to local settings.

Needs Assessments/Baseline

The goal of the needs assessments was to identify barriers and gaps along the continuum of care that prevent care seeking by patients, proper diagnosis, and management of CVD and diabetes. A mixed-methods approach was implemented which utilized both quantitative and qualitative data to capture different types of needs, barriers, and opportunities. Existing data sources were supplemented with primary data collection targeting three major aspects of the health system: demand side (i.e., the patients' perspective), supply side (the provider/system perspective), and context. Table 1 below summarizes the purpose, content, and data collection methods for these three health system aspects.

	Demand side	Supply side	Context
Purpose	To understand the needs and barriers in seeking care, proper diagnosis, and treatment among the general population	To assess the quality, capacity, and barriers in the provision of care	To capture existing physical environment, systems, and policies
Content	1. Sociodemographic 2. Risk factors 3. Knowledge, Attitudes, and Practices (KAP) 4. Care-seeking behavior 5. Medical history 6. Physical examination 7. Personal and cultural beliefs 8. Awareness and participation in activities organized by local NGO/CBO	1. Facility mapping 2. Facility capacities: a. Human resources b. Infrastructure c. Services 3. Frontline health workers' experience and perspective 4. Community-based organizations (awareness raising, for example, happens at the NGO/CBO level – outside of facility)	1. Built environment 2. Existing health programs and policies – some related to NCDs
Data collection method	Quantitative 1. Household + individual survey Qualitative 2. Focus groups with: a. individuals from different sociodemographic background b. Patient groups	Quantitative 1. Facility assessment survey (private, governmental, and non-governmental facilities) Qualitative 2. In-depth interview with frontline health workers on pressing challenges	Qualitative: 1. Observation of community environment 2. Focus group discussion of community members 3. Interview with local stakeholders and

	c. Community leaders	3. In-depth interviews and/or focus groups with facility-level providers of care (nurses, physicians, administrators, and CBO representatives)	document review of existing programs and policy

Table 1. Summary of goals and methods of data utilized in the needs assessment

Monitoring Phase

Given the potential diversity in the programs implemented across the nine HealthRise sites, to achieve consistency and quality in monitoring and evaluation, the monitoring framework was designed around the Medtronic Foundation's continuum of care. This approach focused on tracking prevalence, diagnosis, treatment, and control rates for individuals participating in the HealthRise program. Attention was also devoted to tracking interventions affecting the pillars of the HealthRise approach, including patient empowerment, health system strengthening, and policy reforms.

The process evaluation offered insights into the various activities executed across each of the implementation programs and broadly tracked three categories of indicators (Figure 3):

- **Inputs**: Resources such as money, human resources, time, and equipment devoted to the program. Examples of key HealthRise input indicators are program costs and the number of staff on implementation teams.
- **Processes:** The implementation of various activities that comprise each program. Process indicators differed across the nine sites; however, several key process indicators are relevant across many or all programs. Examples of common HealthRise process indicators include the number of community health workers and clinical providers trained and the number of screening events conducted.
- **Outputs**: Products generated by program activities. Outputs also differ depending on the specific interventions implemented in each site. Examples of key HealthRise output indicators are the number of patients enrolled and the number of new patients receiving a confirmatory diagnosis.

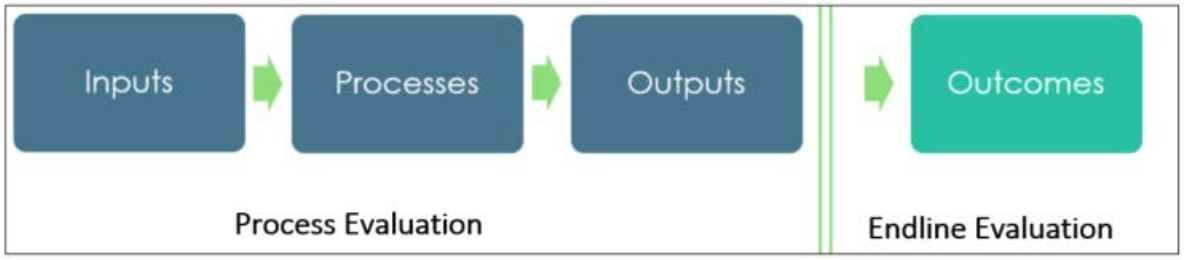

Figure 3. Types of indicators used in the process and endline evaluation

Endline Evaluation

The endline evaluation aimed to measure changes in target health outcomes and consider whether any changes could be attributed to HealthRise interventions. Key outcome indicators were selected to be the same across countries and interventions and aimed to reflect the main goals set for the HealthRise program as a whole. Three main outcome indicators each were identified for diabetes and hypertension. These aimed to

capture the proportion of patients meeting treatment targets and showing improvements in biomarkers for each condition. Specifically, the following indicators were measured:

- For diabetes:
    1. the proportion of individuals diagnosed with diabetes with their most recent HbA1c reading below 8%
    2. the proportion of individuals diagnosed with diabetes whose HbA1c decreased by 10% or more between their first and most recent readings
    3. the average change in HbA1c among individuals with diabetes
- For blood pressure:
    1. the proportion of individuals diagnosed with hypertension with their most recent blood pressure reading below 140 mmHg systolic blood pressure (SBP) and 90 mmHg diastolic blood pressure (DBP)
    2. the proportion of individuals diagnosed with hypertension whose SBP decreased by 10% or more between their first and most recent readings
    3. the average change in SBP among individuals with hypertension

Due to several financial and timing constraints, it was not feasible to implement the same endline evaluation design across all nine interventions. Broadly, the endline evaluation followed a mixed-methods quasi-experimental design that included quantitative and qualitative components. Information on both the supply (provider) and the demand (patient and community) perspectives was collected. When possible, key indicators were measured in both the intervention group and a suitable control group, and also when possible, the levels of these indicators were compared before and after HealthRise interventions occurred.

Table 3 in the Endline Evaluation Methods Overview section shows, for each of the nine implementation partners, the type of analysis that could be undertaken for the endline evaluation. Additional details are presented in the country-specific sections later in this report.

Needs Assessments: Summary

Objectives

In each country, a needs assessment was conducted to guide the design of the HealthRise program in each site and to provide a basis for comparison for measures collected at endline, in order to examine the impacts of HealthRise on key indicators. The specific objectives of the needs assessment were to (i) estimate the prevalence of diseases and risk factors, (ii) quantify major gaps along the continuum of care, and (iii) identify supply- and demand-side barriers that contribute to these gaps.

Methods

A mixed-methods approach was employed, combining quantitative and qualitative data, from both primary data collection and existing sources. The combination of data sources utilized varied by country but included one or more of the following: (i) health facility surveys, (ii) focus group discussions with patients and community members, (iii) key informant interviews with providers, policymakers, and community-based organizations, and (iv) secondary analysis of existing data sources. The needs assessment spanned the nine sites in four countries and, in total, was composed of 134 health facility surveys, 32 focus group discussions, 46 key informant interviews, and 19 secondary data sources. Additional details on the methods and data sources used in each country are provided in the country-specific needs assessment reports (see Appendix A). A summary of key findings is presented below, but more detailed results and conclusions of the needs assessment are also provided in each country's report.

Key Findings

Cross-Country

While the specific challenges identified varied by country, Figure 4 presents overarching conclusions that characterize gaps and opportunities in the continuum of care across the four countries from the perspective of patients. These findings are classified according to four progressive phases along the care continuum: at risk of disease, undiagnosed disease, diagnosed but untreated disease, and treated but uncontrolled disease. At the first stage, it was found that risk factors for cardiovascular disease and diabetes are common in all four countries, with variations in these risk factors by sex, and that many at-risk individuals are unaware of their likelihood of developing disease. For the population with undiagnosed disease, it was found that diagnosis was typically delayed until after the emergence of symptoms, although this was more pronounced for hypertension than for diabetes. This may in part be attributable to the fact that many patients reported traveling long distances to large facilities in order to receive a diagnosis. Once diagnosed, connecting patients to treatment was identified as a relative strength of existing systems; a majority of patients were found to initiate treatment, even in places where the influence of traditional medicine is strong. However, accessing treatment was not a guarantee of controlled disease, with many patients failing to reach treatment targets. Patients cited lifestyle modifications and the time and cost required to attend follow-up appointments and refill medications as major challenges to controlling their disease.

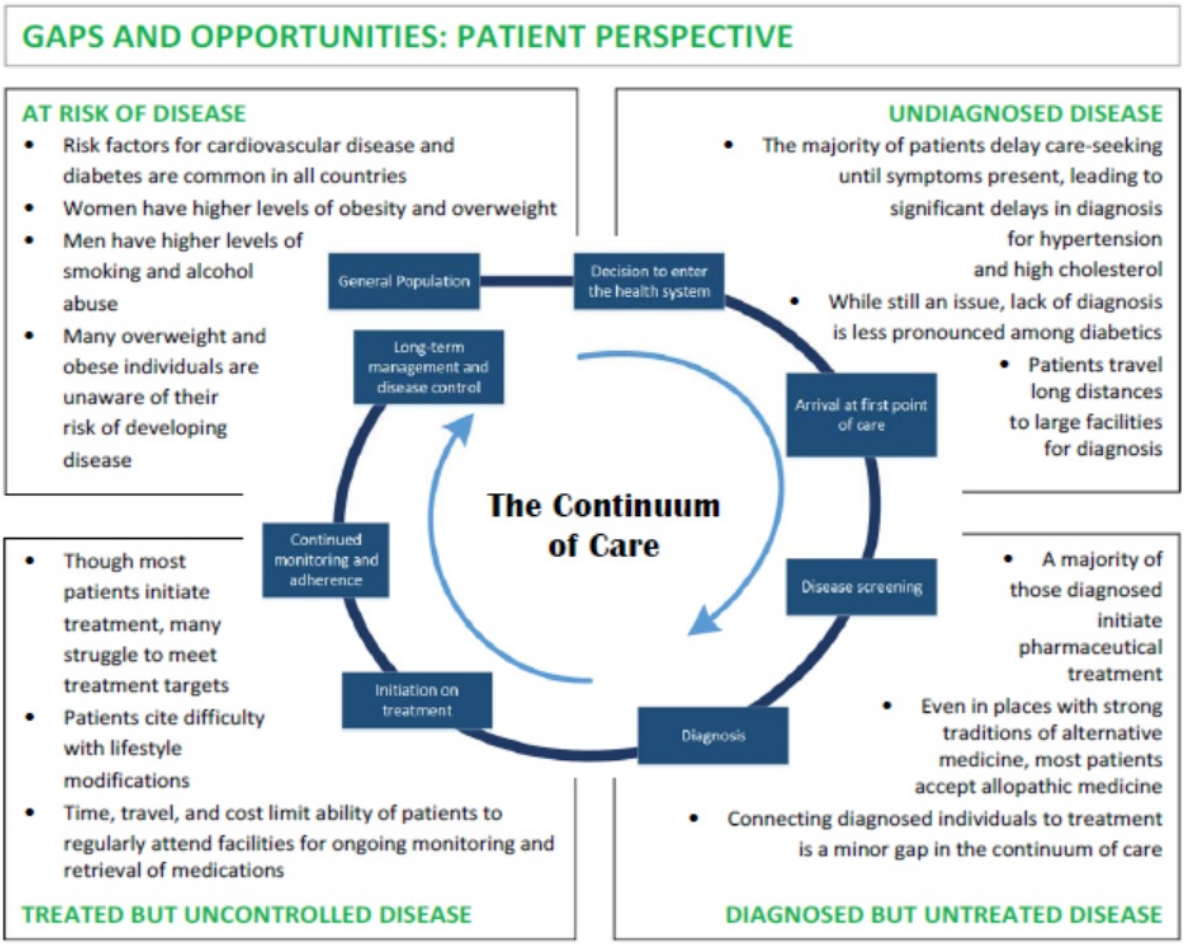

Figure 4. Continuum of care: needs assessment findings

Additional gaps and opportunities were identified from the provider perspective. Key challenges reported included a lack of coordination between providers at facilities and frontline health workers and overburdened tertiary centers as a result of patients bypassing care at lower-level facilities. In South Africa and India, specifically, primary health care facilities were described as lacking needed diagnostics and pharmaceuticals. Across the four countries, providers reported not having enough time to counsel patients on lifestyle modification and medication adherence. Community-level screening for hypertension and diabetes was characterized as very limited.

Each HealthRise site used the needs assessment findings to tailor and design specific interventions that ultimately constituted the HealthRise program in their setting. Using the continuum of care as a guiding framework, interventions were selected to optimally address the specific challenges in each setting. Where awareness of risk factors and symptoms was low, various health education outreach strategies were employed. To improve early detection, screening activities and home visits were used to identify possible cases. Home visits were also employed to overcome the challenges of reaching distant health facilities. A range of approaches was used to improve care coordination. Each grantee organization used these and other creative and context-sensitive strategies to develop and employ a set of interventions that met the needs of their unique populations.

Brazil

The conclusiveness of many findings from the needs assessment in Brazil was limited by a lack of sufficient data, particularly locally representative data. In order to supplement the population data at the state or national level gathered through literature review, a cross-sectional community-based study was conducted in Poções, a city in the state of Bahia (Brazil northeast region), and Padre Paraíso, in the Minas Gerais state (Brazil southeast region), from October to December 2017. These locations were chosen by key stakeholders given their status as underserved municipalities and their socioeconomic similarities to the HealthRise intervention areas (Appendix B).

The estimated prevalence of NCDs in Brazil varied substantially across studies and data sources: for hypertension, from 27% to 44%, for diabetes, from 6% to 15%, and for high cholesterol, from 4% to 11%. The prevalence of these NCDs was found to be higher among women than men and among people with less education; however, estimates were based on self-report and may reflect differences in awareness between groups rather than true differences in disease status.

In Padre Paraíso and in Poções, where individuals had their blood pressure and random blood glucose measured, prevalence of diabetes was around 9.5%, while prevalence of hypertension was over 55% in both locations. No significant difference was seen by sex. Overall, higher prevalence of these conditions was found among older individuals, those with low education and low socioeconomic status, those reporting no or low physical activity, and those with central obesity (Appendix B).

Of those living with these diseases, many were found to be undiagnosed, with as many as 52% of men with hypertension from Poções and 25% of men with diabetes from Padre Paraíso unaware of their disease. According to the literature, this was likely an even greater problem for high cholesterol, as a larger proportion of people reported never having been tested for this condition in Brazil. In regard to treatment, an important gap was seen among women with diabetes in Poções, where over one-third of previously diagnosed patients reported not being on treatment. Among those on treatment, 14–40% had their blood glucose under control. Among diagnosed hypertension patients, 78–90% were receiving treatment, with 11–25% meeting treatment targets.

The literature also suggested that major NCD risk factors were highly prevalent in Brazil: over 40% of the population in the two HealthRise states were overweight or obese and reported low physical activity, and among males, binge drinking and smoking were common. The level of health awareness in relation to NCDs was low. Individuals did not demonstrate knowledge of disease symptoms, were hesitant to seek preventive care, and were unaware of educational activities and support groups available in health facilities.

Several important limitations were identified in the provision of NCD-related health services. Patients described health facilities as having inconvenient operating hours and long wait times, being understaffed, and facing medication shortages. A small minority of patients reported ever having received an in-home visit from a health professional. From the supply side, primary health care facilities lacked the infrastructure, equipment, and drugs to diagnose and treat NCDs. Despite patients reporting crowding and long wait times, facility data indicated that primary care physicians saw only nine to 13 patients per day in both Vitória da Conquista and Teófilo Otoni.

Based on the major findings of the needs assessment, several recommendations were developed to guide the design of HealthRise interventions in Brazil. First, it was concluded that interventions should focus on patient empowerment by seeking to increase awareness of NCD risk factors and symptoms, available resources for treatment, and the importance of lifestyle behaviors and medication adherence in disease management. Second, it was recommended to improve health facility capacity in terms of the ability to diagnose and treat NCDs, improve patient satisfaction, and increase the quantity of appropriate staff to treat and counsel NCD patients. The third recommendation was to explore interventions involving home visits, which were believed to have the potential to increase access to care. Finally, improving the diagnosis and treatment of high cholesterol was identified as a priority area, considering the very low testing rates found for this condition.

In addition to these key recommendations regarding intervention design and focus, several information gaps were identified that were recommended to be addressed through stakeholder engagement. Conflicting evidence from patient reports and administrative data regarding wait times and appropriate staffing levels at health facilities required additional exploration. Given the interest in expanding the use of in-home visits, there was a need to determine existing numbers of in-home providers, as well as their management, perception among the population, and capacity for additional NCD-related activities. An understanding of supply chain failures was also needed to clarify reasons for the identified lack of sufficient equipment and pharmaceuticals for NCD diagnosis and treatment.

India

Based on existing data, the burden of NCDs was found to be high in Shimla and Udaipur, with the prevalence of hypertension in both districts above the national average. Among older adults, prevalence ranged from 42% among 65- to 69-year-old males in Udaipur to 76% among 75- to 79-year-old females in Shimla. Diabetes prevalence was lower overall, highest among females aged 75-79 in Udaipur (18%) and females aged 65-69 in Shimla (17%). Among hypertension patients, about 60% were found to be undiagnosed, and 59% of those on treatment did not have their disease controlled. For diabetes patients, 23% had not been previously diagnosed, and 40% who were on treatment did not have their condition under control. Data collected from patients and households indicated that awareness of the importance of routine checkups was low.

From the various data sources consulted, several key barriers emerged as impacting care-seeking and the provision of health services. Patients reported problems with the quality and cost of care. Facilities had shortages of equipment, staff, and pharmaceuticals. Only a few primary health centers and sub-centers were found to offer screening and preventive services; private facilities offered a greater variety of preventive services but at a higher cost. There were generally long wait times at facilities, particularly due to overcrowding in tertiary facilities that could diagnose NCDs and were able to provide comprehensive diagnostic and treatment services. ASHAs were found to be active in their communities, were perceived positively, and were viewed as a good resource for health information, particularly regarding maternal and child health. Overall, community members had low awareness of NCD-related interventions led by NGOs and CBOs.

Based on the major findings of the needs assessment, several recommendations were developed to guide the design of HealthRise interventions in India. The first focus area identified was promoting diagnosis-seeking by increasing awareness of the importance of routine checkups and strengthening capacity for community outreach and decentralized screening processes. Second, it was recommended to utilize collaborative efforts

with supply-side partners so that primary and secondary care facilities become better equipped to provide services for NCD treatment and disease management. Third, comprehensive preventive and treatment strategies were encouraged in order to target multiple conditions and risk factors and achieve the best health outcomes.

South Africa

In South Africa, existing estimates suggested fairly low rates of diagnosis: over 50% of patients with hypertension and 20% of patients with diabetes were undiagnosed. Furthermore, no population-wide screening programs appeared to exist for these conditions. Most individuals diagnosed with hypertension or diabetes were found to seek care, but less than one-third of patients receiving hypertension treatment and just over half of those receiving diabetes treatment were meeting treatment targets. The prevalence of cardiovascular disease, diabetes, and key risk factors was found to be high across all subpopulations defined by race, income, and urbanicity. However, there were differences in diagnosis rates, disease management, and care-seeking behavior between racial groups. There were also important differences between the risk and treatment profiles of males and females. Rural populations were found to lack consistent access to health facilities and differ from urban populations in terms of diagnosis for diabetes and cholesterol. Rates of NCD diagnosis, treatment, and disease control were worse among the population under age 50.

Among patients and other community members, knowledge of health behaviors and practices was high, but people had low awareness of their own health status and limited ability to monitor their condition and engage in health promotion activities. Few support groups were available, and providers lacked time to counsel patients on disease management. Health facilities were found to lack proper tests and equipment for diagnosis and ongoing monitoring of NCD patients; 20% of Provincial Health Clinics (ProvHCs) and CHCs lacked sufficient glucose testing materials, and 40% lacked cholesterol testing equipment. Additional challenges included large patient volumes and low staffing levels, leading to long wait times and high patient loads for individual providers. Community care givers (CCGs) were found to be an underutilized mechanism to potentially alleviate gaps in the continuum of care for NCDs; they were respected by community members but had limited capacity to diagnose and monitor NCD patients. In addition, care was not well integrated across providers and facilities, particularly between CCG services provided in the community and facility-based services. Lack of trust between community members and facility-based personnel, and between CCGs and facility staff, was cited as a barrier to greater integration of NCD diagnosis and management.

Several recommendations were developed from these key findings to guide the design of HealthRise interventions in South Africa. First, CCGs should be trained and equipped to diagnose and monitor NCDs in order to overcome barriers related to patients' need to access health facilities. Second, a population-wide screening program using frontline health workers should be implemented, in coordination with facility-based care, to combat widespread under-diagnosis. Third, interventions that encourage individuals to seek diagnosis and follow-up care at health facilities should also address staffing and infrastructure gaps to avoid exacerbating problems related to staff shortages and high patient loads and to ensure new patients get needed support. Finally, interventions should focus on increasing individuals' ability to understand and monitor their own conditions, whether through support groups, expanded counseling from providers, increasing access to monitoring equipment, or improving patient awareness of disease status and treatment.

United States

In the United States, the three participating counties in Minnesota were examined in detail in order to identify the areas and populations in greatest need of additional NCD-related health services. On average, Minnesota is one of the highest-performing US states in terms of health outcomes, with relatively low prevalence of key risk factors. An analysis of disease and risk factor prevalence, performed for 13 sub-county areas, identified large health disparities within the three counties. The worst-performing areas were Minneapolis North (composed of Camden and Near North), Rice County (and its Southern region in particular), and Ramsey County as a whole. Across the 13 sub-county areas, self-reported hypertension prevalence ranged from 11.2% to 26.2%; self-reported diabetes prevalence ranged from 3.2% to 9.2%; and the prevalence of daily smoking ranged from 4.0% to 18.4%. The percentage of people who had received any medical care in the past year ranged from 54.2% to 86.1%. Major differences between men and women were not identified for the outcomes examined.

Using survey data representative at the zip code level, more specific high-need areas were identified. In terms of meeting clinical targets, populations in North Minneapolis and Camden were the lowest-performing in Hennepin County. In Ramsey County, populations in Downtown St. Paul, Southwest Downtown St. Paul, and South East Downtown St. Paul had the worst health outcomes. In Rice County, rural areas had worse outcomes. Across the three counties, there was a consistent pattern of high comorbidity, with over 30% of individuals having more than one condition.

Qualitative data suggested that the worst-performing areas faced unique challenges, though common themes in these areas were larger minority and immigrant populations, lower income levels, and higher use of emergency room and urgent care for general health care. Minneapolis North was described as a largely impoverished, African-American population characterized by low educational attainment and high levels of violence. Downtown St. Paul areas of Ramsey County were noted as having large homeless populations, in addition to recent-immigrant populations, including a large number of undocumented immigrants who may have difficulty understanding or accessing the formal health system. Rice County was identified as more rural, with outreach and supportive services more difficult to access, and also had a large undocumented and recent-immigrant population.

Three primary recommendations were developed from these findings to inform HealthRise programming in the United States. First, interventions should be targeted in areas of highest need and with the poorest clinical outcomes: North Minneapolis in Hennepin County, Downtown St. Paul in Ramsey County, and rural and South Rice County. Second, the focus should be to diagnose and treat individuals who may not have been previously diagnosed. Third, a primary objective should be to reach clinical targets for people in care in these areas.

Monitoring: Summary

Methods

As programs were being designed and rolled out, IHME worked in close collaboration with global partners and individual implementation teams to design, coordinate, and execute a flexible monitoring system that aligned with the continuum of care. Timely reports and feedback were generated by IHME regarding the progress of program execution in order to accumulate longitudinal information for implementation teams and to facilitate the scale-up of intervention programs to meet targets over the implementation period.

In the early phase of the HealthRise project, as implementation teams were being selected and developing intervention programs, IHME worked with partners to develop a series of indicators aimed at tracking key areas of interest, often related to the continuum of care or the primary pillars of the HealthRise approach: patient empowerment, strengthening of frontline health workers, and policy. IHME then coordinated with implementation and grant management teams to adapt these indicators in order to accommodate the myriad differences with regard to the focus of interventions and local contexts across the various program locations. Over the course of the implementation period, as intervention programs developed and new circumstances came to light, IHME continued this dialogue with various partners and further adapted indicators as necessary to help ensure they continued to reflect the dynamic circumstances as accurately as possible.

Monitoring indicators were wide-ranging by design and covered many different elements of the intervention programs. Below are some examples of common monitoring indicators and the broad intervention themes which they related to:

- **Program costs:** Program expenditures
- **Building health worker capacity:** Number of total health workers trained; number of community health workers trained
- **Screening:** Number of screening activities held; number of individuals screened; number of individuals screened with a biomarker measurement above a given threshold
- **Follow-up and care**: Number of individuals who received a follow-up consultation; number of individuals who received a confirmatory diagnosis
- **Biomarker readings:** Number of enrolled individuals with biomarker readings below a given threshold; number of individuals with a significant change in biomarker values over time

Throughout the implementation period, local implementation teams, in coordination with country-level managers, maintained data on program activities in accordance with established indicators. The exact form and structure of these data differed drastically across programs depending on the location and the implementation team. Most notably, due to restrictions on data sharing, partners from the South Africa and India teams provided aggregated data based on broad demographic groupings, while partners in the US and Brazil were able to share individual-level data which had been de-identified and complied with ethical clearances of all partners. These data were shared with IHME on a regular basis over the course of the implementation period.

Important caveat in considering the results from the monitoring phase: All monitoring data were generated and provided to IHME from implementation teams and implementation management partners. Due to

variations in the interventions across the nine locations and differences in data collection platforms and analysis systems, indicators were provided to IHME in many different formats. While IHME strived to guarantee that indicators were defined consistently across locations, this was frequently not possible due to constraints that were site-specific. In this report and in the monitoring reports, IHME attempted to make the information comparable across locations; however, due to limitations that cannot be overcome by data processing, this was not always possible. For the US and for Brazil, where IHME received individual-level data and produced the monitoring indicators in-house, the IHME team has a greater level of confidence that the measurement complies with the definition of the indicators. For monitoring data received from India and South Africa, since the indicators were reported in aggregate format, IHME cannot guarantee that the definitions are consistent with the definitions in the monitoring framework and cannot guarantee the validity of the indicators. The in-country partners, Abt Associates and HSRC, respectively, were responsible for the production of these indicators and reporting them to IHME.

IHME generated custom computer code using an array of programming languages and data analysis tools to process incoming monitoring data from each of the implementation teams. These customized programs joined, collated, and reformatted datasets as necessary and extracted key figures that were then compiled into monitoring reports. Monitoring reports tracked the progress of program implementation over time and were shared with implementation teams and other partners to provide timely feedback on program scale-up and development.

As noted, the types of data collected and shared with IHME varied by site. Below are descriptions of the data type and time frame for which data were shared with IHME by each grantee (Table 2).

Country	Site	Data type	Timeframe
United States	Ramsey	Patient data	6/2016 - 6/2018
United States	Ramsey	Centricity clinical data	1/2016 - 1/2017
United States	Ramsey	WSCHS	6/2015 - 9/2018
United States	Rice	Patient data	9/2016 - 6/2018
United States	Rice	Mayo patient data	3/2016 - 9/2018
United States	Rice	NH+C attendance data	7/2016 - 10/2018
United States	Hennepin	NorthRising Screening	6/2016 - 2/2017
United States	Hennepin	EPIC	6/2016 - 9/2018
United States	Hennepin	North Market	11/2017 - 5/2018
India	Udaipur	Aggregated indicators	6/2016 - 12/2018
India	Shimla	Aggregated indicators	6/2016 - 12/2018
South Africa	Pixley ka Seme	Aggregated indicators	3/2017 - 8/2018
South Africa	uMgungundlovu	Aggregated indicators	2/2017 - 8/2018
Brazil	Teófilo Otoni	Indicators	5/2017 - 12/2018
Brazil	Vitória da Conquista	Indicators	3/2017 - 12/2018

Table 2. Summary of data available for monitoring, by site

The following section briefly presents a small subsection of key monitoring indicators for each implementation program. A more complete list of monitoring indicators for each program can be found in Appendix C.

Key Findings

Brazil

Both Brazilian grantees designed interventions aimed at identifying new hypertension and diabetes patients, educating and empowering health workers and patients, and strengthening the local health system through better coordination of health services provided.

Teófilo Otoni (TO)

Over the course of the program, 384 health workers were trained on topics related to diabetes and hypertension care management, of which 63% were CHWs. Trainings occurred through in-person meetings and online modules developed by the grantees.

The TO team organized nine public screening events, which were open to the general population aged 30 years and older in the Teófilo Otoni region. In addition to these public events, individuals were also screened during home visits performed by CHWs. During these activities, patients who reported a previous diagnosis of diabetes and/or hypertension were referred directly to a health facility for program enrollment and follow-up, while patients without a previous diagnosis were investigated through consecutive blood pressure and blood glucose measurements. Out of 9,432 individuals who participated in a screening activity, 3,129 did not report a previous hypertension diagnosis, and 190 were diagnosed with hypertension by the project. For diabetes, 40 new patients were identified out of 5,396 individuals without a previous diagnosis that were screened, as detailed on the cascade below (Figure 5).

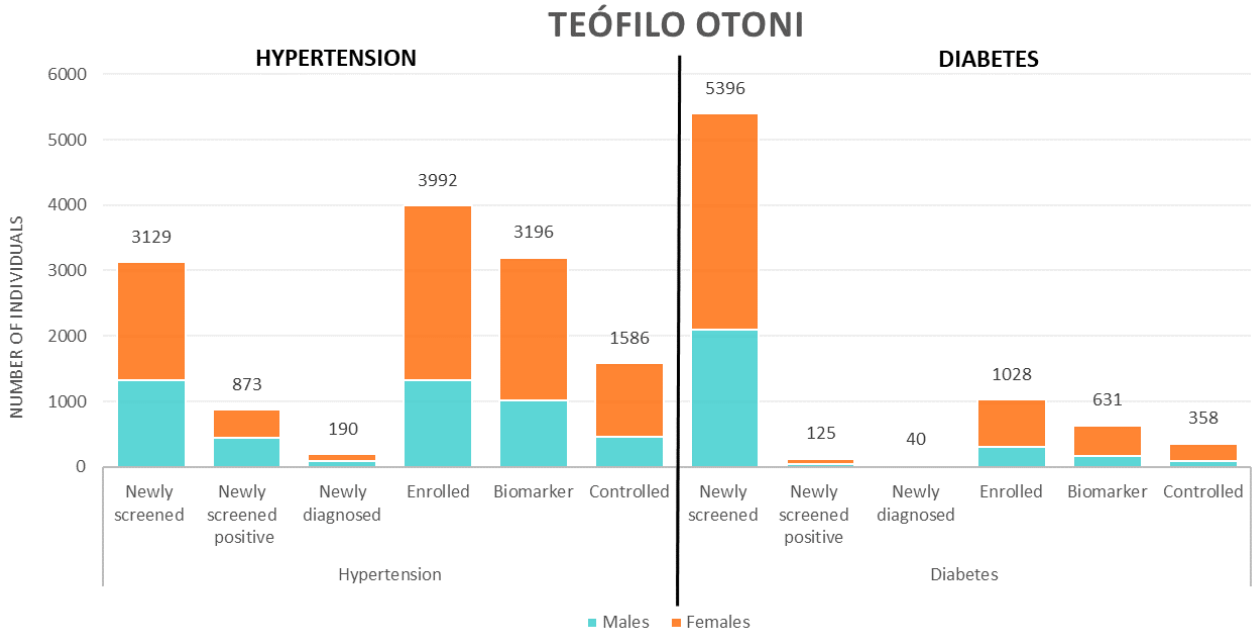

Figure 5. Teófilo Otoni cascade of care

Finally, 3,992 individuals with hypertension and 1,028 individuals with diabetes were enrolled in the program. All patients who attended at least one consultation or other activity at the health facility after diagnosis confirmation were considered enrolled. Diagnosed patients who were not screened could still be enrolled through regular facility activities. Not all enrolled patients had a blood pressure or blood glucose reading

registered. Out of those who could be evaluated, a total of 1,586 (50%) and 358 (57%) patients had their most recent blood pressure (SBP < 140 mmHg and DBP < 90 mmHg) and blood glucose (A1c < 8%) readings under control, respectively.

Females outnumbered males in all categories from "Newly screened" to "Controlled" for both hypertension and diabetes, with the exception of the "Newly screened positive" category for hypertension, in which males slightly outnumbered females. Tables containing disaggregated counts by sex for each category can be found in Appendix D.

To promote patient empowerment, TO was also responsible for consolidating patient support groups at health facilities, as well as a new patients association. By the end of the program, 813 hypertension and diabetes patients had attended at least one support group meeting. Additionally, storytelling workshops and physical activity session were provided, the latter attended regularly by 93 individuals.

The incorporation of new technologies by the health teams was one of the key components of TO's interventions, especially the use of the clinical support system, and a system for tele-consult and tele-diagnosis. However, despite providing all the trainings and the necessary equipment, only 31 tele-consults were performed in the region over the course of the program.

Vitória da Conquista (VC)

The VC team trained almost 600 health workers in Vitória da Conquista, of which 57% were CHWs. As part of activities intended to educate patients and health workers, the grantees designed different awareness activities, such as street plays, radio programs, animated videos, and more. The team also built four public gyms, which were installed at different primary health units. By the end of the program, 136 individuals had attended a gym at least once.

In the past two years, 23 public screening events were organized in Vitória da Conquista. These events were held during the weekends and were open to the general population aged 30 years old and older. Industry workers attending the SESI health clinic were also screened during regular checkups. While attendees reporting a previous diagnosis of diabetes and/or hypertension were referred directly to the health facility for program enrollment and follow-up, those without a previous diagnosis were investigated through consecutive blood pressure and blood glucose measurements. A total of 4,323 individuals attended a screening event in VC, of whom 2,315 and 3,609 did not report a previous diagnosis of hypertension and diabetes, respectively. By the end of the program, 233 new hypertension patients and 44 new diabetes patients were identified (Figure 6).

A total of 2,443 individuals with hypertension and 1,052 individuals with diabetes were enrolled in HealthRise. All patients who attended at least one consultation (or other activity) at the primary health care unit or at the SESI clinic were considered enrolled. Most of the enrolled patients in Vitória da Conquista had not attended a screening event but were enrolled through regular facility activities. Not all enrolled patients had a blood pressure or blood glucose reading available for analysis. For example, less than half (41%) of enrolled patients with diabetes had at least one A1c test result recorded. Of patients with available test results for each of the conditions, 41% (n=845) had their blood pressure under control (SBP < 140 mmHg and DBP < 90 mmHg) and 52% (n=228) had their blood glucose under control (A1c < 8%) (Figure 6).

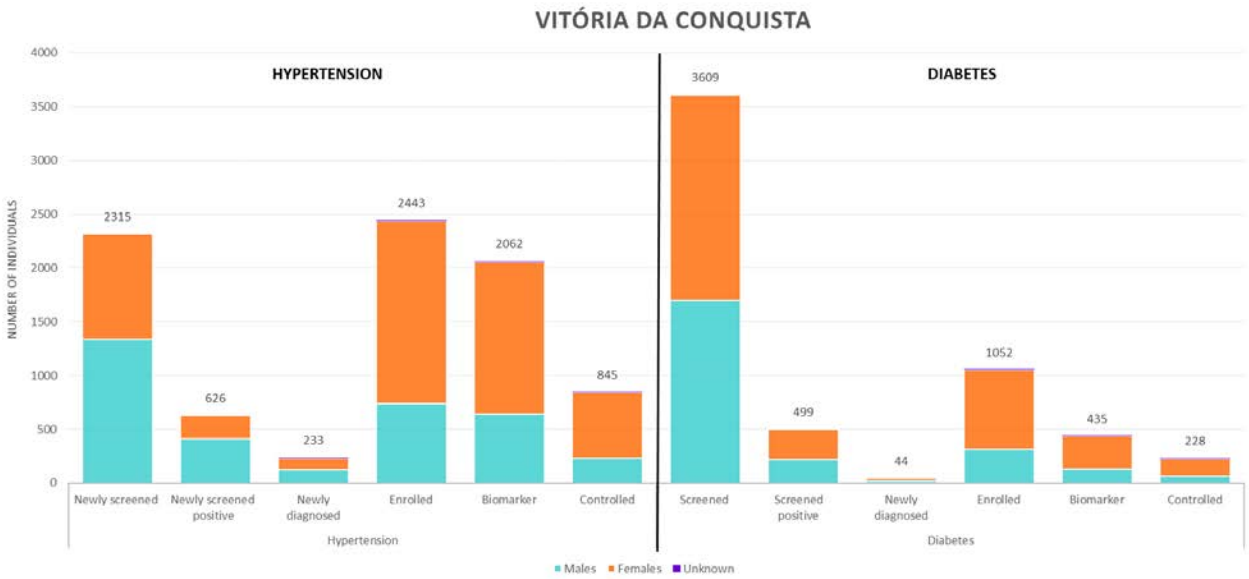

Figure 6. Vitória da Conquista cascade of care

More males than females were "Newly screened," "Newly screened positive," and "Newly diagnosed" for hypertension; however, females considerably outnumbered males in the "Enrolled," "Biomarker," and "Controlled" categories for hypertension. For diabetes, females outnumber males in all categories from "Screened" to "Controlled." Tables containing disaggregated counts by sex, category, and disease can be found in Appendix D.

India

Patient empowerment and community engagement were prominent intervention approaches by both grantees in India. Along with support groups for patients and their families in or close to their communities, grantees partnered with Constellation to introduce an appreciative listening technique – SALT – which was implemented in 14 villages in the Shimla intervention area and four villages in the Udaipur intervention area.

The grantees were also keen on screening and finding new individuals at risk of having hypertension, diabetes, or both. A total of 48,612 individuals were screened, and individuals suspected of having either condition were referred to a health facility for confirmatory diagnosis.

Udaipur

In an attempt to identify individuals at risk, CHAI organized 128 screening events which were open to both those aware and not aware of their condition. CHAI also conducted household screening events to meet screening targets. A total of 26,559 individuals were screened for hypertension, and 18,166 individuals were screened for diabetes; Of those individuals, 26,144 individuals who were screened for elevated blood pressure reported no previous diagnosis of hypertension, and 17,994 individuals who were screened for elevated blood sugar reported no previous diagnosis of diabetes. The cascade of care below describes the number of individuals at various stages of identification and treatment for hypertension and diabetes. Categories containing the label "Newly" exclude individuals with pre-existing diagnoses for a given condition (Figure 7).

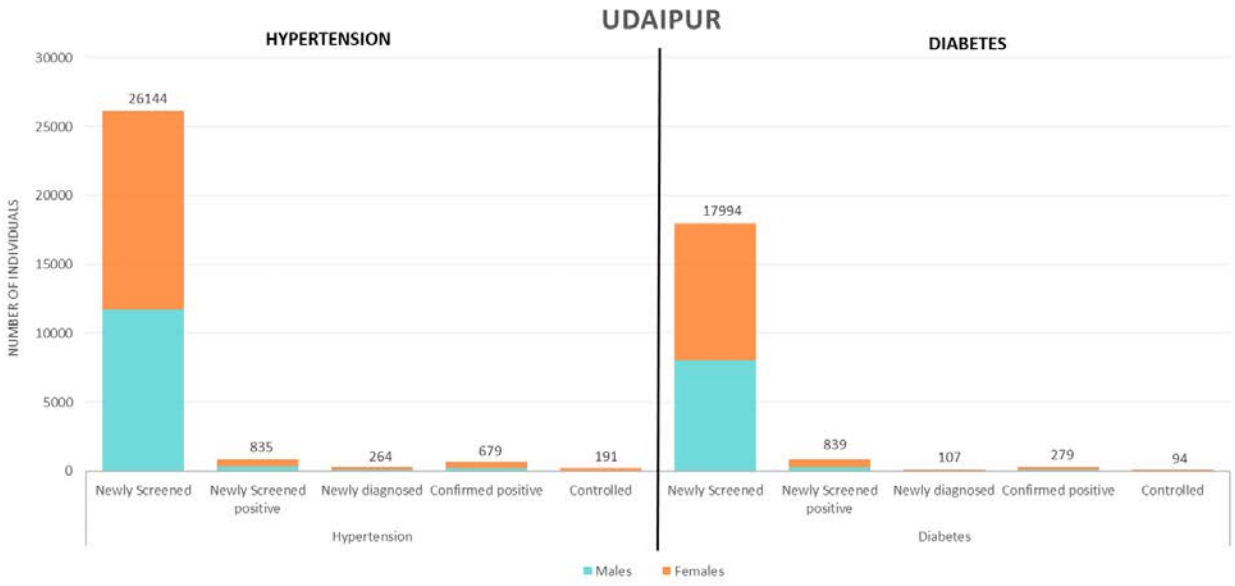

Figure 7. Udaipur cascade of care

835 individuals who reported no previous diagnosis of hypertension were identified through the screening process as having elevated blood pressure and were referred to a health facility for a confirmatory diagnosis; 264 individuals who reported no previous diagnosis of hypertension received a confirmatory diagnosis of hypertension. An additional 415 individuals who reported a previous diagnosis of hypertension had this diagnosis confirmed. Among individuals with a confirmed hypertension diagnosis (regardless of whether or not the diagnosis predated contact with the HealthRise program) for whom blood pressure readings were available, 191 patients had controlled blood pressure levels (SBP < 140 mmHg and DBP < 90 mmHg) at the time of the most recent available blood pressure measurement (Figure 7).

839 individuals who reported no previous diagnosis of diabetes were identified through the screening process as having elevated levels of blood sugar and were referred to a health facility for confirmatory diagnosis; 107 individuals who reported no previous diagnosis of diabetes received a confirmatory diagnosis of diabetes. An additional 172 individuals who reported a previous diagnosis of diabetes had this diagnosis confirmed. Among individuals with a confirmed diabetes diagnosis (regardless of whether or not the diagnosis predated contact with the HealthRise program) for whom blood glucose measurements were available, 94 patients had controlled blood glucose levels (A1c < 8%; FPG < 157; RBS < 183) at the time of their most recent available blood glucose measurement (Figure 7).

Females outnumbered males in all categories from "Newly Screened" to "Controlled" for both hypertension and diabetes. More detailed disaggregation can be found in Appendix D.

CHAI trained 1,060 health workers including 543 CHWs, who were trained to screen, counsel, follow up, and refer patients with diabetes or hypertension to health facilities. These community health workers played an instrumental role in executing the 258 patient support group and NCD club meetings that were organized by CHAI, which were attended by a cumulative 3,487 patients.

Shimla

MAMTA used 87,151 mixed communications activities – including street plays performed, radio shows aired, and pamphlets distributed – to increase awareness of hypertension and diabetes and to mobilize community members to attend HealthRise screening camps.

In an attempt to identify individuals at risk, MAMTA organized 336 screening events which were open to both those aware and not aware of their condition. A total of 22,053 individuals were screened; the cascade of care below describes the proportion of new patients.

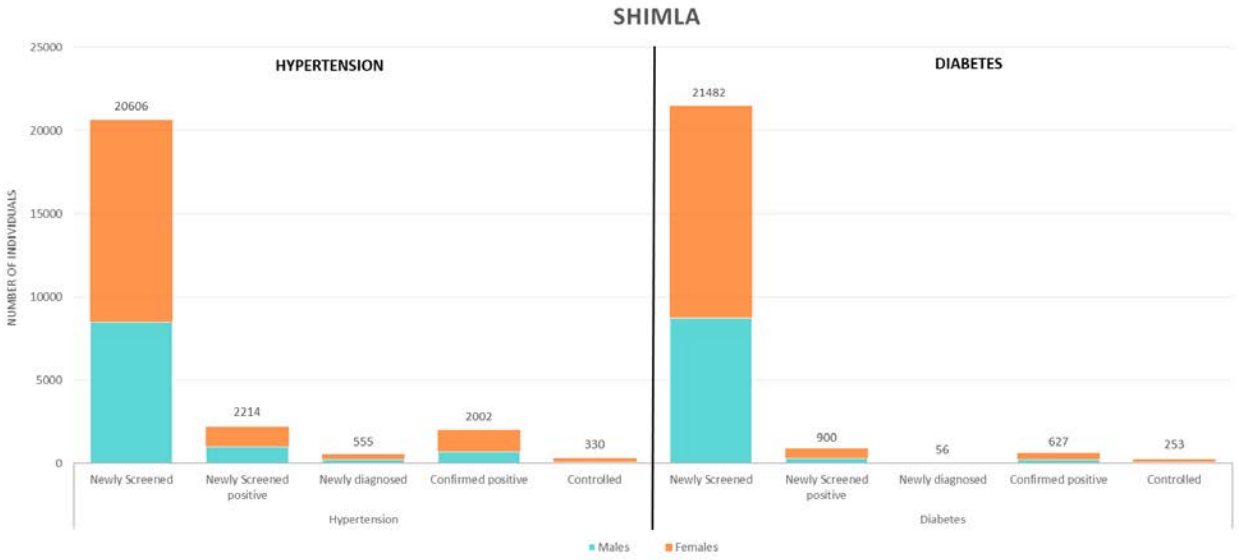

Figure 8. Shimla cascade of care

Limiting to individuals who reported no previous diagnosis of hypertension, 20,606 individuals were screened for elevated blood pressure; 2,214 individuals were referred to health facilities based on elevated blood pressure at the time of the screening; and 555 individuals received a confirmatory diagnosis of hypertension. An additional 1,447 patients who reported a previous diagnosis of hypertension had this diagnosis confirmed. Among individuals with a confirmed diagnosis of hypertension (regardless of whether or not that diagnosis predated contact with the HealthRise program) for whom blood pressure readings were available, 330 individuals had controlled blood pressure levels (SBP < 140 mmHg and DBP < 90 mmHg) at the time of the most recent available blood pressure measurement (Figure 8).

Limiting to individuals who reported no previous diagnosis of diabetes, 21,482 individuals were screened for elevated blood glucose; 900 individuals were referred to health facilities based on elevated blood glucose at the time of the screening; and 56 individuals received a confirmatory diagnosis of diabetes. An additional 571 patients who reported a previous diagnosis of diabetes had this diagnosis confirmed. Among individuals with a confirmed diagnosis of diabetes (regardless of whether or not that diagnosis predated contact with the HealthRise program) for whom blood glucose readings were available, 253 individuals had controlled blood glucose levels (A1c < 8%; FPG < 157; RBS < 183) at the time of the most recent available blood glucose measurement (Figure 8).

Females outnumbered males in all categories from "Newly Screened" to "Controlled" for both hypertension and diabetes. More detailed disaggregation can be found in Appendix D.

MAMTA organized 386 patient support group and NCD club meetings. A crucial component of these support groups and meetings were the 787 health workers who received training from MAMTA, including 473 community health workers, who were trained to screen, counsel, follow up, and refer patients with diabetes or hypertension to health facilities.

South Africa

uMgungundlovu

Expectra built the capacity of CCGs to screen and follow up individuals at risk for diabetes and hypertension. To that end, Expectra provided training to 317 health care workers, including 269 CCGs. Many of these health workers also assisted with the 64 support groups and NCD club meeting that were coordinated as part the Expectra HealthRise program. Screening activities were refined over the course of 26 "war room" meetings, in which governmental departments, non-governmental organizations, and other stakeholders convened to discuss common challenges facing the community.

A total of 8,456 individuals were screened for hypertension through Expectra's screening activities, of whom 4,782 reported not having a previous diagnosis of hypertension. Among screened individuals reporting no previous hypertension diagnosis, 1,216 individuals were referred to a health facility for confirmatory diagnosis based on elevated blood pressure at the time of the screening, of which 129 received a confirmatory diagnosis of hypertension. An additional 416 individuals who reported a previous diagnosis of hypertension received a follow-up visit through the HealthRise program. Among individuals with a confirmed diagnosis of hypertension (including individuals newly identified as hypertensive and those who reported a previous diagnosis), 64 individuals had a follow-up monitoring visit with a blood pressure measurement, of which 24 individuals had controlled levels of blood pressure (SBP < 140 mmHg and DBP < 90 mmHg) at the time of their last available blood pressure measurement (Figure 9). Disaggregated counts by sex for each category are available in Appendix D.

A total of 6,248 individuals were screened for diabetes. Limiting to individuals who did not report a previous diagnosis of diabetes, 4,591 individuals were screened for diabetes, 129 individuals were referred to a health facility based on elevated levels of blood glucose at the time of screening, and 24 individuals received a confirmatory diagnosis of diabetes. 112 additional individuals who did report a previous diabetes diagnosis received a follow-up visit through the HealthRise program. Among individuals with a confirmed diabetes diagnosis (including individuals newly diagnosed with diabetes and those who reported a previous diagnosis), 17 patients had one or more follow-up visits with a blood glucose measurement, and one patient had their blood glucose level under control (RBS <= 7.8 mmol/L) at the time of their most recent blood glucose measurement (Figure 9). Disaggregated counts by sex for each category are available in Appendix D.

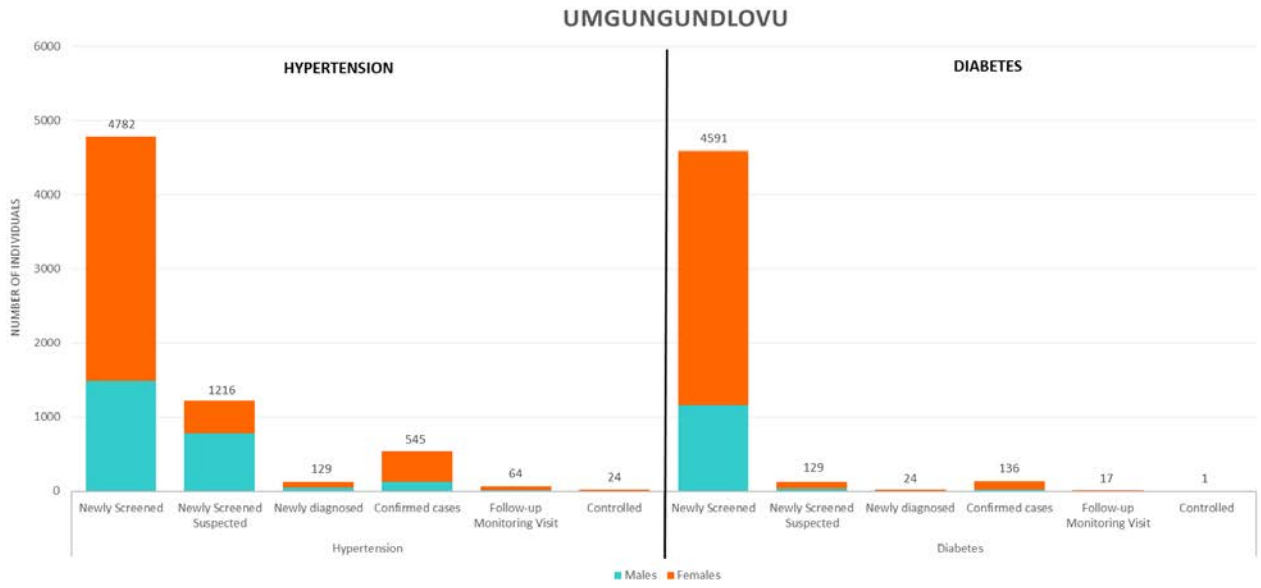

Figure 9. uMgungundlovu cascade of care

Pixley ka Seme

Project Hope trained 461 health workers, of which 327 were CHWs.

Community engagement and empowerment was a prominent focus of many Project HOPE interventions, where patients and their families were encouraged to participate in support groups that were beneficial to the whole community. A total of 94 support groups were started over the course of the implementation period, including five-step groups, village savings and loans groups, and gardening groups.

A total of 3,789 individuals were screened for hypertension through Project HOPE screening activities, of whom 2,366 reported not having a previous diagnosis of hypertension. Among screened individuals reporting no previous hypertension diagnosis, 677 individuals were referred to a health facility for confirmatory diagnosis based on elevated blood pressure at the time of the screening, of which 93 received a confirmatory diagnosis of hypertension. An additional 49 individuals who reported a previous diagnosis of hypertension received a follow-up visit through the HealthRise program. Among individuals with a confirmed diagnosis of hypertension (including individuals newly identified as hypertensive and those who reported a previous diagnosis), 98 individuals had a follow-up monitoring visit with a blood pressure measurement, of which 53 individuals had controlled levels of blood pressure (SBP < 140 mmHg and DBP < 90 mmHg) at the time of their last available blood pressure measurement (Figure 10). Disaggregated counts by sex for each category are available in Appendix D.

A total of 3,872 individuals were screened for diabetes. Limiting to individuals who did not report a previous diagnosis of diabetes, 3,570 individuals were screened for diabetes, 71 individuals were referred to a health facility based on elevated levels of blood glucose at the time of screening, and 24 individuals received a confirmatory diagnosis of diabetes. Nine additional individuals who did report a previous diabetes diagnosis received a follow-up visit through the HealthRise program. Among individuals with a confirmed diabetes diagnosis (including individuals newly diagnosed with diabetes and those who reported a previous diagnosis),

31 patients had one or more follow-up visits with a blood glucose measurement and nine patients had their blood glucose levels under control (RBS <= 7.8 mmol/L) at the time of their most recent blood glucose measurement (Figure 10). Disaggregated counts by sex for each category are available in Appendix D.

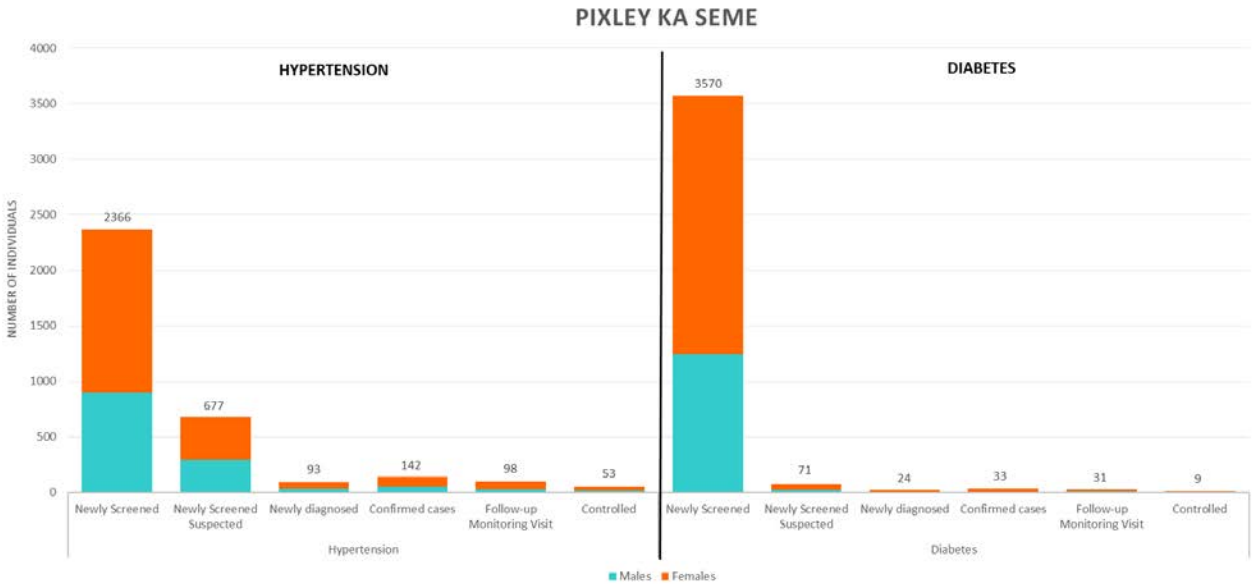

Figure 10. Pixley ka Seme cascade of care

United States

Ramsey County

One of the key challenges Regions faced was retaining enrollees. Regions lost a significant number to follow-up within the first six months of program implementation (100% of initial enrollees within the first three months; 88% of a second group of enrollees during the fourth through sixth months). Most withdrawals were those aged between 45 and 59 years with public/state insurance.

Regions Hospital had a combined enrollment of 78 patients; 33 patients were enrolled for hypertension, and 69 patients were enrolled for diabetes. Females slightly outnumbered males for enrollment for both hypertension and diabetes. Appendix D contains counts for enrollment and disease control for both diabetes and hypertension disaggregated by sex.

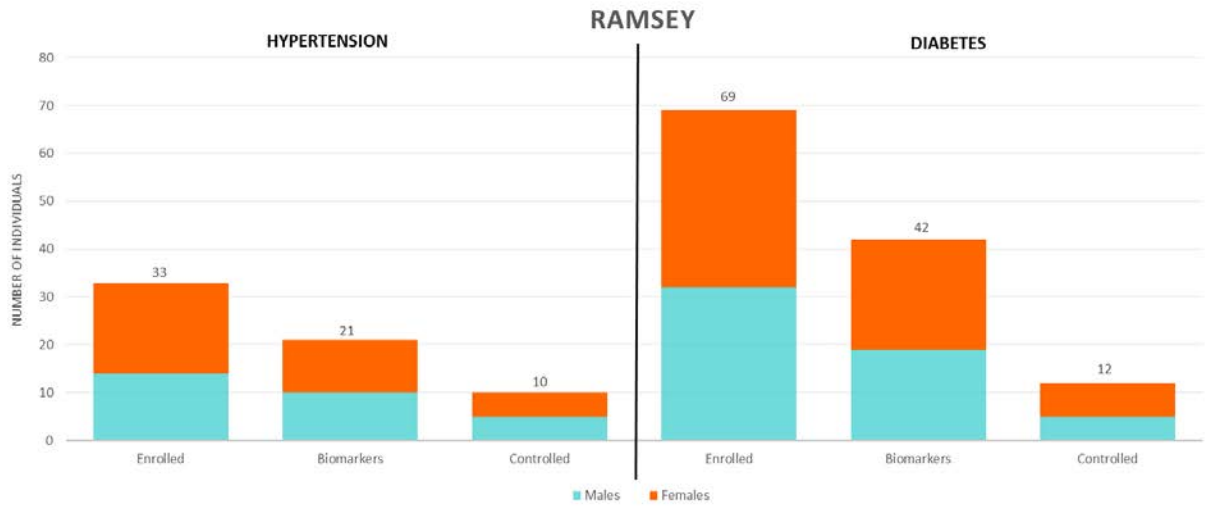

Figure 11. Ramsey County cascade of care

Among 33 individuals enrolled in HealthRise with a diagnosis of hypertension, 21 individuals had multiple blood pressure readings, permitting assessment of changes in blood pressure over time. Based on changes between the first and last available blood pressure measurement for each patient since enrollment in the program, 10 individuals displayed reductions in blood pressure and moved to a lower blood pressure category. (Blood pressure categories considered were: SBP < 140 mmHg and DBP < 90 mmHg; SBP ≥ 140 mmHg to SBP < 160 mmHg and DBP ≥ 90 mmHg to DBP < 100 mmHg; SBP ≥ 160 mmHg or DBP ≥ 100 mmHg). The average change in blood pressure for these individuals was -21.54 (95% CI: -28.42, -12.15).

Among individuals with multiple blood pressure readings, 10 patients had their blood pressure under control (SBP < 140 mmHg and DBP < 90 mmHg) as of their most recent available measurement (Figure 11).

Among 69 individuals enrolled in the HealthRise program with a diagnosis of diabetes, 42 individuals had multiple A1c measurements, allowing us to evaluate change in blood glucose over time. Based on changes between the earliest and most recent available A1c measurement for each patient since enrollment in the program, 13 individuals displayed reductions in A1c readings and moved to a lower blood glucose category. (A1c blood glucose categories considered are: <7%, 7%–7.9%, 8%–9.9%, and ≥10%). The average change in A1c values for these individuals was -2.22 (95% CI: -2.69, -1.48).

Among all individuals enrolled in the HealthRise program with a diagnosis of diabetes, 12 patients had their blood glucose under control (A1c < 8%) as of their most recent available measurement (Figure 11).

Hennepin County

Pillsbury encountered difficulties encouraging individuals to enroll in the program. Only six patients enrolled at the start of the program, of which four withdrew within the first three months. Throughout the program, Pillsbury had a combined enrollment of 121 patients, where 102 patients were enrolled for hypertension and

100 were enrolled for diabetes. Appendix D contains counts disaggregated by sex for enrollment and disease control for both hypertension and diabetes.

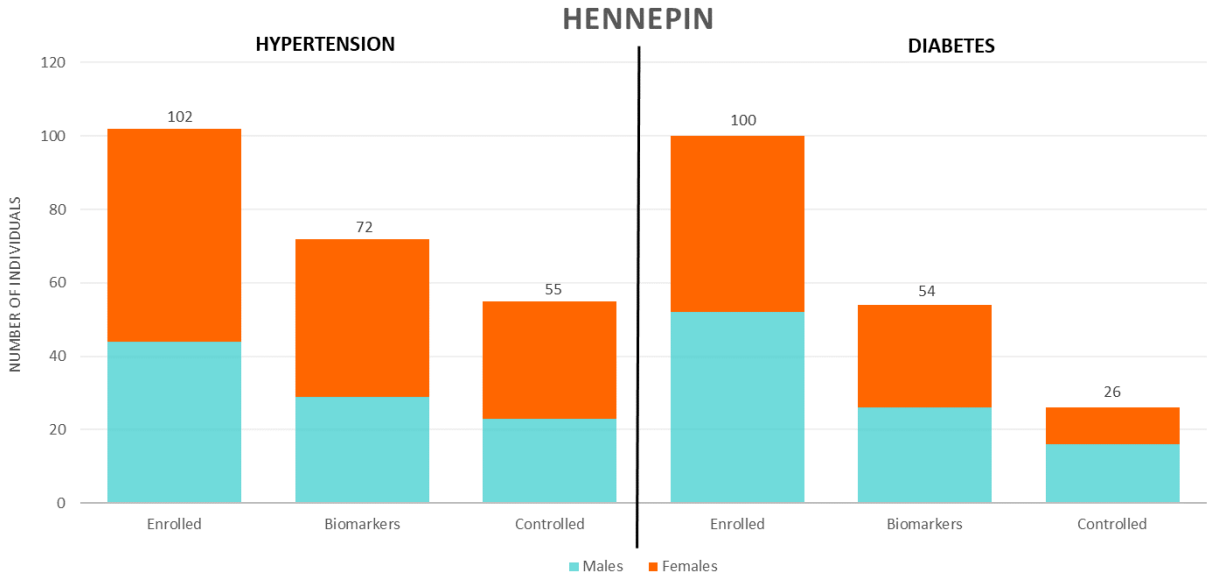

Figure 12. Hennepin County cascade of care

Among 102 individuals with a diagnosis of hypertension, the progress of 72 individuals can be reported based on multiple blood pressure measurements. Since enrollment in the program, 21 of these 72 individuals showed a sufficient reduction in blood pressure to transition to a lower blood pressure category. (Blood pressure categories considered were: SBP < 140 mmHg and DBP < 90 mmHg; SBP ≥ 140 mmHg to SBP < 160 mmHg and DBP ≥ 90 mmHg to DBP < 100 mmHg; SBP ≥ 160 mmHg or DBP ≥ 100 mmHg). The average change in blood pressure among these 21 patients was -13.44 (95% CI: -16.42, -10.46).

55 of the 72 individuals with multiple blood pressure measurements had their blood pressure under control (SBP < 140 mmHg and DBP < 90 mmHg) at the time of the most recent available reading (Figure 12).

Among 100 individuals with a diagnosis corresponding to diabetes, the progress of 54 individuals can be reported based on multiple A1c measurements. Since enrollment, 22 of these 54 individuals showed a sufficient reduction in blood glucose to transition to a lower blood glucose category. ((A1c blood glucose categories considered are: <7%, 7%–7.9%, 8%–9.9%, and ≥10%). Among those individuals who moved to a lower A1c category, the average change in A1c measurement was -1.87 (95% CI: -2.37, -1.36).

26 of the 54 individuals with multiple A1c measurements available had their blood glucose levels under control (A1c < 8%) at the time of their most recent available measurement (Figure 12).

North Market in North Minneapolis – considered a food desert – provided a full-service grocery store, a center for wellness services, and a community gathering place, all under a single roof. A variety of classes, ranging from cardio kickboxing, Zumba, boot camp, meal prep, yoga, and mindfulness, to grocery store tours, were offered between December 2017 and July 2018. A total of 214 classes were offered, in which 1,965 individuals participated. A total of 479 unique participants were recorded to have attended these classes.

North Market retained approximately 13% of total participants. The graphic below visualizes the number of participants in each of the classes between December 2017 and May 2018 (Figure 13).

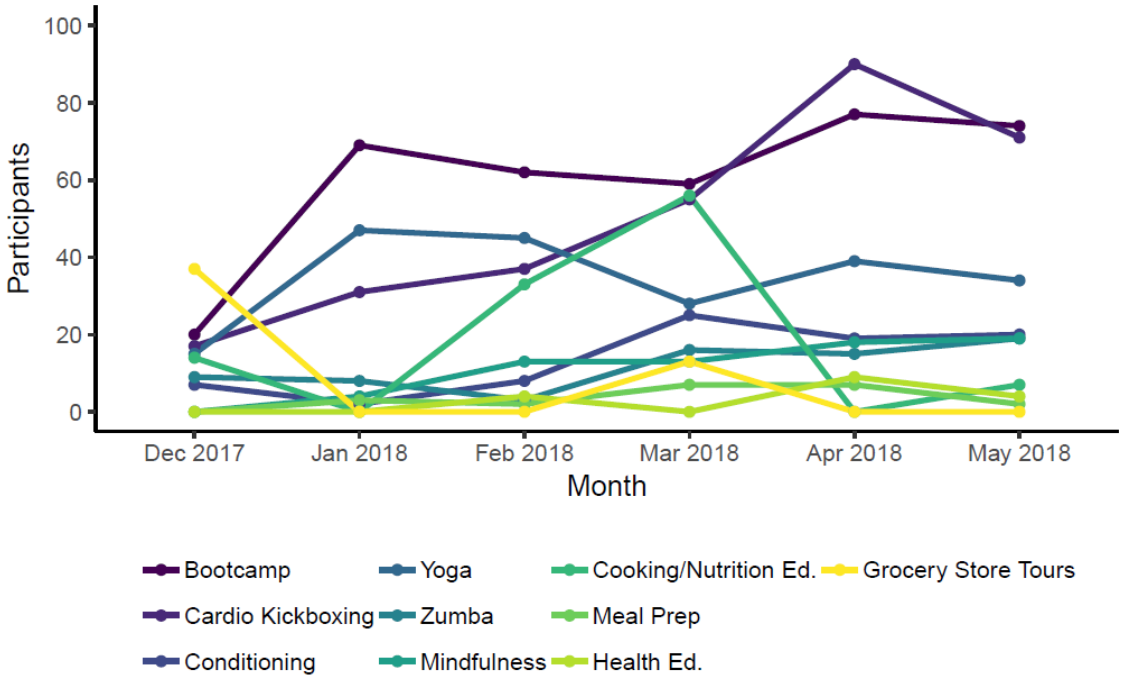

Figure 13. North Market class attendance over time

Rice County

HealthFinders Collaborative faced challenges enrolling patients, with no patients opting to enroll in HealthRise in the first six months of project implementation. However, following these initial difficulties, they were successful in retaining all the patients who enrolled in the program at a later time, for the duration of the program. Among the 208 patients enrolled in the HFC program, 191 individuals were identified with diagnoses of hypertension, diabetes, or both based on ICD codes provided by HFC.

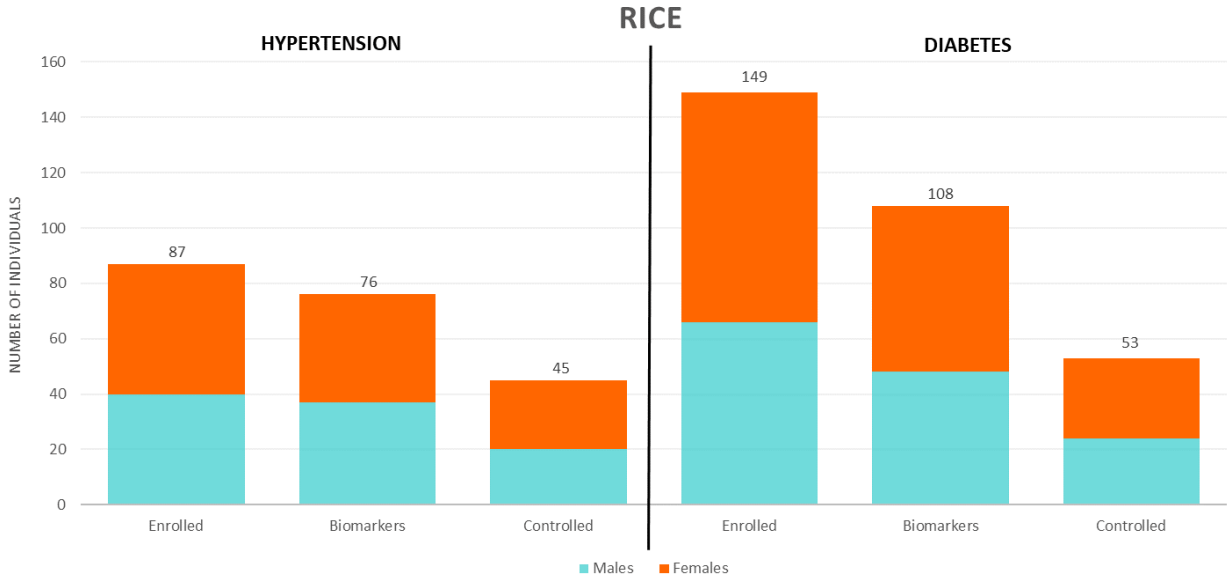

Figure 14. Rice County cascade of care

Among 87 individuals with a diagnosis corresponding to hypertension, the progress of 76 individuals can be reported based on multiple blood pressure measurements. Of these 76 individuals, since enrollment in the program, 23 have had reductions in blood pressure such that they transitioned to a lower blood pressure category. (Blood pressure categories considered were: SBP < 140 mmHg and DBP < 90 mmHg; SBP ≥ 140 mmHg to SBP < 160 mmHg and DBP ≥ 90 mmHg to DBP < 100 mmHg; SBP ≥ 160 mmHg or DBP ≥ 100 mmHg). The average change in blood pressure among individuals who transitioned to a lower blood pressure category was -9.75 (95% CI: -11.88, -7.62).

Among individuals enrolled in the HealthRise program with a diagnoses of hypertension who had two or more blood pressure readings available, a total of 45 individuals had controlled levels of blood pressure (SBP < 140 mmHg and DBP < 90 mmHg) according to their most recently available blood pressure reading (Figure 14).

Among the 149 individuals with a diagnosis corresponding to diabetes, the progress of 108 individuals can be reported based on multiple A1c measurements. Of those 108 individuals, since enrollment in the program, 31 have had reductions in blood glucose levels resulting in a transition to a lower blood glucose category. (A1c blood glucose categories considered are: <7%, 7%–7.9%, 8%–9.9%, and ≥10%). Among individuals who transitioned to a lower A1c category, the average change in A1c level was -1.78 (95% CI: -2.25, -1.32).

Among individuals enrolled in the HealthRise program with a diagnoses of diabetes who had two or more blood glucose readings available, a total of 53 individuals had controlled levels of blood glucose (A1c < 8%) according to their most recent available blood glucose measurement (Figure 14).

Appendix D contains counts disaggregated by sex for enrollment and disease control for both hypertension and diabetes.

Endline Evaluation

Methods

Overview

To assess the potential effects and impact of HealthRise programs, a mixed-methods quasi-experimental design was used that included a combination of quantitative and qualitative data from intervention and comparison locations, where possible. The exact types and sources of endline data used varied by site (described in more detail in the upcoming sections), but they shared a common goal: understanding the program components, provider dimensions, and patient characteristics that could lead to improvements in the cascade of care for diabetes and hypertension; patient empowerment; and strengthening of community-based health programs. In all countries, both quantitative and qualitative data were collected; sites varied in terms of whether a comparison group was available and whether data were collected both before and after program implementation. Table 3 provides a summary of the data available from each site for the endline evaluation.

		Intervention Group		Comparison Group		Time Perspective	
		Quantitative	Qualitative	Quantitative	Qualitative	Before	After
USA	Hennepin	✓	✓	✓	×	✓	✓
	Ramsey	✓	✓	✓	×	✓	✓
	Rice	✓	✓	✓	×	✓	✓
India	Udaipur	✓	✓	×	×	×	×
	Shimla	✓	✓	✓	✓	×	×
South Africa	Pixley ka Seme	✓	✓	✓	✓	×	×
	uMgungundlovu	✓	✓	✓	✓	×	×
Brazil	Teófilo Otoni	✓	✓	×	✓	✓	✓
	Vitória da Conquista	✓	✓	×	✓	✓	✓

Table 3. Summary of data available for endline evaluation, by site

From all sources of quantitative data, unless indicated otherwise, the average value across groups or the percentage of individuals or facilities included in a given category (e.g., percentage of facilities that stocked at least one key blood pressure medication; percentage of patients who were diagnosed with diabetes and had an A1c measure less than 8%) was estimated. For all indicators of interest, 95% confidence intervals (CIs) were computed. Confidence intervals aim to capture the range of likely values for a given measure while accounting for how much the measure might vary among individuals or facilities. When CIs are relatively narrow, this can mean there is less variation among individuals or facilities for a given measure; it can also mean a large enough number of individuals or facilities were included in the analysis and thus provided a more precise estimate of the indicator. When CIs are wide, it can mean individuals or facilities might vary a lot on a given measure; it can also mean that a relatively small number of individuals or facilities could be included and thus it was more difficult to be "confident" about the estimate. Due to the nature of the HealthRise program – with a community-based focus – and smaller sample sizes among some sites, it was not uncommon for particular measures to have wide confidence intervals.

Qualitative data consisted of a combination of focus group discussions and key informant interviews with various project stakeholders and participants. These were analyzed using thematic coding to distill major themes arising by country, site, and perspective (provider, patient, etc.), and to draw comparisons with baseline findings and conditions in comparison areas, depending on the data available for each country. The qualitative findings help to contextualize the quantitative results and elucidate impacts of HealthRise programs that cannot be captured with quantitative data. By comparing the qualitative findings from intervention facilities at endline with those from intervention facilities at baseline, as well as with comparison facilities, it is possible to draw inferences about what some of the effects of the HealthRise programs may have been. Key themes arising from the intervention site qualitative data at endline are presented for each country, reflecting the perspectives of patients, providers, other facility staff, and policymakers, and comparisons are drawn to baseline and non-HealthRise sites, depending on the data available for each country. Quotes from interviews and focus group discussions are presented throughout to provide examples of key themes in participants' own words.

> "What I learned from HR…the big aha moment…there is an absolute definite need to combine quantitative evaluation with qualitative evaluation...it's one thing if you have numbers, it's another thing what's behind the numbers…I would argue so what, tell me how you did it, tell me how you got people engaged, to adhere to medication...what are the stories behind, what would the patients say...together they make a very strong story." – *Policymaker, US*

Quantitative

Overview

Patient exit interviews with biomarkers and facility surveys were implemented in India and in South Africa in intervention and comparison areas. All facility and patient survey questionnaires were designed by IHME and are available for download (Appendix A). Even though the design of the study had been completed, no endline data (quantitative or qualitative) were collected during the timeline of this evaluation in the India site of Udaipur because of challenges in procuring the necessary approvals. The sampling details and instruments are available to local partners who may be able to complete data collection in 2019. In the US and in Brazil, due to financial constraints, IHME did not collect quantitative data; rather, the analysis relies on data that were collected and collated by the grantees and shared with IHME.

Brazil

Data Collection

IHME did not collect quantitative data in Brazil for the endline analysis. Although community-level baseline data were collected in comparison municipalities in Brazil, the intervention in Brazil had the shortest implementation time, which, along with some of the barriers faced by the implementation teams, reduced the likelihood of seeing impacts of the interventions at the population level.

Fortunately, both Brazilian sites had extensive monitoring datasets that tracked enrolled individuals over time and which permitted before and after analysis using the data regularly collected by in-country partners. Facility-level endline data collection in comparison municipalities was discouraged by local partners since electronic medical records are not available in those locations.

Analysis

Initially, a descriptive analysis was performed for both sites using monitoring data for patients who had at least two blood pressure or blood glucose readings available, to allow for before and after analysis. For those with hypertension, the first available blood pressure reading at or after enrollment was used as the first observation, while the most recent reading, provided it was carried out on a date other than the initial measure, was used as the last observation. Patients were then classified according to their hypertension status at the time of enrollment and at the time of the last measurement as: 1) Controlled (SBP < 140 mmHg and DBP < 90 mmHg); 2) Stage 1 (SBP 140–160 mmHg and DBP 90–100 mmHg); and 3) Stage 2 (SBP ≥160 mmHg or DBP ≥100 mmHg). After comparing first and last measures, we also computed the number of patients who had a decrease in SBP of 10% or more and the number of patients who experienced the opposite trend, an increase in SBP of more than 10%.

The approach for those with diabetes was similar. Patients were classified according to their diabetes state at the time of enrollment and at the time of the most recent measurement as: 1) A1c < 7%; 2) A1c 7%–7.9%; 3) A1c 8%–9.9%; and 4) A1c ≥ 10. The number of patients with ≥ 10% decrease in A1c and the number of those with > 10% increase, between enrollment and last measurement, was also calculated.

Finally, a paired-sample t-test was conducted to evaluate whether statistically significant changes (p-value < 0.05) in blood pressure and blood glucose were seen among HealthRise patients after enrolling to the program. Tests were run for males, females, and both sexes combined. Analysis were performed with Stata, version 13.

India

Data Collection

Data were collected in intervention areas as well as comparison areas (selected in consultation with the implementation partners based on similar sociodemographic characteristics and the absence of any HealthRise programs.) In Udaipur, CHAI implemented HealthRise programs in the blocks of Girwa and Jhadol. Bhinder and Rishabdev were chosen as comparison blocks. In Shimla, MAMTA implemented HealthRise programs in Mashobra and Theog. Tikker and Jubbal Kotkhai were selected as comparison blocks.

Data collection consisted of a facility survey and patient survey. The facility and patient questionnaires were similar across intervention and comparison blocks, with the exception of questions specific to HealthRise interventions (asked in intervention blocks only). The surveys aimed to also capture information about similar programs run by government health authorities, e.g., screening camps and electronic record systems. The facility questionnaire was predominately the same across all facility types, with only slight variations. The same patient questionnaire was used, regardless of the type of facility where the patient was identified. The patient interviews included biomarker measurements. Specifically, the patients' blood pressure and HbA1c were measured using point-of-care diagnostic kits; weight and height were also measured.

In Shimla, sampled facilities were one of three types: civil hospitals, community health centers (CHC), and primary health centers (PriHC). The facility sample consisted of 18 of 33 facilities in intervention blocks, selecting with certainty facilities with targeted HealthRise interventions (eClinic, NCD Day, or SALT village): three of four hospitals, three of four CHC, and 12 of 25 PriHC. In comparison blocks, 12 of 33 facilities were

selected at random: two of two hospitals, two of three CHC, and eight of 28 PriHC. The order of non-selected facilities was randomized for use as alternates in case substitution was necessary.

At all selected facilities, a quota was defined for the number of participants needed for the patient survey based on location in an intervention or comparison block, the number of facilities in the sample, and the total sample size needed to detect changes from baseline. In Shimla, the quota was six patients with diabetes and 10 patients with hypertension per facility in intervention blocks and nine patients with diabetes and 15 patients with hypertension in comparison blocks. In cases when there was an insufficient number of patients arriving at a selected facility over two days of surveying, additional patients above the quota number were surveyed at other facilities to reach the total needed sample size. Patients were eligible for participation in the survey if they were a) age 30 or older and b) had ever been told by a medical professional that they have hypertension and/or diabetes. Patients with both conditions could count toward the quota for either condition and were included in the analysis for both conditions. To efficiently identify patients for participation, field coordinators contacted each facility to learn when NCD patients commonly seek care or when patient volumes are highest. To ensure patients were selected at random, enumerators were instructed to approach the first potentially eligible patient, determine eligibility, and request consent to administer the survey. In Shimla, NCD patient volumes were so low that all eligible patients were invited to participate. Table 4 displays the number of completed patient surveys, by location, intervention group, and facility type.

	Shimla	
Facility Type	HealthRise	Comparison
PriHC	184	146
CHC	46	46
Civil Hospital	48	39
Total	**278**	**231**

Table 4. Sample sizes for patient survey in Shimla

Analysis

Endline evaluation analysis was only conducted in Shimla, as data collection in Udaipur was delayed. The summary of analytic components for Shimla reflects a similar approach to what would be implemented for Udaipur endline analyses.

Facility data. For Shimla, baseline data were collected from a sample of facilities prior to HealthRise implementation and then were compared to facilities located in HealthRise implementation blocks and facilities in blocks where HealthRise programs were not explicitly active. While baseline and endline surveys were similar in terms of questions on pharmaceutical stocks and human resources for health – two focus areas for the current analysis – the endline survey also included questions on HealthRise program exposure and uptake, facility trainings, and current use of platforms or programs like Health Management Information Systems (HMIS), the HealthCard application, and e-clinics.

Facility administrators reported the total number and types of health workers currently employed at the facility to interviewers. In terms of pharmaceutical stocks, a total of 23 different NCD medications were

covered by the survey module, which included three questions per pharmaceutical: (1) whether the pharmaceutical was in stock at the facility today; (2) whether the facility experienced at least a one-day stock-out last quarter; and (3) whether the facility experienced eight consecutive days or more of stock-outs last quarter. To assess different dimensions of facility NCD treatment capacity, pharmaceutical stocking "index" performance metrics were developed, composed of the percentage of *x* pharmaceuticals stocked currently at the facility for all NCD medications covered in the survey (listed below); the percentage of four key diabetes pharmaceuticals currently in stock at the facility (biguanides, insulin, sulfonylureas, potassium-sparing diuretics); and the percentage of five key hypertension pharmaceuticals currently in stock at the facility (ACE inhibitors, angiotensin receptor blockers, beta blockers, calcium channel blockers, thiazide diuretics).

The 23 NCD pharmaceuticals included in the overall index were biguanides, insulin, sulfonylureas, thiazolidinediones, diuretics, potassium-sparing diuretics, statins, ACE inhibitors, alpha agonists, angiotensin receptor blockers, beta blockers, calcium channel blockers, thiazide diuretics, cardiac glycosides, anticoagulants, antiplatelets, nitrates, opiates, salicylates, anticholinergics, thrombolytic therapies, antiarrhythmics, and beta adrenaline agonists.

Patient data. Patient exit interviews were conducted only at endline, so analyses focused on quantifying the cascade of care for diabetes and hypertension patients who presented at facilities in HealthRise implementation blocks as compared to patients who presented at facilities where HealthRise was not implemented; these classifications served as proxy measures for HealthRise program exposure. In terms of biometric data, one A1c measure and up to three blood pressure measures were taken for each patient, following their consent for each. Because patients varied in terms of the number of blood pressure measures recorded (i.e., ranging from one to three), the average of systolic and diastolic measures were used as the overall blood pressure reading for each patient. While the original intent was to collect biometric data for all patients, irrespective of their diagnosis, a sizeable proportion of Shimla patients were only offered biometric data consent forms for the diagnoses they reported (i.e., if a patient reported a diagnosis of diabetes but not hypertension, only A1c was collected for that patient).

<u>For the diabetes cascade of care, the following categorizations were used:</u>

- Prevalence: reported diagnosis of diabetes; OR an A1c level exceeding 6.4%
- Diagnosis: reported diagnosis of diabetes
- Ever treated: reported ever taking medications for diabetes
- Currently treated: reported currently taking medications for diabetes as prescribed by a health provider
- Controlled: prevalent case of diabetes AND A1c level < 8%

<u>For the hypertension cascade of care, the following categorizations were used:</u>

- Prevalence: reported diagnosis of hypertension; OR systolic blood pressure of 140 mmHg or higher; OR diastolic blood pressure of 90 mmHg or higher
- Diagnosis: reported diagnosis of hypertension
- Ever treated: reported ever taking medications for hypertension
- Currently treated: reported currently taking medications for hypertension as prescribed by a health provider

- Controlled: prevalent case of hypertension AND systolic blood pressure less than 140 mmHg and diastolic blood pressure less than 90 mmHg; if only systolic blood pressure was available and diastolic blood pressure readings were missing, then only the systolic threshold was applied.

South Africa

Data Collection

Data were collected at intervention and comparison facilities in Pixley ka Seme and uMgungundlovu. In Pixley ka Seme, intervention facilities were those in which Project Hope implemented HealthRise programs, and comparison facilities were those in the same municipality that did not have any HealthRise programming. In uMgungundlovu, intervention facilities were those in which Expectra implemented HealthRise programs, and comparison facilities were those in the same municipality that did not have any HealthRise programming. Most intervention and comparison facilities were also surveyed during the baseline health facility survey.

Data collection consisted of a facility survey and patient survey. The facility and patient questionnaires were similar across intervention and comparison facilities, with the exception of questions specific to HealthRise interventions (asked in intervention facilities only). The surveys aimed to also capture information about similar programs run by government health authorities, e.g., screening camps and electronic record systems. The facility questionnaire was predominately the same across all facility types, with only slight variations. The same patient questionnaire was used, regardless of the type of facility where the patient was identified. The patient interviews included biomarker measurements. Specifically, the patient's blood pressure and HbA1c were measured using point-of-care diagnostic kits; weight and height were also measured.

The facility sample covered two types of facilities: community health centers (CHC) and provincial health clinics (ProvHCs). In Pixley ka Seme, the sample included all six facilities (all ProvHC) where interventions were carried out and a random selection of 12 out of 22 comparison ProvHC that were surveyed at baseline; seven CHC surveyed at baseline were excluded from the sample. In uMgungundlovu, the sample included all seven facilities (all ProvHCs) where interventions were carried out and a random selection of 14 of 16 comparison facilities that were surveyed at baseline (four of five ProvHC and 10 of 11 CHC). The order of non-selected comparison facilities was randomized so these could be used as alternates if substitutions were required.

At all selected facilities, a quota was defined for the number of participants needed for the patient survey based on identification from an intervention or comparison facility, the number of facilities in the sample, and the total sample size needed to detect changes from baseline. In both Pixley ka Seme and uMgungundlovu, the quota was 21 individuals with diabetes and 19 individuals with hypertension at intervention facilities and 12 individuals with diabetes and 10 individuals with hypertension at comparison facilities. In cases when there was an insufficient number of patients arriving at a selected facility over two days of surveying, additional patients above the quota number could be surveyed at other facilities to reach the total needed sample size. Patients were eligible for participation in the survey if they were a) age 30 or older and b) had ever been told by a medical professional that they have hypertension and/or diabetes. Patients with both conditions could count toward the quota for either condition and were included in the analysis for both conditions. To efficiently identify patients for participation, field coordinators contacted each facility to learn when NCD patients commonly seek care or when patient volumes are highest. To

ensure patients were selected at random, enumerators were instructed to approach the first potentially eligible patient, determine eligibility, and request consent to administer the survey. Overall, NCD patient volumes were so low that all eligible patients were invited to participate. Table 5 displays the number of completed patient surveys, by location, intervention group, and facility type.

	uMgungundlovu		Pixley ka Seme	
Facility Type	HealthRise	Comparison	HealthRise	Comparison
ProvHC	88	120	62	123
CHC	-	29	-	-
Total	**88**	**149**	**62**	**123**

Table 5. Sample sizes for patient survey in South Africa

Analysis

Due to the similarity in data collected in Pixley ka Seme and uMgungundlovu, similar endline analyses took place for each HealthRise program site.

Facility data. Because both baseline and endline facility surveys were implemented in Pixley ka Seme and uMgungundlovu, direct comparisons could be drawn for key service capacity metrics prior to versus following HealthRise implementation – any diverging patterns among comparison facilities where HealthRise programming did not occur were also examined. Similar facility analyses were conducted – focusing on human resources for health and pharmaceutical stocking – as done for Shimla due to the similarity in survey structure and questions.

Patient data. A similar analytic approach and cascade of care categorizations for patient data collected at exit interviews were used as for these data from Shimla.

United States

Data Collection

IHME did not engage in primary data collection for quantitative data in the US. Instead, HealthRise grantees provided individual-level data to IHME for both monitoring and the endline evaluation. Below is a summary of specific considerations for endline analyses.

Intervention patient data

Monitoring data from each HealthRise grantee were used for the endline analysis. To best capture the potential impact of HealthRise on patients' outcomes, endline analyses were limited to HealthRise patients who (1) remained enrolled in the HealthRise program at endline (i.e., never withdrew from the program); and (2) had at least two separate biometric data points for either blood pressure (i.e., ideally both systolic and diastolic blood pressure, but at minimum, systolic) or A1c. Subsequently, quantitative endline evaluation results were meant to reflect potential effects from HealthRise program participation, and not "intent to treat," which would have included patients who enrolled but at some point withdrew from HealthRise programs.

For baseline measures, we used biometric data collected at HealthRise program enrollment, or if such data were not available at enrollment, biometric data collected at the date closest to program enrollment. For endline measures, we used the most recent biometric measurements taken for participants. Patients who only had biometric data available prior to HealthRise program enrollment were excluded.

Comparison patient data

Each HealthRise grantee provided comparison patient data drawn from patient populations similar to those who ultimately enrolled in the HealthRise program offered by Regions, HealthFinders, or Pillsbury United Communities; further detail is provided below.

Grantees selected comparison patient populations between October 2018 and January 2019, which has important implications for interpreting results contrasting HealthRise and comparison patient outcomes. First, no comparison patient enrolled in HealthRise programs, which means there is minimal chance of program exposure beyond enrolled patients. However, there is a chance that comparison patients differ significantly from patients who were ultimately recruited, enrolled, and maintained enrollment in HealthRise programs. Second, while the attempt was made to reconstruct a sample of comparison patients that was similar demographically and in terms of baseline health conditions to HealthRise patients (i.e., excluding comparison patients younger than 30 years and those 90 years or older; excluding comparison patients who did not have a diagnosis of hypertension or diabetes *and* had baseline biometric data that fell within disease control categories), no formal matching or statistical processes were used to force the same distributions across all of these characteristics. Future analyses may consider whether or how to better account for potential underlying differences between comparison and HealthRise patient populations.

Ramsey County. Data for patients who formed a comparison group were extracted through West Side Community Health Services (WSCHS); eligible individuals were patients who had not enrolled in HealthRise and had similar levels of A1c or systolic blood pressure as HealthRise patients at baseline. Beyond similar exclusions applied for HealthRise patients for endline analyses (i.e., patients who lacked more than one measurement of A1c and systolic blood pressure and therefore could not contribute to baseline versus endline comparisons), we limited comparison patients to those who had similar follow-up time to the distribution of program duration of HealthRise patients since 2016. This allowed for more direct comparisons of the potential for changing levels of A1c or systolic blood pressure, and/or improving disease control status, given HealthRise program implementation.

Rice County. Data for patients who formed a comparison group were extracted from a partner clinic where HealthRise interventions were not implemented. Upon receiving the comparison patient dataset from HealthFinders, similar inclusion criteria as used for HealthRise patients were applied: between the ages of 30 and 89 years old; considered a prevalent case of diabetes or hypertension at "baseline" (i.e., either having received a diagnosis of diabetes or hypertension, or having biometric data within levels considered for diagnosis of diabetes or hypertension); and having at least two measures of A1c or blood pressure since 2016. If patients had biomarker data prior to January 1, 2016, panel data were truncated to start at 2016; this meant the time of observation for comparison patients could be more directly aligned with HealthRise patients' duration in the program. Unlike other comparison patient datasets, International Classification of Disease (ICD) codes for diabetes and hypertension were not available for patient diagnosis; instead, the diagnosis variable for HealthFinders comparison patients listed active diagnoses. Consequently, a text-matching algorithm was applied to assign diabetes and/or hypertension diagnosis based on the text data in this variable.

Hennepin County. Data for patients who formed a comparison group were extracted from clinics associated with North Memorial but that had not enrolled in the HealthRise program. Selection criteria included having at least two biometric data measures for A1c or blood pressure – one in 2016 and one in 2018 – to approximate baseline and endline measurements for HealthRise patients; and being between the ages of 30 and 89 years old at "baseline." Because comparison patients were selected from a very similar base population to individuals who ultimately enrolled in HealthRise (i.e., North Memorial clinics), their demographic profile was also considered very similar to that of HealthRise patients.

Analysis

At both baseline and endline, the percentage of HealthRise patients who were prevalent cases of diabetes or hypertension and had achieved levels of disease control (i.e., an A1c lower than 8% or systolic blood pressure <140 mmHg and diastolic blood pressure <90 mmHg, respectively) were computed. Using patient data from comparison groups selected at each US site, the percentage of patients in these comparison groups that achieved similar levels of control at equivalent time points were also computed. The goal was to only include comparison patients with similar periods of time between "baseline" and "endline" biometric measures, aiming to provide the equivalent "program" duration to that of HealthRise patients. This type of analysis permitted examination of if and how both levels and trends in disease control varied over time in relation to HealthRise program participation.

Qualitative

Overview

Qualitative data, in the form of key informant interviews (KII) and focus group discussions (FGD), were collected in each of the four countries. While the methods of participant selection varied slightly by country, the general approach was to identify administrators, providers, and patients from a sample of intervention facilities and a sample of matched comparison facilities (as identified and described in the methods for quantitative data collection) in each country. Balanced representation was sought by intervention group, site, and role (provider, patient, etc.).

All interview and focus group discussion guides were developed at IHME, covering similar content and using many of the same questions across all countries and sites, with slight adaptations to reflect programmatic differences in each location. Questions specifically about the HealthRise program were asked only in intervention sites; only questions not referring to HealthRise interventions were asked in comparison sites. Guides were specific to country and site, role, and intervention group. Local teams of interviewers were recruited and trained in Brazil, India, and South Africa to administer interviews and lead focus groups in the local language, as needed. Data collection in South Africa was conducted primarily in English; all data in the US were collected in English by a member of the IHME team. Table 6 summarizes the sample characteristics for the qualitative data collected in each of the four countries, by site and role. A total of 145 interviews and focus group discussions were held across the four countries.

Country	USA			India		South Africa				Brazil			
Location	Rice	Henn-epin	Ram-sey	Shimla		uMgung-undlovu		Pixley ka Seme		Teófilo Otoni		Vitória da Conquista	
HealthRise vs. Comparison	HR	HR	HR	HR	Comp	HR	Comp	HR	Comp	HR	Comp	HR	Comp
Patient focus groups	-	-	-	5	4	4	2	-	-	5	3	4	2
Community health workers and frontline health workers	2	2	3	3	3	3	6	-	-	10	6	7	4
Facility- or clinic-based providers	2	1	3	3	3	2	-	3	3	-	-	-	-
Facility or clinic managers and administrators	2	2	3	4	3	1	3	2	4	5	3	3	2
Policymakers		3		-	-	-	-	-	-	2	-	1	-
Other	-	-	-	4	-	-	-	-	-	-	-	-	-
Total	**6**	**5**	**9**	**19**	**13**	**10**	**11**	**5**	**7**	**22**	**12**	**15**	**8**

Table 6. Summary of cross-country qualitative sample characteristics

Brazil

Data Collection

Key informant interviews and focus group discussions were conducted in intervention and comparison areas. Comparison locations were selected based on similar sociodemographic characteristics and the absence of any HealthRise programs, and were the same places where quantitative baseline data were collected.

Qualitative activities were conducted in a sample of facilities, which were selected based on the number of diabetes and hypertension patients enrolled. The selection of facilities in the intervention areas also took into consideration the rate of follow-up (number of HealthRise enrollees who attended two or more consultations). Both facilities with high and low follow-up rates were selected. In Vitória da Conquista, in addition to the three selected primary health units, activities were also performed at SESI. Moreover, since interventions in this site were restricted to urban settings, only urban health units were visited for data collection in Poções (comparison region).

Key informant interviews were conducted with a sample of administrators and providers from each of the facilities, as well as with policymakers whose work was relevant to the intervention areas. Health providers were randomly selected after being identified from an initial list provided by each of the facility managers. Facility administrators and policymakers were identified through the implementation teams. Interviews were scheduled at the interviewee's convenience.

Patients were recruited to participate in focus group discussions by health facility staff on behalf of the field enumerators, with advance notice. All interviews and focus group discussions were conducted in Portuguese and were audio recorded. Table 7 summarizes the interviews and focus group discussions conducted in Brazil, by location, intervention group, and role.

	Teófilo Otoni		Vitória da Conquista	
Role	HealthRise	Comparison	HealthRise	Comparison
Patients	5 FGD	3 FGD	4 FGD	2 FGD
Community health workers and frontline health workers	10 KII	6 KII	7 KII	4 KII
Facility or clinic managers and administrators	5 KII	3 KII	3 KII	2 KII
Policymakers	2 KII	-	1 KII	-
Total	**22**	**12**	**15**	**8**

Table 7. Sample details for Brazil key informant interviews and focus group discussions. *FGD: Focus group discussions; KII: Key Informant Interviews.*

Analysis

All interview and focus group discussion recordings were translated and transcribed into English. Each transcription was read two or more times by a single researcher, and key portions of the text were entered into an Excel template for analysis. Thematic coding was used to identify themes in the intervention and comparison sites and draw comparisons between the two groups.

India

Data Collection

Key informant interviews and focus group discussions were conducted with administrators, providers, and patients in a sample of intervention and comparison facilities in Shimla. A balanced sample of facilities in intervention and control sites were selected at random. Within each selected facility, survey field staff identified and invited clinical staff to interview. Patients and community health workers were recruited to participate in focus group discussions by health facility staff on behalf of the field enumerators, with advance notice. Three HealthRise master trainers were selected at random from a list provided by MAMTA: one based at MAMTA, one based at Indira Gandhi Medical College, and one based in a public facility. A MAMTA grantee official was also interviewed. All interviews and focus group discussions were conducted in Hindi. Table 8 summarizes the interviews and focus group discussions (FGD) conducted in Shimla, by intervention group and role.

	Shimla	
Role	HealthRise	Comparison
Patients	5 FGD	4 FGD
Community health workers and frontline health workers	3 FGD	3 FGD
Facility- or clinic-based providers	3 KII/FGD	3 KII/FGD
Facility or clinic managers and administrators	4 KII	3 KII
Other	4 KII	-
Total	**19**	**13**

Table 8. Sample details for India key informant interviews and focus group discussions (Shimla only). *FGD: focus group discussions; KII: Key Informant Interviews.*

Analysis

All interview and focus group discussion recordings were translated and transcribed into English. Each transcription was read two or more times by a single researcher, and key portions of the text were entered into an Excel template for analysis. Thematic coding was used to identify themes in the intervention and comparison sites and draw comparisons between the two groups.

South Africa

Data Collection

Key informant interviews and focus group discussion were conducted with administrators, providers, and patients in a sample of intervention and comparison facilities in uMgungundlovu and Pixley ka Seme. Interviewees were randomly selected from intervention and comparison facilities. Interviews and focus group discussions were conducted primarily in English and audio recorded. Table 9 summarizes the interviews and focus group discussions conducted in South Africa, by location, intervention group, and role.

	uMgungundlovu		Pixley ka Seme	
Role	HealthRise	Comparison	HealthRise	Comparison
Patients	4 FGD	2 FGD	-	-
Community health workers and frontline health workers	3 KII	6 KII	-	-
Facility- or clinic-based providers	2 KII	-	3 KII	3 KII
Facility or clinic managers and administrators	1 KII	3 KII	2 KII	4 KII
Total	**10**	**11**	**5**	**7**

Table 9. Sample details for South Africa key informant interviews and focus group discussions

Analysis

All interview and focus group discussion recordings were translated when necessary and transcribed in English. Each transcription was read two or more times by a single researcher, and key portions were entered into an Excel template for analysis. Thematic coding was used to identify themes in the intervention and comparison sites in each location and draw comparisons between the groups and locations.

United States

Data Collection

Key informant interviews were conducted with a sample of administrators and providers from each of the three intervention sites, as well as with policymakers whose work was relevant to all sites. In the US, no interviews were conducted with staff from comparison sites, nor were focus groups held with patients.

Interview subjects were identified from an initial list of administrators and policymakers engaged with HealthRise in each of the sites, and additional subjects were identified through snowball sampling, based on contacts recommended by other interviewees. Potential interview subjects were invited to participate via email; up to two reminder emails were sent if a response was not received to the initial request. Interviews were scheduled at the interviewee's convenience, conducted via phone, and audio recorded. Table 10 displays the total number of interviews conducted, by site and role. The overall response rate was 79%.

	Rice County	Hennepin County	Ramsey County
Role	HealthRise	HealthRise	HealthRise
Community health workers and frontline health workers	2 KII	2 KII	3 KII
Facility- or clinic-based providers	2 KII	1 KII	3 KII
Facility or clinic managers and administrators	2 KII	2 KII	3 KII
Policymakers	3 KII		
Site Total	**6**	**5**	**9**
Country Total	**23**		

Table 10. Sample details for United States key informant interviews

Analysis

Each interview audio recording was listened to two to three times by a single member of the research team, and key portions were transcribed into an Excel template for analysis. Thematic coding was used to identify themes unique to each site and overarching themes reflected across the three sites.

Country-Specific Findings

Brazil

Quantitative

Vitória da Conquista: Patient findings

In Vitória da Conquista, out of 2,443 patients enrolled in the program with a hypertension diagnosis, 45% (n=1,095) had two or more blood pressure readings available. Although most hypertension patients remained in the same blood pressure category between enrollment and last measurement, patients who experienced changes more frequently moved to a lower blood pressure stage (n= 230, 21%). However, the majority of the analyzed patients (n=592, 54%) did not have their blood pressure under control (SBP <140 mmHg and DBP < 90 mmHg) at the last measurement (Table 11). By the end of the project, 202 (18%) patients presented a decrease in SBP equal to or greater than 10%, and less than 8% (n=79) of the followed individuals went the opposite way, with a SBP increase over 10%.

BP	Controlled at last measurement (<140/90)	Stage 1 at last measurement (≥140/90)	Stage 2 at last measurement (≥160/100)	Total
Controlled at enrollment (<140/90)	327	44	17	388
Stage 1 at enrollment (≥ 140/90)	107	234	19	360
Stage 2 at enrollment (≥160/100)	69	54	224	347
Total	503	332	260	1,095

Table 11. Change in stages of hypertension patients between time of enrollment and most recent measurement, Vitória da Conquista

In accordance with these findings, the t-test revealed that there was a significant difference between the first and last SBP values (First SBP < Last SBP) for HealthRise enrollees of both sexes in Vitória da Conquista, as shown in Table 12.

		Obs	Mean	Confidence Interval	Mean change
Males	First SBP	357	141.1	138.9–143.2	-3.98***
	Last SBP		137.8	135.6–140.0	
Females	First SBP	736	139.9	138.2–141.5	-4.55***
	Last SBP		135.3	133.7–136.9	
All	First SBP	1,095	140.2	138.9–141.5	-4.17***
	Last SBP		136.1	134.8–137.4	

Paired t-test: Last SBP ≠ First SBP. ***P-value < 0.01; **P-value < 0.05

Table 12. Paired t-test statistics comparing first and last blood pressure readings for HealthRise enrollees in Vitória da Conquista, by sex

With regard to patients with diabetes, out of 1,052 enrolled in the HealthRise program, only 68 (6%) had two or more blood glucose readings. Of those, 34 (50%) remained in the same A1c classification, 29 (43%) moved to a lower category, and only 5 (7%) moved to a higher A1c range. Most of the patients (n= 42, 62%) had their condition under control (A1c < 8%) at the last measurement (Table 13). Half (n=34) of these patients had a decrease in A1c equal to or greater than 10%, compared to 9% (n=6) that presented an opposite trend. The t-test confirmed that more recent A1c readings were significantly lower than those available at the time of enrollment, for both sexes, as seen in Table 14.

A1c	Last A1c measurement: <7	Last A1c measurement: 7–7.9	Last A1c measurement: 8–9.9	Last A1c measurement: ≥10	Total
Enrollment: A1c < 7	13	2	1	0	156
Enrollment: A1c 7–7.9	1	6	0	2	9
Enrollment: A1c 8–9.9	6	11	5	0	22
Enrollment: A1c ≥ 10	1	2	8	10	21
Total	21	21	14	12	68

Table 13. Change in stages of diabetes patients between time of enrollment and most recent measurement, Vitória da Conquista

		Obs	Mean	Confidence Interval	Mean change
Males	First A1c	19	9.6	8.2–10.9	-0.73**
	Last A1c		8.8	7.6–10.0	
Females	First A1c	49	8.9	8.3–9.6	-1.03***
	Last A1c		7.9	7.4–8.4	
All	First A1c	68	9.1	8.5–9.7	-0.94***
	Last A1c		8.1	7.6–8.6	

Paired t-test: Last A1c ≠ First A1c. ***P-value < 0.01; **P-value < 0.05

Table 14. Paired t-test statistics comparing first and last A1c readings for HealthRise enrollees in Vitória da Conquista, by sex

Teófilo Otoni: Patient findings

In the Teófilo Otoni region, results were similar. Almost 4,000 hypertensive patients were enrolled in the HealthRise program, but only one-third (n=1,169) had two or more blood pressure measurements. Of these, 614 (52%) remained in the same blood pressure stage, 314 (27%) moved to a better stage, and 241 (21%) moved to a worse stage. Most patients (n= 610, 52%) had their condition under control (BP <140/90 mmHg) at the last measurement (Table 15). Additionally, 273 patients (23%) had a decrease in SBP of 10% or more, while 225 (20%) experienced an increase in blood pressure greater than 10%.

BP	Controlled at last measurement (<140/90)	Stage 1 at last measurement (≥140/90)	Stage 2 at last measurement (≥160/100)	Total
Controlled at enrollment (<140/90)	382	130	53	565
Stage 1 at enrollment (≥ 140/90)	138	130	58	326
Stage 2 at enrollment (≥160/100)	90	86	102	278
Total	610	346	213	1,169

Table 15. Change in stages of hypertension patients between time of enrollment and most recent measurement, Teófilo Otoni

The average SBP was lower in the most recent measurement compared to the time of enrollment for both men and women, and the difference was statistically significant, as seen in Table 16.

		Obs	Mean	Confidence Interval	Mean change
Males	First SBP	358	135.3	133.2–137.4	-2.81**
	Last SBP		132.5	130.5–134.4	
Females	First SBP	811	132.0	130.6–133.4	-1.49**
	Last SBP		130.5	129.2–131.8	
All	First SBP	1,169	133.0	131.8–134.1	-1.89***
	Last SBP		131.1	130.0–132.2	

Paired t-test: Last SBP ≠ First SBP. ***P-value < 0.01; **P-value < 0.05

Table 16. Paired t-test statistics comparing first and last blood pressure readings for HealthRise enrollees in Teófilo Otoni, by sex

For diabetes, 1,028 patients were enrolled and only 17% (n=176) had two or more A1c readings available. Between enrollment and the last measurement, 105 (60%) analyzed patients remained in the same A1c category, 53 (30%) moved to a lower category, and 18 (10%) to a higher classification (Table 17). Still, among those with two biometric readings, 35% (n=61) presented a decrease in A1c equal to or greater than 10%, while approximately 13% (n=23) of the followed individuals had gone the opposite way, with an A1c increase over 10%.

A1c	Last A1c measurement: <7	Last A1c measurement: 7–7.9	Last A1c measurement: 8–9.9	Last A1c measurement: ≥10	Total
Enrollment: A1c < 7	50	4	4	0	58
Enrollment: A1c 7–7.9	11	14	3	1	29
Enrollment: A1c 8–9.9	5	11	24	6	46
Enrollment: A1c ≥ 10	7	3	16	17	43
Total	73	32	47	24	176

Table 17. Change in stages of diabetes patients between time of enrollment and most recent measurement, Teófilo Otoni

Results from the t-test show that last A1c results were significantly lower than initial results for both sexes combined and for females (Table 18).

		Obs	Mean	Confidence Interval	Mean change
Males	First A1c	50	8.0	7.4–8.6	-0.29
	Last A1c		7.7	7.2–8.2	
Females	First A1c	126	8.6	8.2–9.0	-0.74***
	Last A1c		7.8	7.5–8.1	
All	First A1c	176	8.4	8.1–8.7	-0.62***
	Last A1c		7.8	7.5–8.1	

Paired t-test: Last A1c ≠ First A1c. ***P-value < 0.01; **P-value < 0.05

Table 18. Paired t-test statistics comparing first and last A1c readings for HealthRise enrollees in Teófilo Otoni, by sex

Qualitative

In Brazil, nine focus groups were held with diabetes and hypertension patients from intervention areas, and five focal groups were held with patients from comparison regions. Key informant interviews were conducted with frontline health workers, community health workers, and facility managers from both intervention and comparison health facilities. In addition, three policymakers acting in the intervention areas – two in Teófilo Otoni and one in Vitória da Conquista – were also interviewed. Key themes emerging from the Brazil intervention site qualitative data are presented below and contrasted with findings from the comparison facilities.

Themes

Patient knowledge about NCDs

Patients from HealthRise facilities demonstrated a moderate level of knowledge about NCD symptoms, risk factors, disease complications, and basic disease management, particularly diet modification and exercise. Alcohol and tobacco were infrequently mentioned as risk factors compared to many references to the

importance of diet and exercise. Stress and anxiety were referred to multiple times as one of the main causes of diabetes and hypertension. Despite this level of knowledge, patients' understanding of diabetes and hypertension from a biological or clinical perspective was much more limited.

"Diabetes is when you have sugar in our blood, but I don't know how it starts it." – Patient

"There is part of diabetes that comes from the emotions." – Patient

"You can get blind and you can even need to amputate your leg." – Patient

"When I'm stressed, I start shaking and my blood pressure gets high." – Patient

"The main cause of hypertension is the salt on the food…" – Patient

"It also depends on our quality of life, but you need to eat healthier and exercise as well." – Patient

General barriers to care

According to the patients, adopting a healthier diet, exercising, and the need for different medications are the main challenges for self-managing their conditions. Some types of problematic foods are part of the region's food culture, such as flour, rice, pasta, and red meat, resulting in greater need for dietary adjustments by patients. The high number of prescribed drugs, especially for hypertension, is seen as a burden, and drugs are not always available in the public health system, requiring patients to pay for these out-of-pocket at private pharmacies or await their arrival at a public facility. Shortcomings in basic health system inputs were also reported by facility staff and policymakers as barriers to quality health care, particularly medication stock-outs and staff shortages. Barriers when referring patients to other health specialists (e.g., nutritionists, physiotherapists) and when requesting specialized tests were also mentioned, especially due to a reduced staff and budget limitations within the public health system.

"I really like eating rice, but we can't. But I eat it anyway." – Patient

"You starting taking one medication, then it's two…three…" – Patient

"You get to their home after a month and the medication is still all there…" – CHW

"The main challenge is to bring the patient to the health unit." – FLHW

"Not always we can refer a patient to the nutritionist or to the physiotherapist, there are too many patients to such a reduced team." – FLHW

"The main barrier is to not have a doctor here every day. There is no pharmacist." – Facility manager

Patient experiences with HealthRise

Patients demonstrated limited understanding of HealthRise; however, they were able to recognize some of the main program aspects, such as screening health fairs and some educational activities. The use of tablets by CHWs during home visits and computers by FLHWs during consultations was also perceived positively by patients. Individuals from Teófilo Otoni more frequently reported enhanced access to specialized tests after the implementation of HealthRise.

"They got a device that you take home with you to monitor your blood pressure." – Patient

"The health fair was really good. There were some educational activities in there." – Patient

"It was because of this project that I found out about my condition." – Patient

"I was even able to get my eyes examined!" – Patient

"Now I feel more confident. We need to go to the health unit frequently, to get some tests frequently, you need to collect blood more frequently as well." – Patient

"They didn't use computers before and now they use it. And there is everything in there…the frequency we go to the health unit, the medication we take…" – Patient

Provider experiences with HealthRise

Facility-based providers listed key elements of HealthRise as patient screening, patient education, referrals for treatment, and follow-up care. Overall, the program resulted in reorganized patient flows and health unit routines, which were perceived by CHWs and FLHWs as resulting in better and more structured delivery of care. Providers also highlighted the importance of training opportunities and reported an intensification of group activities for patients and an expansion of the availability of some specialized tests after the implementation of HealthRise. From their perspective, these activities improved the relationship between patients and providers. Staff also recognized the value added by the use of tablets and the implementation of EMR (in Vitória da Conquista) and the Decision Support System (in Teófilo Otoni).

"HealthRise has brought some changes to our work process. It has changed some of the things that were not working before." – FLHW

"I think the EMR resulted in a better way of communicating about the patient…any professional can now access the information stored in there." – FLHW

"With the Decision Support System I feel more confident now, and I know exactly what I need to do." – Nurse/Facility manager

"In my opinion, one of the main goals of the project was to bring back to the system those patients who didn't use to care about their diabetes or hypertension." – CHW

Ideas for improvement

Interviewees raised many ideas for ways to improve HealthRise and the quality of health care more generally. Some ideas simply involved addressing noted weaknesses in the health system, such as guaranteeing medication availability and increasing the availability of specialized tests at the local level, without the need to refer patients to a central unit in a different municipality. FLHWs and CHWs requested additional and more periodic in-person training opportunities. Specifically, CHWs frequently expressed interest in in-depth technical trainings that would allow them to measure blood glucose and blood pressure during home visits. Overall, interviewees would like health professionals other than doctors and nurses to be more closely involved in the project, allowing for a truly multidisciplinary approach.

"The trainings were good, but they need to be permanent…" – FLHW

"A more intense multidisciplinary approach…I missed that a lot. A psychologist, a nutritionist…so that we could discuss the cases together." – FLHW

Sustainability

Interviewees and focus group participants expressed an urgent need for the continuity of the program. Health providers mentioned that maintaining the program would allow for better outcomes to be achieved among patients. Providers and policymakers worried that economic constraints would negatively affect the continuity of the program in terms of access to different exams, but they also believe that what was learned from HealthRise will not be forgotten.

"The discussion is still going on…is the program continuing or not?" – Policymaker

"The program has increased our awareness about diabetes and hypertension…now we need to keep it going." – FLHW

Comparison facilities

Patient focus group discussions and staff interviews at comparison facilities echoed many of the same themes as those from intervention areas, but a few key differences emerged. Patients in focus groups at comparison facilities demonstrated somewhat limited knowledge regarding diabetes and hypertension when compared to those from intervention facilities. Although comparison site patients were able to identify changes in diet as an important step for disease management, most could not elaborate on what kind of changes were needed and what types of foods should be avoided. Hypertension was usually described based on its symptoms only.

Overall, similar barriers to care were raised in intervention and comparison regions, but while complaints regarding the availability of medication and specialized exams also arose in intervention facilities, these complaints were clearly more escalated in comparison facilities. Although facilitating the referral process to specialists was a core component of HealthRise in both sites, this seems to be a major problem in comparison facilities, according to patients, health providers, and facility managers. Additionally, FLHWs in comparison areas agreed that diabetes and hypertension were not their highest priority since there were so much else to address in these areas (e.g., maternal and child health). Comparison facilities from both regions have a program for diabetes and hypertension patients called "Hiperdia;" however, patients' adherence is low, according to facility managers. Finally, staff in comparison facilities were more likely to request opportunities for trainings.

India

Quantitative

Shimla: Facility findings

Facility-based HealthRise awareness, implementation, and trainings. Compared with facilities located in blocks where HealthRise was not implemented, facilities in program implementation blocks had higher rates of e-clinic and HealthCard application availability (Table 19). HMIS use was more similar across facilities, though it remained relatively low among both groups. A comparable percentage of facilities had organized any training session in the last 12 months (i.e., 38.9% among facilities in HealthRise implementation locations; 41.7% among comparison facilities). While nearly 90% of facilities located in HealthRise implementation blocks had heard of the HealthRise/MAMTA program, 50% of comparison facilities indicated recognition of such programs as well. This result may reflect a more widespread recognition of the HealthRise program beyond its initial implementation areas.

	Facilities in HealthRise implementation locations				Facilities in comparison locations			
	All facilities	Civil hospitals	Primary health centres	Community health centres	All facilities	Civil hospitals	Primary health centres	Community health centres
Number of facilities	**18**	**3**	**12**	**3**	**12**	**2**	**8**	**2**
HealthRise awareness and implementation status								
Percentage of facilities where the HealthRise/MAMTA/CHAI program was ever heard about	16 (88.9%)	3 (100.0%)	10 (83.3%)	3 (100.0%)	6 (50.0%)	2 (100.0%)	4 (50.0%)	0 (0.0%)
Percentage of facilities where the HealthRise/MAMTA/CHAI program was implemented	15 (83.3%)	3 (100.0%)	9 (75.0%)	3 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Facility trainings and outreach								
Percentage of facilities having organized any training sessions in the last 12 months	7 (38.9%)	1 (33.3%)	4 (33.3%)	2 (66.7%)	5 (41.7%)	1 (50.0%)	3 (37.5%)	1 (50.0%)
Percentage of facilities where any trainings in the last 12 months were provided by HealthRise	8 (44.4%)	3 (100.0%)	3 (25.0%)	2 (66.7%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
HMIS implementation								
Percentage of facilities where HMIS is used	2 (11.1%)	0 (0%)	1 (8.3%)	1 (33.3%)	3 (25.0%)	0 (0%)	2 (25.0%)	1 (50.0%)
Percentage of facilities where HMIS was implemented by HealthRise	1 (5.6%)	0 (0%)	0 (0%)	1 (33.3%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
HealthCard implementation								
Percentage of facilities where the HealthCard application is used to manage care of hypertensive or diabetic patients	5 (27.8%)	2 (66.7%)	2 (16.7%)	1 (33.3%)	1 (8.3%)	0 (0.0%)	0 (0.0%)	1 (50.0%)
Percentage of facilities where the HealthCard was implemented by HealthRise	3 (16.7%)	1 (33.3%)	1 (8.3%)	1 (33.3%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
E-clinic implementation								
Percentage of facilities with an e-clinic	3 (16.7%)	1 (33.3%)	2 (16.7%)	0 (0.0%)	1 (8.3%)	0 (0.0%)	0 (0.0%)	1 (50.0%)
Percentage of facilities where an e-clinic was implemented by HealthRise	2 (11.1%)	1 (33.3%)	1 (8.3%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)

Table 19. Shimla: Comparing facility-based HealthRise awareness, implementation, and trainings

Human resources for health. In terms of total human resources for health, the average number of staff did not markedly vary from baseline to endline among facilities located in HealthRise implementation blocks, nor did average staff levels differ from comparison facilities (Figure 15). Notably, almost all primary health centers had fewer total staff than the average across facility samples. In contrast, the average number of auxiliary nurse midwives (ANMs) and village health workers was somewhat higher at endline than baseline among facilities in HealthRise implementation areas (Figure 16); comparison facilities had comparable levels of ANMs and village health workers as facilities in the HealthRise endline analysis. At endline, a number of primary health centers and community health centers in both HealthRise and comparison locations had no ANMs or village health workers associated with them.

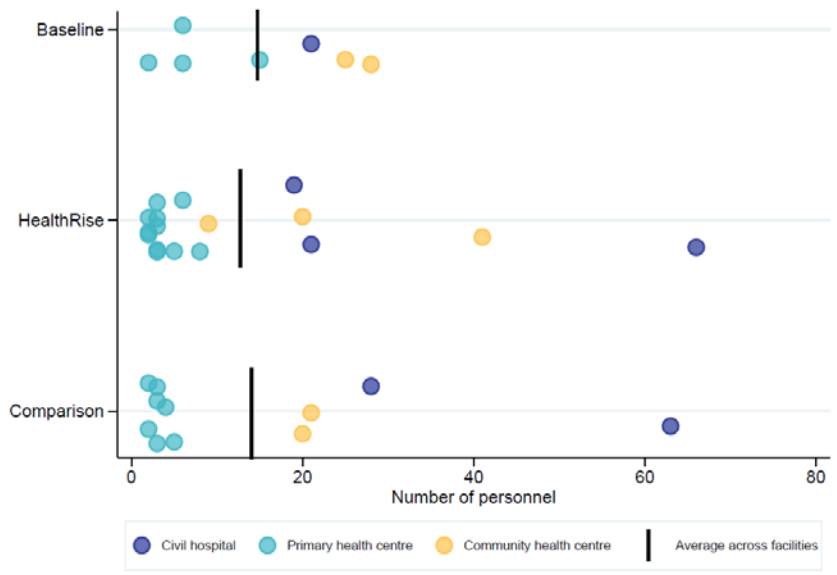

Figure 15. Shimla: Comparing the average and distribution of human resources for health in facilities

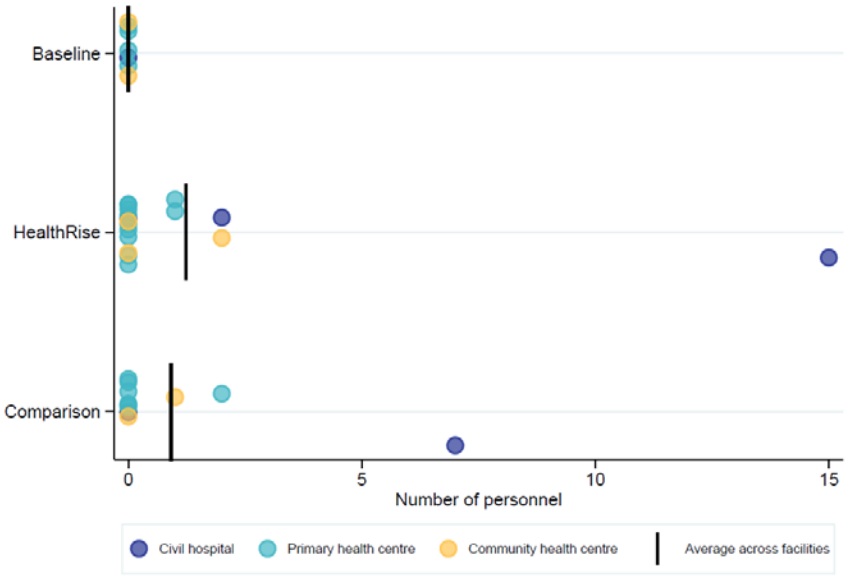

Figure 16. Shimla: Comparing the average and distribution of village health workers in facilities. *Health workers represented in this figure included ANM village health workers, ANM nurses, and village health workers.*

Pharmaceutical stocks. Compared with baseline measures, overall stocks of 23 NCD pharmaceuticals appeared to somewhat improve, albeit not statistically significantly (*p*-value was not <.05), among facilities located in the blocks where Shimla's HealthRise program was implemented (Figure 17). However, facilities in comparison blocks averaged slightly higher levels of NCD pharmaceutical stocks than facilities in HealthRise implementation locations at endline. These patterns somewhat diverged when key medications for hypertension (i.e., ACE inhibitors, angiotensin receptor blockers, beta blockers, calcium channel blockers,

thiazide diuretics) and diabetes (i.e., biguanides, insulin, sulfonylureas, potassium-sparing diuretics) were considered (Figures 18 and 19, respectively). For both hypertension and diabetes medications, facilities in HealthRise implementation locations averaged somewhat lower stocks at endline than at baseline – and averages were slightly lower, albeit not statistically significantly, than pharmaceutical stocking among comparison facilities. This may be related to potentially higher demand – and thus stocking out of – NCD pharmaceuticals in later years as compared with the baseline. For instance, no facility reported stocking out of any key hypertension medications at baseline, whereas more than 70% of facilities in HealthRise and comparison locations had stocked out of a key hypertension medication for at least one day in the last quarter at endline.

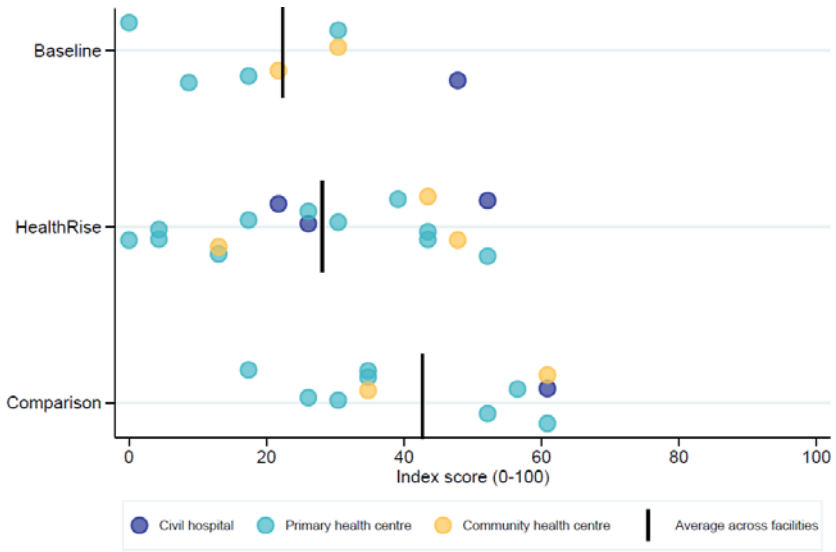

Figure 17. Shimla: Comparing the average and distribution of performance on current stocks of 23 NCD pharmaceuticals in Shimla. *The "index score" represents the percentage of the 23 NCD pharmaceuticals currently stocked in a given facility at the time of survey.*

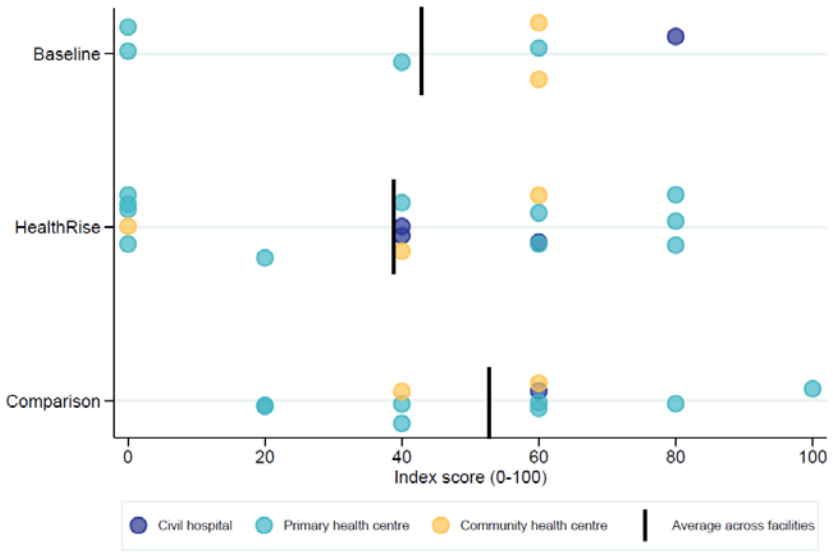

Figure 18. Shimla: Comparing the average and distribution of performance on current stocks of five key hypertension pharmaceuticals in Shimla. *The "index score" represents the percentage of the five key hypertension pharmaceuticals (i.e., ACE inhibitors, angiotensin receptor blockers, beta blockers, calcium channel blockers, thiazide diuretics) currently stocked in a given facility at the time of survey.*

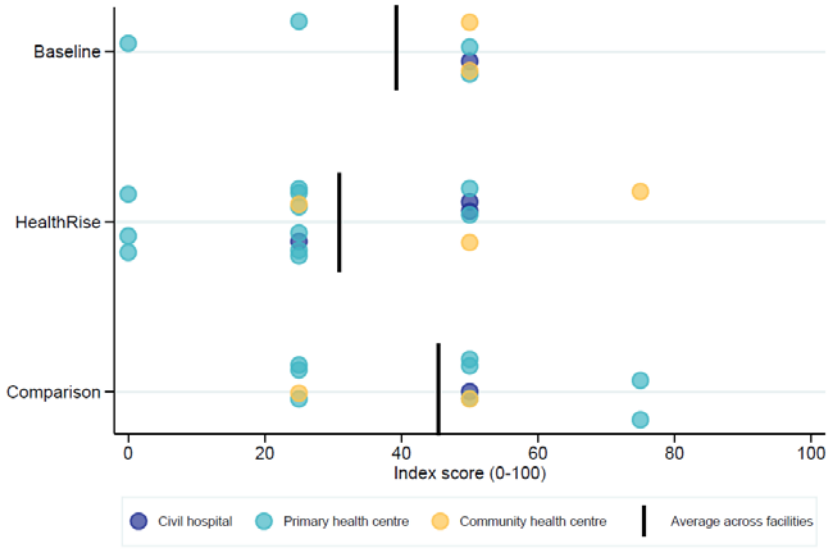

Figure 19. Shimla: Comparing the average and distribution of performance on current stocks of four key diabetes pharmaceuticals in Shimla. *The "index score" represents the percentage of the four key diabetes pharmaceuticals and diabetes (i.e., biguanides, insulin, sulfonylureas, potassium-sparing diuretics) currently stocked in a given facility at the time of survey.*

Shimla: Patient findings

Diabetes cascade of care. Although the overall cascade of care for diabetes did not substantially vary among patients presenting at facilities in HealthRise implementation locations and comparison facilities (Figure 20), some notable trends emerged by sex. For both facility groups, the majority of prevalent cases of diabetes were also diagnosed, suggesting that India's broader NCD awareness and screening efforts may be in action. Diabetes patients presenting at comparison facilities had higher levels of current treatment (69.7% [95% CI: 60.3–77.7%]) than patients presenting at facilities located in HealthRise program areas (54.5 [95% CI: 45.0–63.7%]). This represented a gap of about 28% and 42% of patients, respectively, diagnosed with diabetes who are not currently on treatment for the disease. Approximately 65%–66% of diabetes patients presenting at facilities in HealthRise and comparison locations had A1c levels less than 8%. Of note, a somewhat higher, albeit not statistically significantly higher, percentage of diabetes patients at HealthRise locations had A1c measures at levels considered controlled than patients who reported currently being on treatment. Similar overall patterns were found by age group (i.e., <50 years old; 50 years and older), though patients 50 and older generally showed higher performance on treatment cascade of care metrics than their younger counterparts (Figure 21).

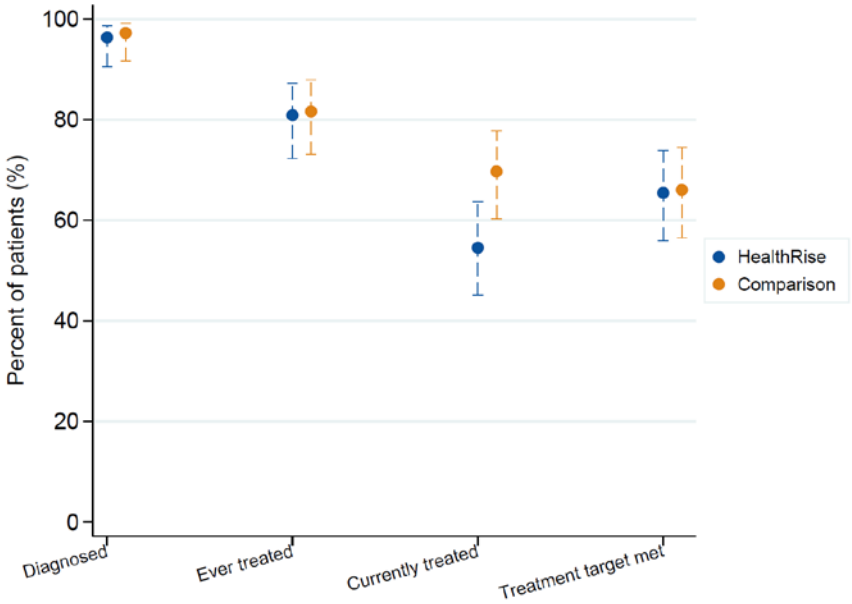

Figure 20. Shimla: Comparing the cascade of care for diabetes patients presenting at facilities located in HealthRise implementation blocks and comparison facilities. *Only prevalent cases of diabetes (i.e., individuals who reported being diagnosed with diabetes or had an A1c measure exceeding 6.4%, a level that would elicit diabetes case management by health care providers) were included in this figure. Currently treated cases are individuals who reported currently taking their medications for diabetes as prescribed. Controlled cases are individuals who are considered a prevalent case and then have an A1c measure of less than 8%.*

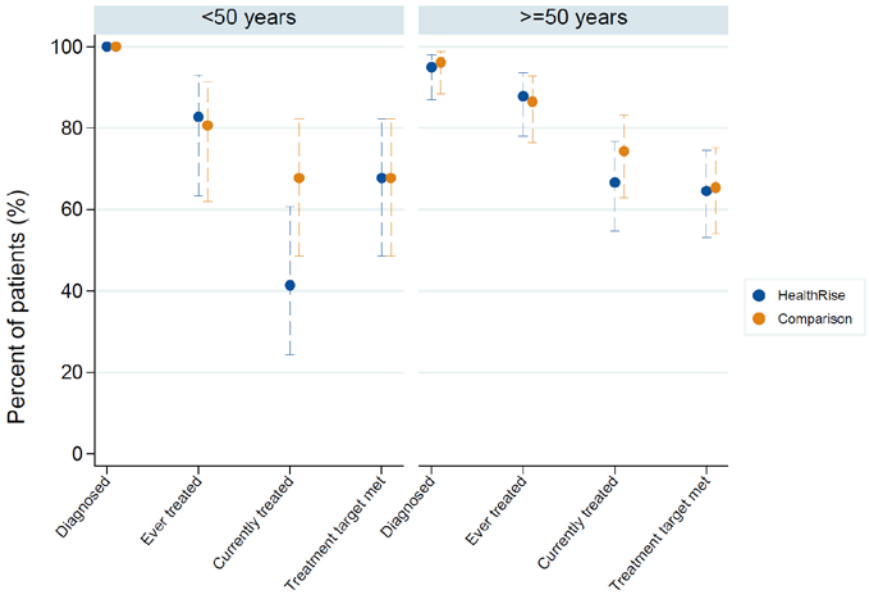

Figure 21. Shimla: Comparing the cascade of care for diabetes patients, by age, presenting at facilities located in HealthRise implementation blocks and comparison facilities. *Only prevalent cases of diabetes (i.e., individuals who reported being diagnosed with diabetes or had an A1c measure exceeding 6.4%, a level that would elicit diabetes case management by health care providers) were included in this figure. Currently treated cases are individuals who reported currently taking their medications for diabetes as prescribed. Controlled cases are individuals who are considered a prevalent case and then have an A1c measure of lower than 8%.*

Cascade of care indicators somewhat varied by sex among patients presenting at facilities in HealthRise implementation and comparison locations (Figure 22). For both males and females, comparison patients with diabetes had higher rates of being currently treated than patients at facilities in HealthRise areas. Female patients in comparison and HealthRise areas had narrow ranges across the diabetes cascade of care (i.e., a smaller drop-off between diagnosis and meeting treatment targets for diabetes) than male patients with diabetes (i.e., 23%–28% drop-off versus 33%–37% gap).

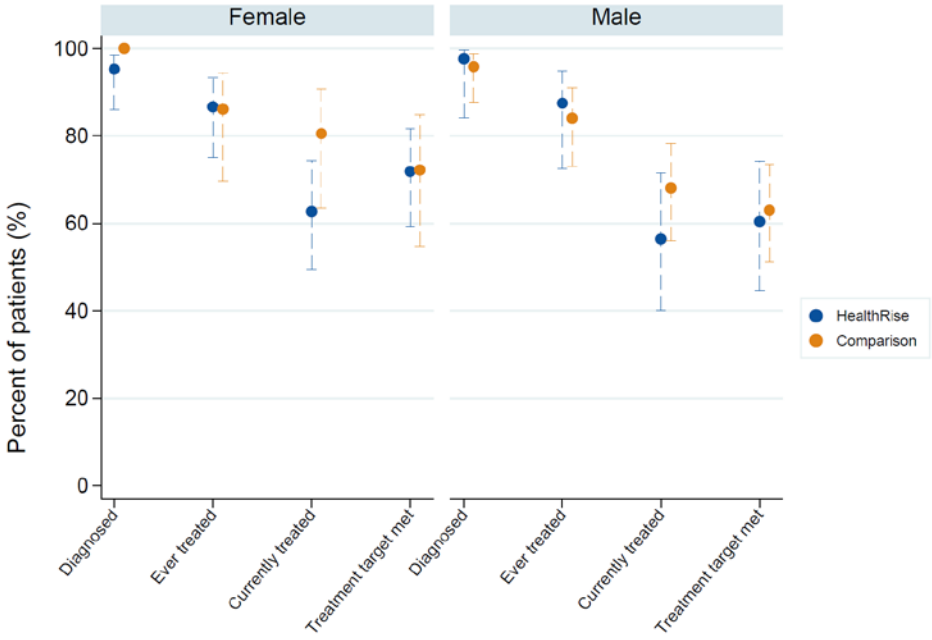

Figure 22. Shimla: Comparing the cascade of care for diabetes patients, by sex, presenting at facilities located in HealthRise implementation blocks and comparison facilities. *Only prevalent cases of diabetes (i.e., individuals who reported being diagnosed with diabetes or had an A1c measure exceeding 6.4%, a level that would elicit diabetes case management by health care providers) were included in this figure. Currently treated cases are individuals who reported currently taking their medications for diabetes as prescribed. Controlled cases are individuals who are considered a prevalent case and then have an A1c measure of lower than 8%.*

Hypertension cascade of care. For both sexes and all ages, patients presenting at facilities located in HealthRise implementation areas trended toward higher levels of hypertension treatment, but not higher levels of control compared to patients at comparison facilities (Figure 23). While somewhat more hypertension patients at facilities in HealthRise implementation locations had ever received treatment (81.4% [95% CI: 75.7–86.1%]) than those presenting at comparison facilities (74.4% [95% CI: 67.0–80.6%]), a greater percentage of hypertension patients presenting in comparison locations met treatment targets (58.1% [95% CI: 50.3–65.6%]) than patients in HealthRise areas (45.0% [95% CI: 38.6–51.7%]). The drop-off in the cascade of care, from diagnosis to controlled hypertension, was fairly steep for both patient groups, with HealthRise patients experiencing a 52-percentage-point gap from diagnosis to meeting treatment targets and comparison patients recording a 41-percentage-point difference. These patterns were mirrored among hypertension patients 50 years and older by facility group (Figure 24), while hypertension patients less than 50 years old for patients in comparison areas trended toward higher performance across the cascade of care than the equivalent patients in HealthRise areas.

By sex, differences were more pronounced than those found for diabetes (Figure 25). For treatment cascade of care metrics, male hypertension patients presenting at facilities in HealthRise implementation areas out-performed patients at comparison facilities. For instance, 64.0% (95% CI: 53.4–73.5%) of male patients with hypertension were currently on treatment in HealthRise locations, while 46.7% (95% CI: 35.5–58.2%) were at

comparison facilities. The opposite pattern emerged for hypertension treatment targets, with more male hypertension patients at comparison facilities meeting treatment targets (60.3% [95% CI: 48.8–70.7%]) than those presenting at facilities in HealthRise implementation areas (38.9% [95% CI: 29.5–49.3%]). For female hypertension patients, cascade of care metrics were essentially indistinguishable across facility categories; the main exception was ever receiving treatment, which was slightly higher in HealthRise areas than comparison locations. Focusing on facilities in HealthRise areas, gaps across the hypertension cascade of care, from diagnosis to control, were somewhat narrower for female patients (i.e., a 48-percentage-point difference between diagnosis and control) than for male patients (i.e., a 58-percentage-point difference from diagnosis to control).

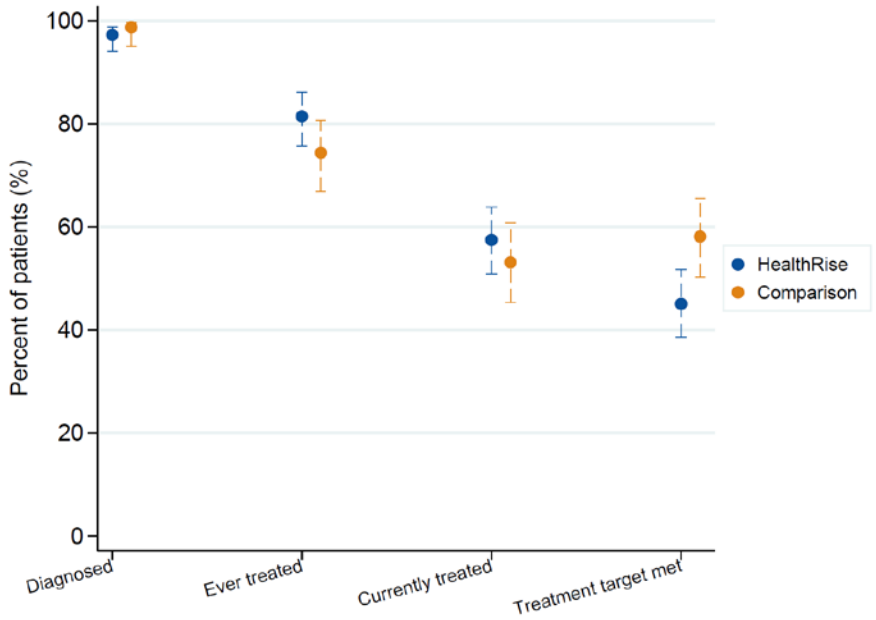

Figure 23. Shimla: Comparing the cascade of care for hypertension patients presenting at facilities located in HealthRise implementation blocks and comparison facilities. *Only prevalent cases of hypertension (i.e., individuals who reported being diagnosed with hypertension or had blood pressure measures that equaled or exceeded 140 mmHg for systolic or 90 mmHg for diastolic) were included in this figure. Currently treated cases are individuals who reported currently taking their medications for hypertension as prescribed. Controlled cases are individuals who are considered a prevalent case and then have blood pressure measures below 140 mmHg for systolic and 90 mmHg for diastolic; if only systolic measures were available for a given individual, then only the 140 mmHg threshold was applied.*

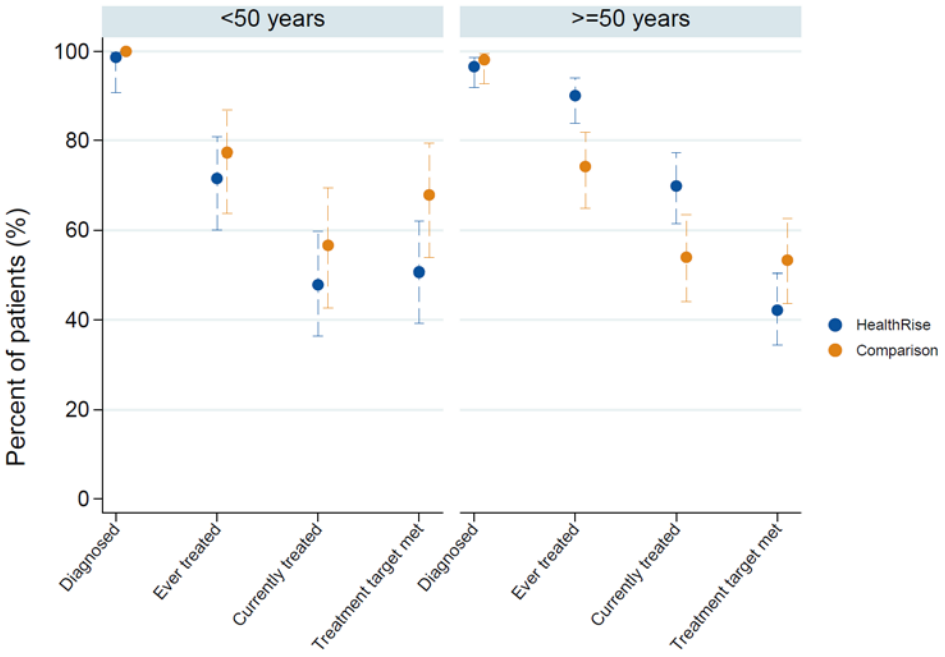

Figure 24. Shimla: Comparing the cascade of care for hypertension patients, by age, presenting at facilities located in HealthRise implementation blocks and comparison facilities. *Only prevalent cases of hypertension (i.e., individuals who reported being diagnosed with hypertension or had blood pressure measures that equaled or exceeded 140 mmHg for systolic or 90 mmHg for diastolic) were included in this figure. Currently treated cases are individuals who reported currently taking their medications for hypertension as prescribed. Controlled cases are individuals who are considered a prevalent case and then have blood pressure measures below 140 mmHg for systolic and 90 mmHg for diastolic; if only systolic measures were available for a given individual, then only the 140 mmHg threshold was applied.*

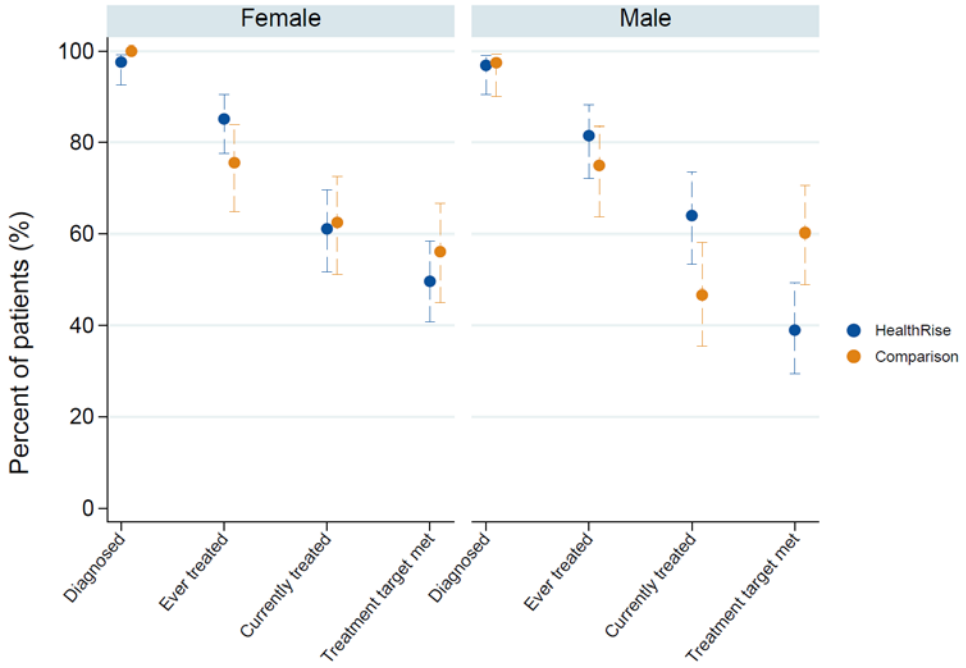

Figure 25. Shimla: Comparing the cascade of care for hypertension patients, by sex, presenting at facilities located in HealthRise implementation blocks and comparison facilities. *Only prevalent cases of hypertension (i.e., individuals who reported being diagnosed with hypertension or had blood pressure measures that equaled or exceeded 140 mmHg for systolic or 90 mmHg for diastolic) were included in this figure. Currently treated cases are individuals who reported currently taking their medications for hypertension as prescribed. Controlled cases are individuals who are considered a prevalent case and then have blood pressure measures below 140 mmHg for systolic and 90 mmHg for diastolic; if only systolic measures were available for a given individual, then only the 140 mmHg threshold was applied.*

Qualitative

In India, qualitative data were only collected in Shimla, thus the qualitative findings presented below are only reflective of the implementation of HealthRise in one of the two sites in India. In Shimla, data were collected from both intervention and comparison facilities. In intervention facilities, there were five focus group discussions with patients; three focus group discussions with frontline health workers; three interviews or focus group discussions with clinic-based providers; four interviews with facility managers or administrators; three interviews with master trainers; and one interview with a MAMTA official. In comparison facilities, there were four focus group discussions with patients; three focus group discussions with frontline health workers; three interviews or focus group discussions with clinic-based providers; and three interviews with facility managers or administrators. Key themes emerging from the qualitative data collected in the intervention sites are presented below and contrasted with findings from the comparison facilities as well as with data collected at baseline.

Themes

Patient knowledge about NCDs

Patients from HealthRise facilities demonstrated a high level of knowledge about NCD symptoms, risk factors, and basic disease management, particularly diet modification and exercise. Alcohol and tobacco were infrequently mentioned as risk factors compared to many references to the importance of diet and exercise. Despite this knowledge, patients' understanding of diabetes and hypertension from a biological or clinical perspective was much more limited, and most could not accurately explain who is susceptible to these illnesses. With regard to disease management, patients expressed more ambiguity about medication adherence, with many reporting taking prescriptions most of the time or as needed.

> "You feel it – sleepy, dizzy, irritable, can't control yourself." – *Patient*
>
> "We started controlling diet, doing tests, taking care, taking medicines, after we got to know." – *Patient*
>
> "I do not have an idea. I heard it's hereditary." – *Patient*
>
> "I am not in control because I leave medicines sometimes and it revives." – *Patient*

Patient experiences with HealthRise

Among patients, awareness of HealthRise interventions was high, with many citing familiarity with the program or one or more of its key components, including home visits, CHWs, and health cards. Support groups do not appear to have reached a large proportion of patients as participants in only one out of four focus groups reported these being provided through their local facility. Patients reported having positive views of community health workers (CHWs), but expressed utmost trust in doctors, whom they viewed as having greater knowledge or ability to provide effective treatments. Overall, patients reported many noticeable improvements since the start of HealthRise – in health services and their own health knowledge and behaviors and health status.

> "They [CHWs] are not people from outside, but they are people among us. They did not come from foreign, they are our people." – *Patient*
>
> "I am following doctor-prescribed ways. There is a lot of difference in comparison to old times." – *Patient*
>
> "From MAMTA for the past two years they are coming continuously in our village. They give us information and also tell us precautions about what to do. They do medical checkups also every month after the health center was made. Have given us cards as well." – *Patient*
>
> "They come to homes in 3-4 months and Gram Sabha - when people gather they make us aware, people come to know what programs are being conducted by government." – *Patient*
>
> "After they spread awareness, we got to know." – *Patient*

Provider experiences with HealthRise

Providers, both clinic-based as well as CHWs, characterized the key elements of HealthRise as patient screening through camps, patient education, referrals for treatment, and follow-up care. Reported use of the HealthCard app was also high, with many having utilized or been exposed to it. Providers stressed the importance of communication, listening skills, and taking time to build relationships when working with communities. Between providers, communication was described as reliable and consistent, primarily through phone calls and WhatsApp; email was not often utilized. Clinic-based providers recognized the value added

by CHWs due to their ability to provide counseling beyond what is feasible within the time constraints of a clinical appointment. CHWs reported gaining substantial new knowledge about NCDs and disease management through the HealthRise program. Clinic-based providers reported seeing noticeable increases in NCD patient volumes after the start of HealthRise and described substantial improvements in patient knowledge about NCDs, not only from provider-patient education but also as a result of information exchange between patients and within communities.

> "When people see the camps on a regular basis, they get assurance we are investing in their health, that we care for them." – *CHW*

> "For BP and sugar – well, people of the village fear that they will get habituated to the medicines for these, so they tend not to start the medicines. But we motivate them to start the medicines." – *Clinic-based provider*

> "Initially people think, 'what do they know, they are just freshly appointed ASHAs,' but they bring people to us, mobilize people; people do listen to them." – *Clinic-based provider*

> "When we go to villages we made cards of what diseases every family member has." – *CHW*

> "We have been working for 33 years. There was never so much attention paid to it – neither the community nor the workers. Advice such as taking morning walks – people who worked on the fields said that we don't need it as we work on the fields. Now they see it as something extra other than their daily job that they must do. There is a difference before and after the implementation of this program." – *Clinic-based provider*

> "People of the community inspire...their relatives or other patients." – *CHW*

Barriers to care

Shortcomings in basic health system inputs were reported by patients and facility staff as primary barriers to quality health care, particularly medication stock-outs and staff shortages. The remote location in this part of India also acts as a challenge, with patients having to travel far distances to reach health facilities and also making it difficult for CHWs to access patients' homes. In this area, network connectivity can also be low or inconsistent, which at times complicated communication between clinic-based providers and CHWs and delayed data uploads. In working with patients, clinic- and home-based providers reported greater difficulties providing health education to patients who are older or have less formal education; these groups of patients were described as less receptive to the information being shared. In part, this was due to traditional beliefs about health and treatment, which can interfere with recommended health behaviors. Patients described other challenges to NCD prevention and management arising outside the clinic. These included busy, modern lifestyles that keep them from focusing on or investing in their health; family and social obligations that make it difficult to maintain a healthy diet and exercise routine; and beliefs that food is often adulterated with unhealthy additives or pesticides.

> "Our medicinal requirement is very high. Monday it is like havoc…We have a lot of patients. We need days and better medicinal facilities." – *Facility administrator*

> "When we have to visit – we are frightened sometimes…and it feels difficult. There are houses that are far apart; the villages are far apart – sometimes there are dogs, we are afraid of their bites. But we have to brave ourselves – because we know that it is us who have to do the job." – *CHW*

> "Some people harp on traditional views; the older generation tend to advocate their own views on food habits for health. Traditional mindset acts as an impediment." – *CHW*

> "It is easy to make the new generation understand; the older ones are a bit difficult." – *CHW*

> "Life is too fast paced, people pay more attention to electronics, social media and not nutrition and exercise." – *Patient*

> "In big families, some prefer more salt…we have to eat it anyways." – *Patient*

> "Food is not hygienic; people inject medicines…before people didn't have such major diseases…because of these injected foods people are suffering more." – *Patient*

Ideas for improvement

Interviewees and focus group participants raised many ideas for ways to improve HealthRise and the quality of health care more generally. Some ideas simply involved addressing noted weaknesses in the health system, such as improving the reliability of the medication supply and hiring additional workers to relieve staff shortages. There was also a demand for increasing the availability of blood pressure and glucose testing equipment, both in facilities and for use by CHWs when visiting patients' homes. Clinic-based and home-based providers requested additional trainings, particularly refresher trainings to reinforce learning. They specifically mentioned an interest in trainings that provide more practical skills, using hands-on learning, and training to improve communication with patients. Patients expressed great interest in peer support groups and requested that these be implemented in more facilities.

> "Medicines for sugar and BP should be available at every institution." – *Clinic-based provider*

> "BP apparatus should be with us so we can check BP in homes." – *CHW*

> "More facilities are provided at the OPD [outpatient department] regarding tests and basic screening, specially the kit method, which I feel should be mandatory in all PriHCs. This can play a huge role in encouraging people to go for tests and have faith in us." – *Clinic-based provider*

> "It happened two years ago, how will we remember it?...Should have been a refresher, one forgets when out of practice." – *Clinic-based provider*

> "Community of patients can be set up…can discuss causes and topics and increase awareness collectively." – *CHW*

Sustainability

In reflecting on the successes of HealthRise and the future of the program, sustainability was a common theme in interviews and focus group discussions. Overall, there was demand from providers and patients to expand HealthRise to additional areas and particularly to continue employing CHWs from communities served by the program. Interviewees described the strong relationship established with the government during HealthRise as a foundation for ongoing activities. From the perspective of the implementing partner, the government has used components of HealthRise as a model for its programs and there is substantial overlap between HealthRise activities and NPCDCS: the HealthCard app and screening camp model have been integrated into government-funded activities and the government is pilot testing e-clinics and street plays. In the focus group discussions, many patients expressed gratitude to the government for services and medications they received during HealthRise. The perception by patients that this was a government program may also contribute to sustainability as this suggests patients could be unaware of future shifts in program ownership.

> "This is a great model, [could be used in] whole of HP or whole of India…for a lot of people clinical facilities are far, they want facilities nearer, this saves time." – *CHW*

> "If this program in a demo can provide such improved results, the outcome of a full capacity running will definitely be way better." – *Facility administrator*

> "We used to get the treatment done ourselves but now we feel the government is thinking about us; why they have issued health cards, government wants citizens to be healthy." – *Patients*

Comparison facilities and baseline

Patients in focus groups at comparison facilities were similar to those from intervention facilities with regard to the level of knowledge they displayed about NCD symptoms, risk factors, and management, and also cited similar barriers to care. While differences between the two groups of patients were not stark, some variations emerged from the discussions that suggest patient exposure to HealthRise activities in the intervention sites. In comparison facility groups, patients were more likely to report being diagnosed with an NCD after becoming symptomatic, as compared to a greater tendency among intervention site patients to report awareness of their diagnosis as a result of visiting a screening camp. Comparison site patients were also slightly less likely than those in intervention sites to report having received a home visit from a CHW. While only a few patients from intervention facilities were aware of patient support groups, none from comparison facilities were aware of such a group. Finally, in comparison sites, patients' assessments of any perceived changes in health services or disease knowledge over the past 18 months were more mixed, as opposed to the generally favorable changes mentioned by intervention site patients.

Clinic-based providers and CHWs from comparison facilities were similar to those from intervention facilities in how they described their relationships and communication between providers and with communities. Both groups of providers also reported similar increases in NCD patient volumes and high uptake of the HealthCard app, although this was under NPCDCS in the comparison sites. There were a few notable differences between CHWs from the two groups, which may reflect the influence of HealthRise. In comparison sites, most CHWs had not participated in a screening camp, as compared to many CHWs mentioning this in intervention sites. CHWs from comparison sites also reported receiving no training specifically on NCDs, aside from a one-day training on the HealthCard app; many CHWs in intervention sites did report such training. Overall, in comparison areas, there was a greater tendency – by both patients and all types of providers – to characterize CHWs in terms of maternal and child health- and infectious disease-related activities. In contrast, in intervention areas, CHWs were characterized with greater emphasis on their role in NCD care as well.

Two key differences were observable in the qualitative data from baseline versus endline. First, NPCDCS was not mentioned at baseline, whereas there was high awareness of this government program at endline, which had been rolled out in the intervening period. Second, at baseline, interviewees unanimously reported that a large majority of people only sought care for NCDs after developing symptoms; at endline, there was substantial discussion of early detection through screening. Some of this shift in the timing of diagnosis may reflect the impacts of NPCDCS and HealthRise.

South Africa

Quantitative

Pixley ka Seme: Facility findings

Human resources for health. In contrast with comparison facilities, facilities with HealthRise programs averaged somewhat higher levels of total human resources for health at endline (36.0 total staff) than at baseline (29.1 total staff) (Figure 26). The opposite trend appeared to occur for comparison facilities, with average total human resources for health registering as comparable or slightly lower at endline (26.1 total staff) than at baseline. A similar pattern took place for community caregivers (Figure 27), with HealthRise facilities recording an average of 16.2 community caregivers at endline. Conversely, at baseline, HealthRise facilities averaged 10.0 community caregivers. Comparison facilities reported similar community caregiver staffing at baseline and endline (i.e., an average of about 11 per facility); in combination, these findings point to HealthRise program implementation as a potential factor in community caregiver staffing.

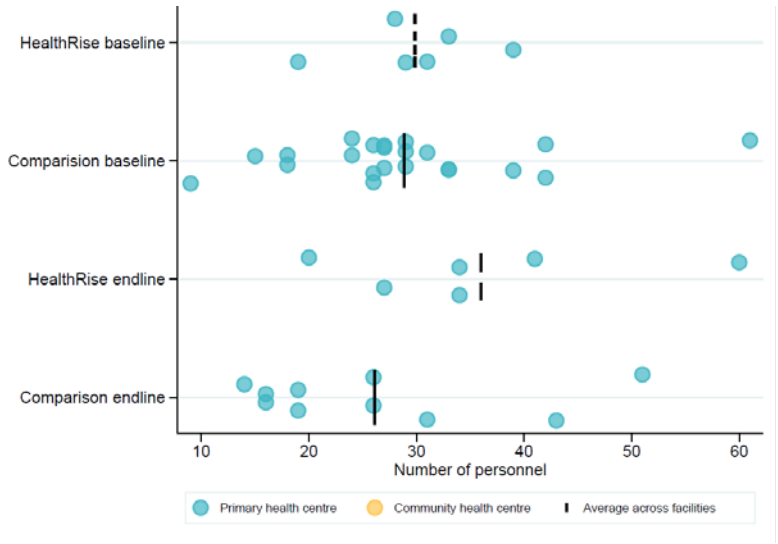

Figure 26. Pixley ka Seme: Comparing the average and distribution of human resources for health in facilities

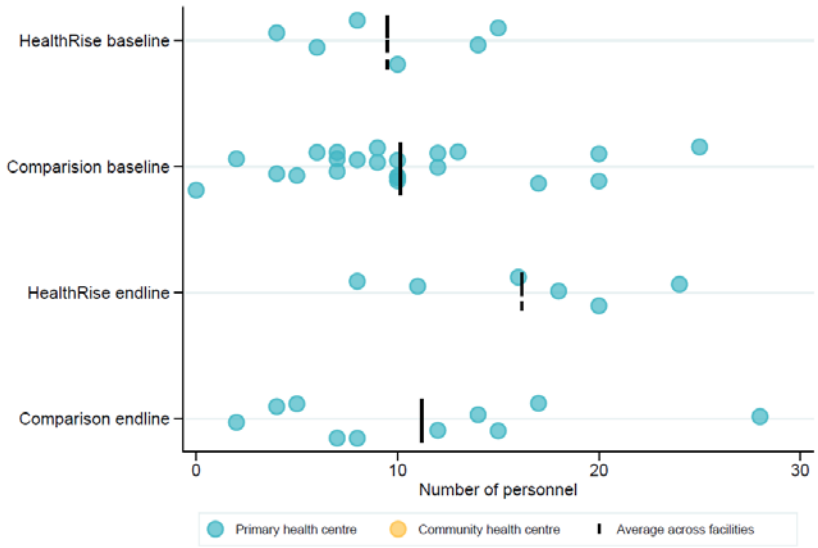

Figure 27. Pixley ka Seme: Comparing the average and distribution of community caregivers in facilities

Pharmaceutical stocks. Compared with baseline measures, overall stocks of 23 NCD pharmaceuticals appeared to decline in both HealthRise-associated and comparison facilities in Pixley ka Seme (Figure 28). At baseline, both facility groups had similar NCD pharmaceutical "index" scores (i.e., the proportion of 23 NCD pharmaceuticals currently in stock at the time of facility survey), at approximately 77%–78%. At endline, however, average facility scores fell to about 40% for HealthRise and comparison facilities. Notably, this "decrease" was primarily driven by a subset of facilities where 0% of key NCD pharmaceuticals were currently in stock; the other facilities, for both HealthRise and comparison facilities, maintained or slightly increased their pharmaceutical index scores at endline. Very similar patterns emerged when key medications for hypertension (i.e., ACE inhibitors, angiotensin receptor blockers, beta blockers, calcium channel blockers, thiazide diuretics) and diabetes (i.e., biguanides, insulin, sulfonylureas, potassium-sparing diuretics) were considered (Figures 29 and 30, respectively). If or how higher demand for – and thus stocking out of – NCD pharmaceuticals occurred by endline, as compared with baseline, is not quite clear. For instance, among HealthRise facilities, similar rates of stockouts of any of the key hypertension medications were reported at baseline and endline. On the other hand, comparison facilities averaged somewhat lower rates of stockouts during the last quarter by endline. Further examination of the dynamics affecting NCD pharmaceutical availability at facilities, which may range from supply-chain challenges to changes in prescription practices, is warranted.

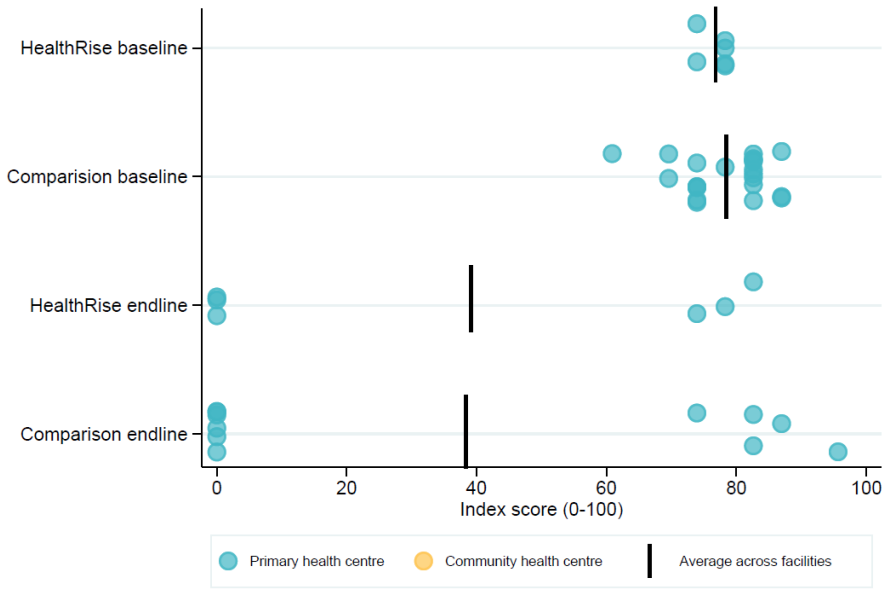

Figure 28. Pixley ka Seme: Comparing the average and distribution of performance on current stocks of 23 NCD pharmaceuticals. *The "index score" represents the percentage of the 23 NCD pharmaceuticals currently stocked in a given facility at the time of survey.*

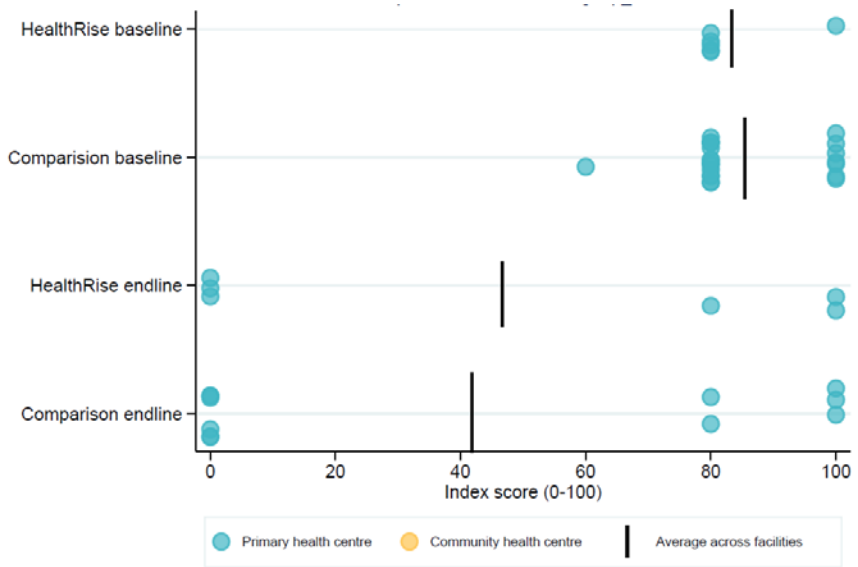

Figure 29. Pixley ka Seme: Comparing the average and distribution of performance on current stocks of five key hypertension pharmaceuticals. *The "index score" represents the percentage of the five key hypertension pharmaceuticals (i.e., ACE inhibitors, angiotensin receptor blockers, beta blockers, calcium channel blockers, thiazide diuretics) currently stocked in a given facility at the time of survey.*

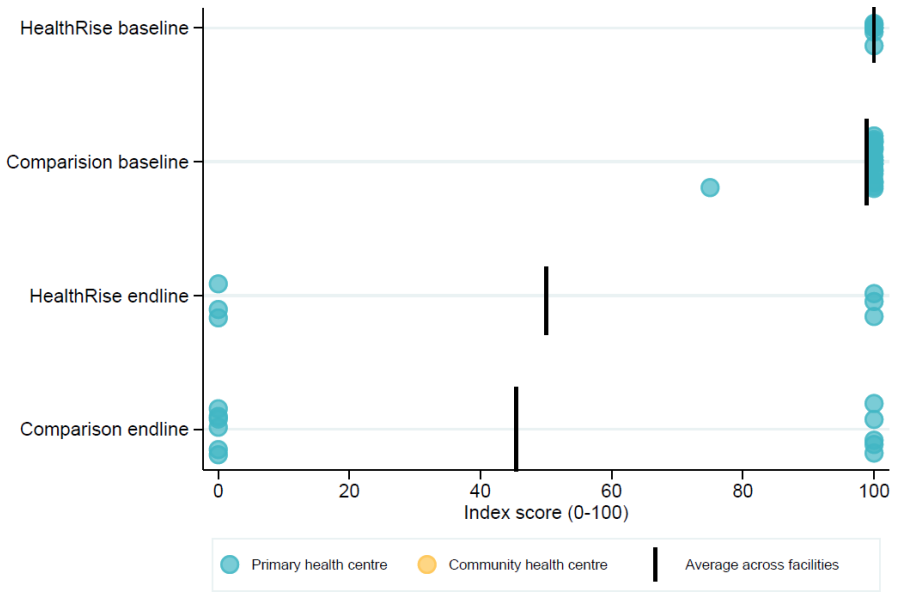

Figure 30. Pixley ka Seme: Comparing the average and distribution of performance on current stocks of four key diabetes pharmaceuticals. *The "index score" represents the percentage of the four key diabetes pharmaceuticals and diabetes (i.e., biguanides, insulin, sulfonylureas, potassium-sparing diuretics) currently stocked in a given facility at the time of survey.*

Pixley ka Seme: Patient findings

Diabetes cascade of care. Performance on diabetes cascade of care measures did not significantly vary among HealthRise and comparison facilities (Figure 31). Of note, approximately 70% of prevalent cases had reported a formal diagnosis of diabetes among both patient groups; this may signal a need for heightened screening and awareness of diabetes risk. While overall findings did not substantially differ by age group (i.e., <50 years; 50 years and older) and by sex among the two facility groups, some interesting patterns emerged. By age group (Figure 32), patients younger than 50 generally trended toward higher performance on cascade of care metrics. This was particularly discernable for meeting diabetes treatment targets; 81.8% (95% CI: 42.0–96.5%) of <50-year-old diabetes patients at HealthRise facilities had A1c levels lower than 8%, whereas 50.0% (95% CI: 28.7–71.3%) of diabetes patients 50 years and older at HealthRise facilities achieved similar levels of control. It is worth noting the large, overlapping confidence intervals for these estimates, as the number of patients in each group was relatively small.

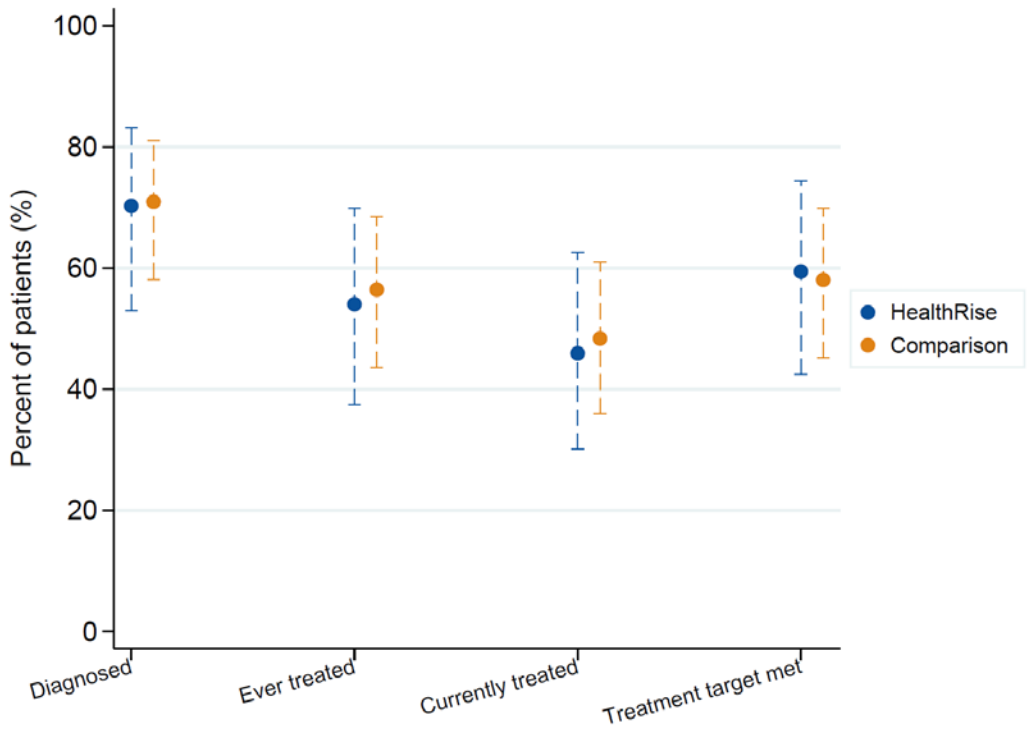

Figure 31. Pixley ka Seme: Comparing the cascade of care for diabetes patients presenting at facilities located in HealthRise implementation and comparison facilities. *Only prevalent cases of diabetes (i.e., individuals who reported being diagnosed with diabetes or had an A1c measure exceeding 6.4%, a level that would elicit diabetes case management by health care providers) were included in this figure. Currently treated cases are individuals who reported currently taking their medications for diabetes as prescribed. Controlled cases are individuals who are considered a prevalent case and then have an A1c measure of lower than 8%.*

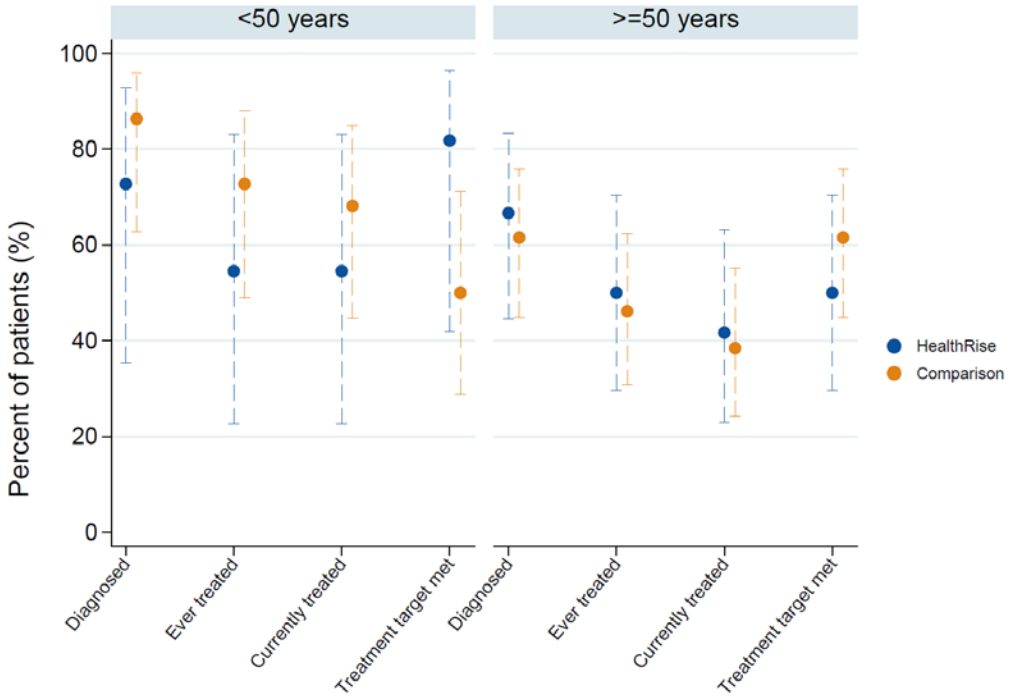

Figure 32. Pixley ka Seme: Comparing the cascade of care for diabetes patients, by age, presenting at facilities located in HealthRise implementation and comparison facilities. *Only prevalent cases of diabetes (i.e., individuals who reported being diagnosed with diabetes or had an A1c measure exceeding 6.4%, a level that would elicit diabetes case management by health care providers) were included in this figure. Currently treated cases are individuals who reported currently taking their medications for diabetes as prescribed. Controlled cases are individuals who are considered a prevalent case and then have an A1c measure of lower than 8%.*

At HealthRise facilities, male and female patients' cascade of care patterns showed somewhat different trends (Figure 33). For males, diabetes patients at comparison facilities had slightly higher, though not significantly higher, measures across the diabetes cascade of care than patients at HealthRise-affiliated facilities. For both facility groups, male diabetes patients generally had the most pronounced gap between reported diagnosis (approximately 85% to 90% of prevalent cases) and being currently on treatment (about 50% to 65% of prevalent cases). In contrast, female diabetes patients in both facility groups saw a major gap in diagnosis, with approximately 60% of prevalent diabetes cases reporting a formal diagnosis. For female diabetes patients, those at HealthRise-associated facilities had slightly higher, albeit not significantly, measures across the cascade of care for diabetes.

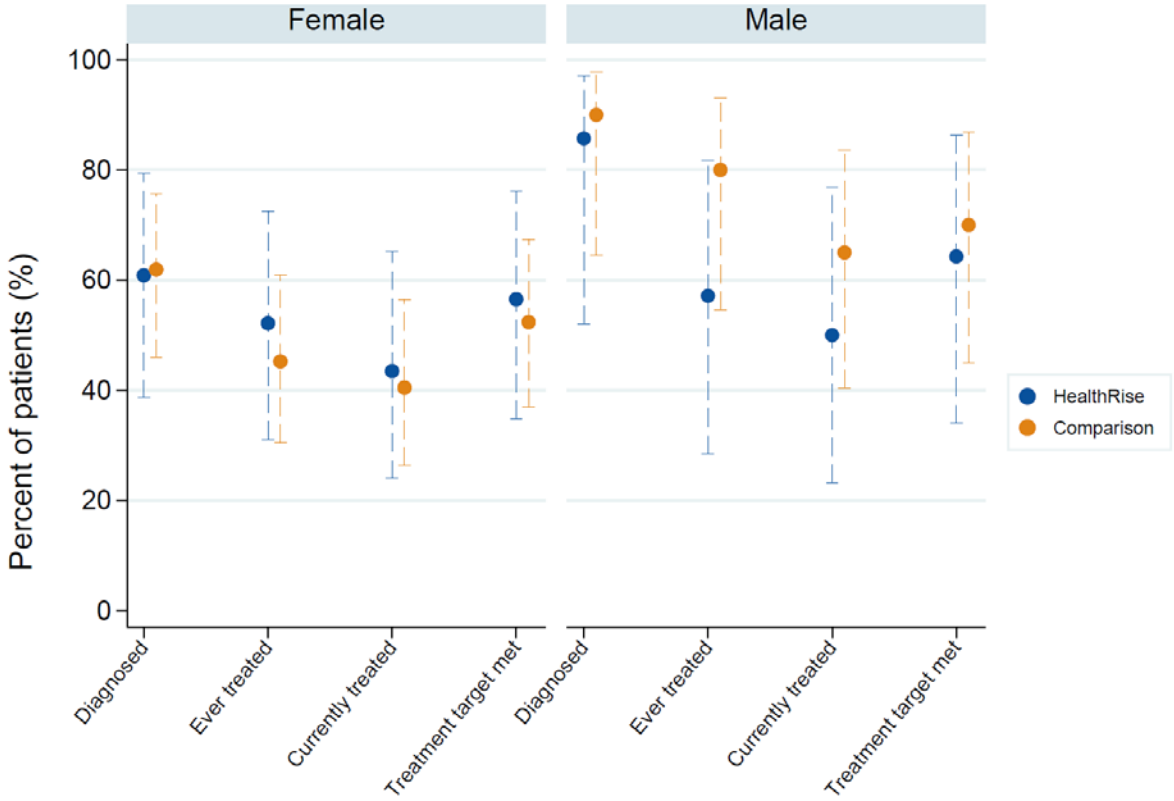

Figure 33. Pixley ka Seme: Comparing the cascade of care for diabetes patients, by sex, presenting at facilities located in HealthRise implementation and comparison facilities. *Only prevalent cases of diabetes (i.e., individuals who reported being diagnosed with diabetes or had an A1c measure exceeding 6.4%, a level that would elicit diabetes case management by health care providers) were included in this figure. Currently treated cases are individuals who reported currently taking their medications for diabetes as prescribed. Controlled cases are individuals who are considered a prevalent case and then have an A1c measure of lower than 8%.*

Hypertension cascade of care. For both sexes and all ages, patients presenting at comparison facilities trended toward higher cascade of care measures than patients at HealthRise facilities (Figure 34); however, these patient groups did not statistically differ from each other. The opposite was true for meeting treatment targets, with hypertension patients at HealthRise implementation areas trending toward higher, albeit not significantly higher, performance (55.3% [95% CI: 38.7–70.7%]) than patients at comparison facilities (41.8% [95% CI: 31.9–52.3%]). At both facility groups, the drop-off between hypertension diagnosis and treatment was sizeable, ranging from 17 to 26 percentage points for ever-treated and approximately 40 percentage points for currently treated. Although overall patterns were somewhat similar across age groups (Figure 35), hypertension cascade of care levels were generally higher among patients 50 years and older in both facility groups. Of note, though this difference was not statistically significant, the percentage of hypertension patients 50 years and older who met treatment targets at HealthRise facilities (60.6% [95% CI: 42.4–76.3%]) was somewhat higher than those at comparison facilities (42.6% [95% CI: 31.2–54.9%]). For patients younger

than 50, rates of controlled hypertension appeared to be somewhat higher at comparison facilities than at HealthRise facilities; however, their confidence intervals considerably overlapped, reflecting the very small sample size of patients in this cascade of care category. While no statistically significant differences took place by sex across the hypertension cascade of care (Figure 36), both male and female patients at comparison facilities trended toward better performance on most measures. Nonetheless, both male and female hypertension patients at HealthRise locations trended toward better performance on meeting treatment targets than their counterparts at comparison facilities, and male hypertension patients at HealthRise locations also trended toward higher levels of being currently treated than those in comparison areas.

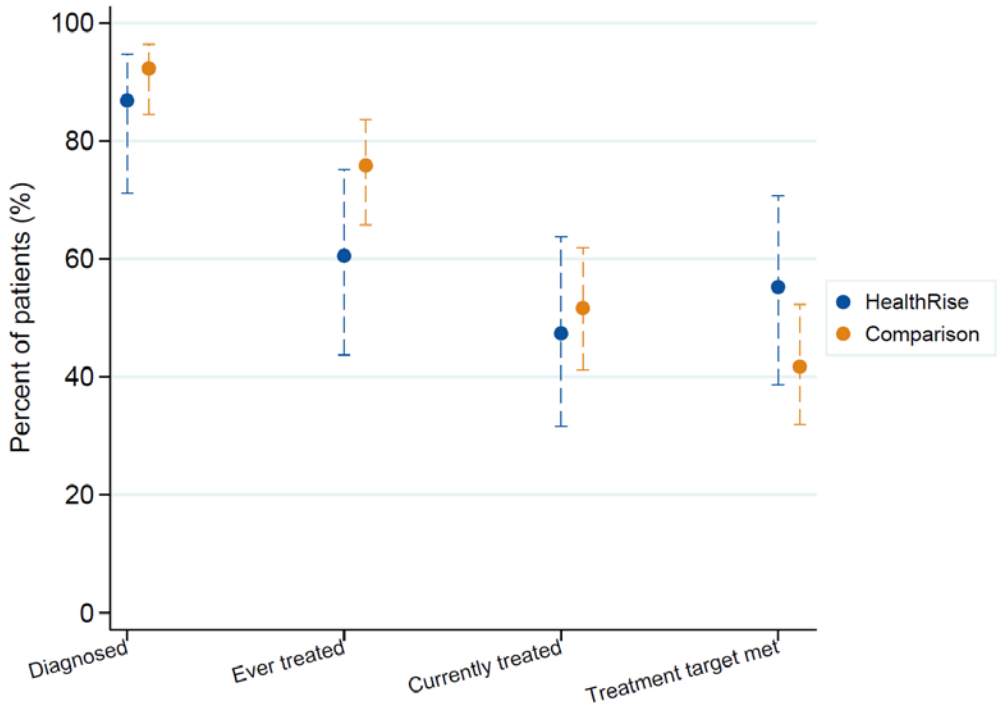

Figure 34. Pixley ka Seme: Comparing the cascade of care for hypertension patients presenting at facilities located in HealthRise implementation and comparison facilities. *Only prevalent cases of hypertension (i.e., individuals who reported being diagnosed with hypertension or had blood pressure measures that equaled or exceeded 140 mmHg for systolic or 90 mmHg for diastolic) were included in this figure. Currently treated cases are individuals who reported currently taking their medications for hypertension as prescribed. Controlled cases are individuals who are considered a prevalent case and then have blood pressure measures below 140 mmHg for systolic and 90 mmHg for diastolic; if only systolic measures were available for a given individual, then only the 140 mmHg threshold was applied.*

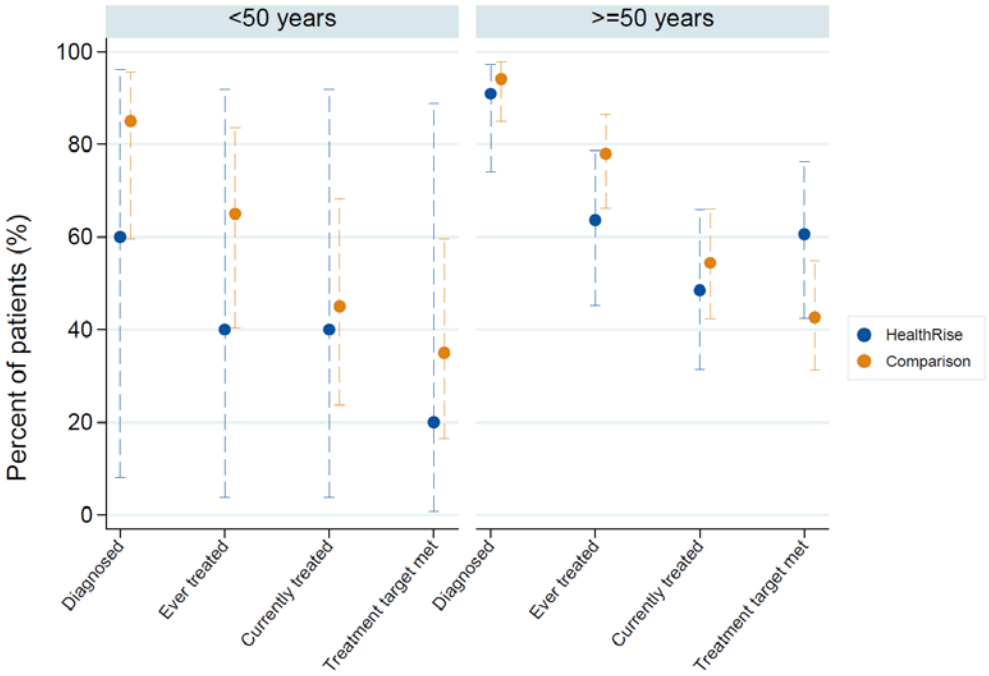

Figure 35. Pixley ka Seme: Comparing the cascade of care for hypertension patients, by age, presenting at facilities located in HealthRise implementation and comparison facilities. *Only prevalent cases of hypertension (i.e., individuals who reported being diagnosed with hypertension or had blood pressure measures that equaled or exceeded 140 mmHg for systolic or 90 mmHg for diastolic) were included in this figure. Currently treated cases are individuals who reported currently taking their medications for hypertension as prescribed. Controlled cases are individuals who are considered a prevalent case and then have blood pressure measures below 140 mmHg for systolic and 90 mmHg for diastolic; if only systolic measures were available for a given individual, then only the 140 mmHg threshold was applied.*

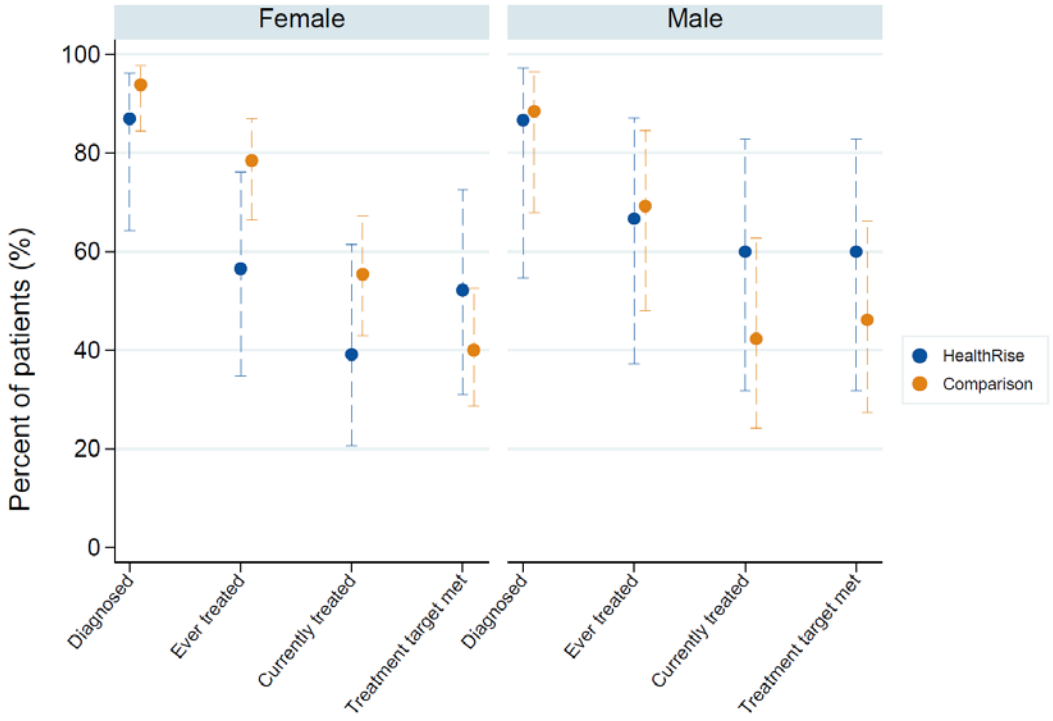

Figure 36. Pixley ka Seme: Comparing the cascade of care for hypertension patients, by sex, presenting at facilities located in HealthRise implementation and comparison facilities. *Only prevalent cases of hypertension (i.e., individuals who reported being diagnosed with hypertension or had blood pressure measures that equaled or exceeded 140 mmHg for systolic or 90 mmHg for diastolic) were included in this figure. Currently treated cases are individuals who reported currently taking their medications for hypertension as prescribed. Controlled cases are individuals who are considered a prevalent case and then have blood pressure measures below 140 mmHg for systolic and 90 mmHg for diastolic; if only systolic measures were available for a given individual, then only the 140 mmHg threshold was applied.*

uMgungundlovu: Facility findings

Human resources for health. Overall, the total number of personnel at HealthRise facilities was somewhat lower at endline than at baseline (Figure 37), though this difference was not statistically significant. The opposite trend appeared to occur with comparison facilities; however, the composition of facility types at baseline and endline differed, with community health centers included among comparison facilities at endline. For HealthRise facilities, total human resources for health ranged from about 20 to 80 across primary health centers at endline; for comparison primary health centers at this time, total staff ranged from less than 20 to approximately 70. Fairly similar patterns were found for community caregivers (Figure 38), though the range of community caregiver staffing was wider among primary health centers in both facility groups at endline (as compared with baseline). For instance, for HealthRise facilities, primary health centers saw a range of about nine to 36 community caregivers at baseline, while this range spanned from two to 34 at endline. At least part of this difference is due having more facilities associated with HealthRise at endline than at baseline.

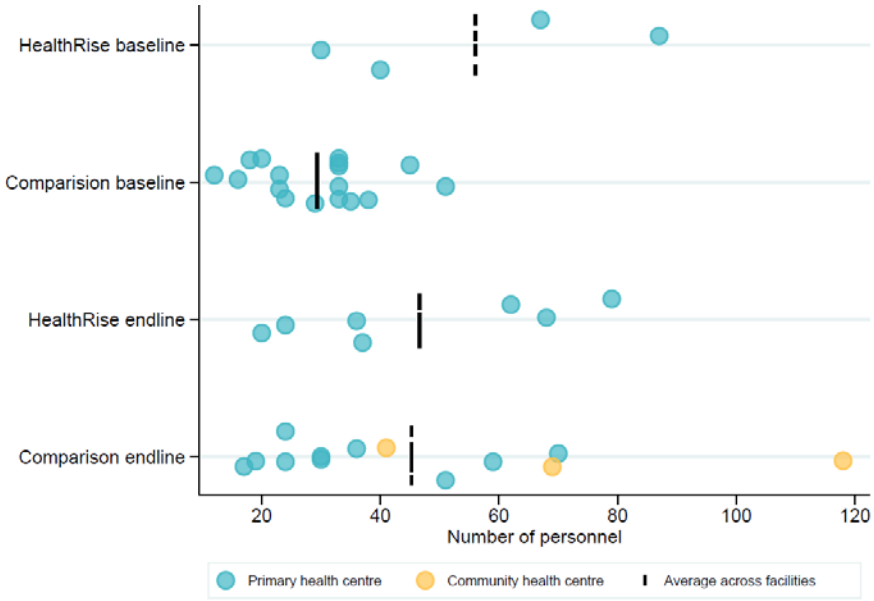

Figure 37. uMgungundlovu: Comparing the average and distribution of human resources for health in facilities

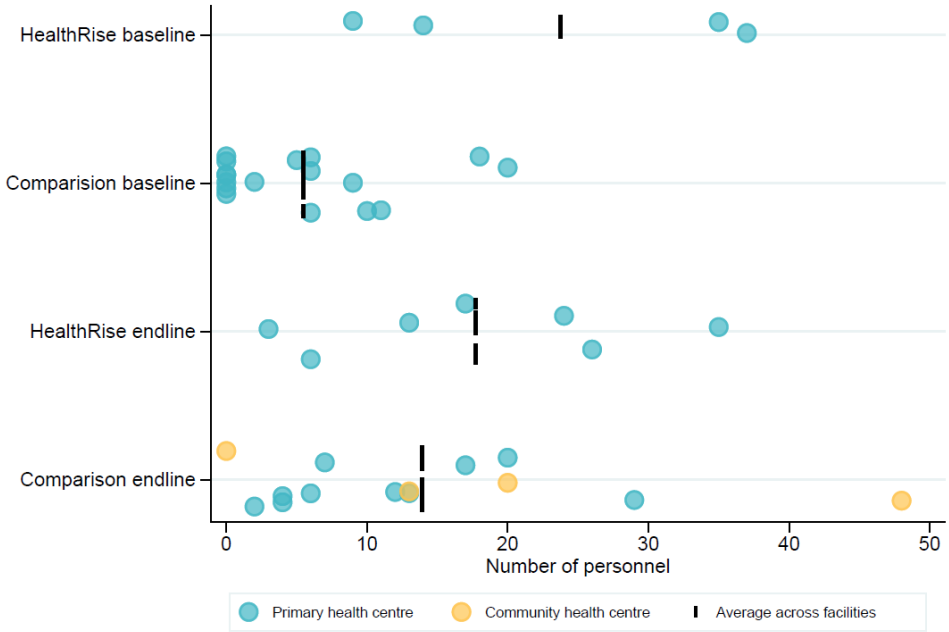

Figure 38. uMgungundlovu: Comparing the average and distribution of community caregivers in facilities

Pharmaceutical stocks. For both HealthRise and comparison facilities, overall stocks of 23 NCD pharmaceuticals were fairly similar at baseline and endline (Figure 39). Both facility groups averaged between 70% and 73% NCD pharmaceutical "index" scores (i.e., the proportion of 23 NCD pharmaceuticals currently in stock at the time of facility survey; only a subset of comparison primary health centers fell below 50% at

both time points. When focusing on key medications for hypertension (i.e., ACE inhibitors, angiotensin receptor blockers, beta blockers, calcium channel blockers, thiazide diuretics) and diabetes (i.e., biguanides, insulin, sulfonylureas, potassium-sparing diuretics), some divergent patterns emerged (Figures 40 and 41, respectively). All facility groups showed average diabetes pharmaceutical stocking scores exceeding 90% at baseline and endline, with many facilities recording 100% current stocks of the key diabetes medications. For key hypertension medications, average scores were somewhat lower (i.e., approximately 80% across facilities for all facility groups and timing except for comparison facilities at endline). Of note, from baseline to endline, both facility groups saw an increased percentage of facilities that experienced any stockouts of key diabetes and hypertension medications during the last quarter.

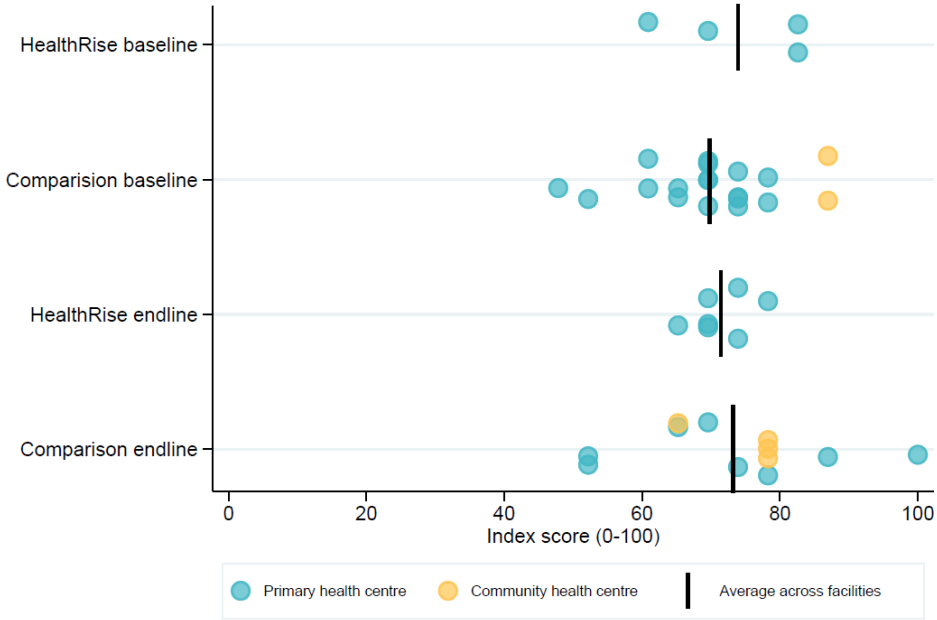

Figure 39. uMgungundlovu: Comparing the average and distribution of performance on current stocks of 23 NCD pharmaceuticals. *The "index score" represents the percentage of the 23 NCD pharmaceuticals currently stocked in a given facility at the time of survey.*

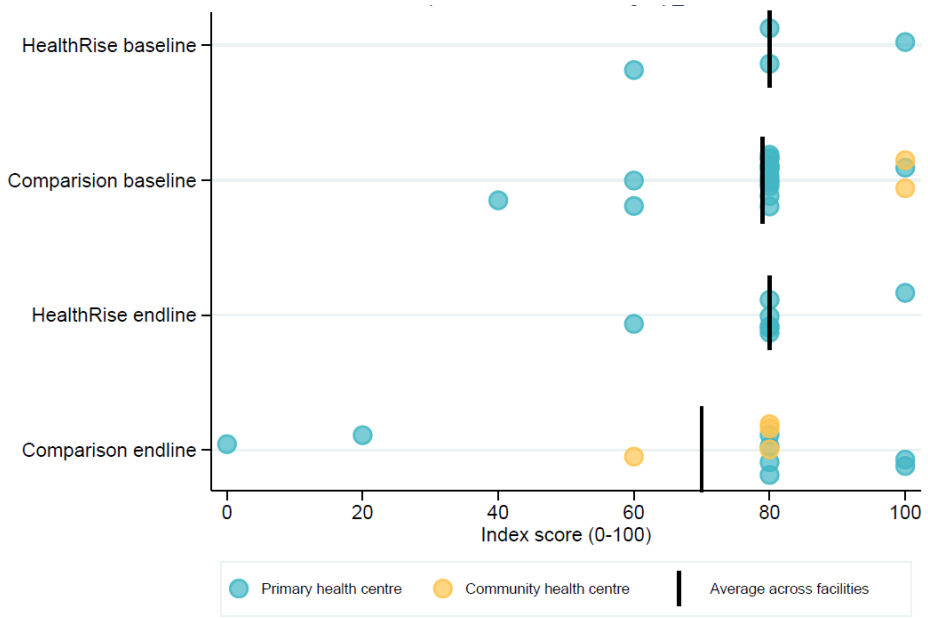

Figure 40. uMgungundlovu: Comparing the average and distribution of performance on current stocks of five key hypertension pharmaceuticals. *The "index score" represents the percentage of the five key hypertension pharmaceuticals (i.e., ACE inhibitors, angiotensin receptor blockers, beta blockers, calcium channel blockers, thiazide diuretics) currently stocked in a given facility at the time of survey.*

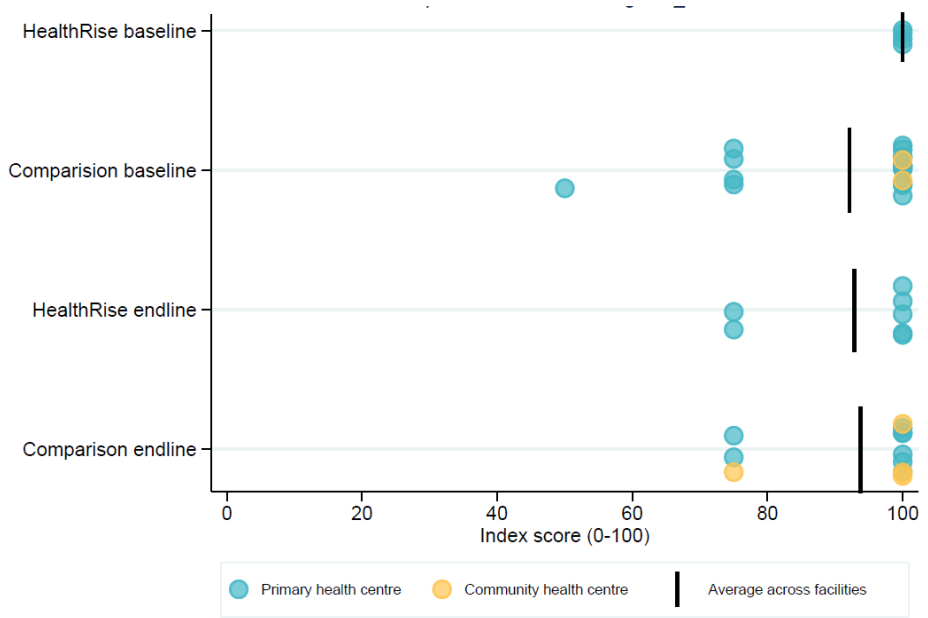

Figure 41. uMgungundlovu: Comparing the average and distribution of performance on current stocks of four key diabetes pharmaceuticals. *The "index score" represents the percentage of the four key diabetes pharmaceuticals (i.e., biguanides, insulin, sulfonylureas, potassium-sparing diuretics) currently stocked in a given facility at the time of survey.*

uMgungundlovu: Patient findings

Diabetes cascade of care. For both sexes and all ages, the diabetes cascade of care was not significantly different between intervention and comparison groups (Figure 42). Approximately 50% of prevalent cases in both facility groups met treatment targets (i.e., A1c measure of lower than 8%). The most sizeable drop-off along the cascade of care was from diagnosis (about 85% to 87% among all patients) to treatment (e.g., averages lower than 40% in both facility groups for current treatment). These findings conflict somewhat with facility-level stocks of diabetes pharmaceuticals, with most facilities having a relatively high percentage of key diabetes medications. Similar patterns were found by age group (Figure 43), though due to a very low number of diabetes patients under the age of 50, the confidence intervals for these results are very wide.

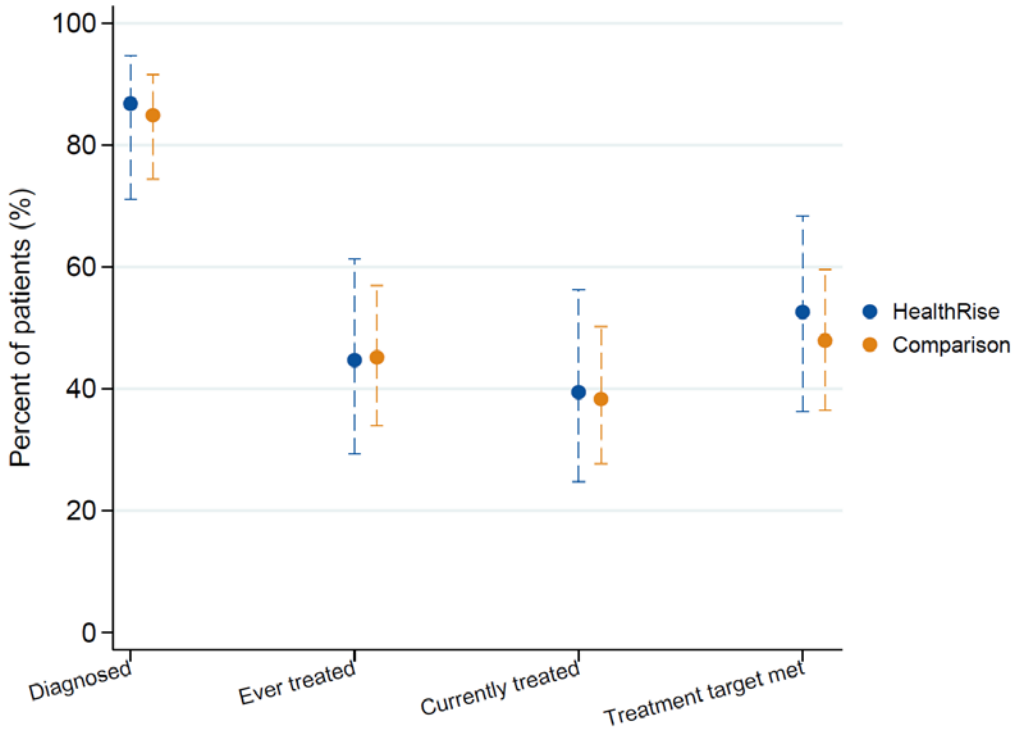

Figure 42. uMgungundlovu: Comparing the cascade of care for diabetes patients presenting at facilities located in HealthRise implementation and comparison facilities. *Only prevalent cases of diabetes (i.e., individuals who reported being diagnosed with diabetes or had an A1c measure exceeding 6.4%, a level that would elicit diabetes case management by health care providers) were included in this figure. Currently treated cases are individuals who reported currently taking their medications for diabetes as prescribed. Controlled cases are individuals who are considered a prevalent case and then have an A1c measure of lower than 8%.*

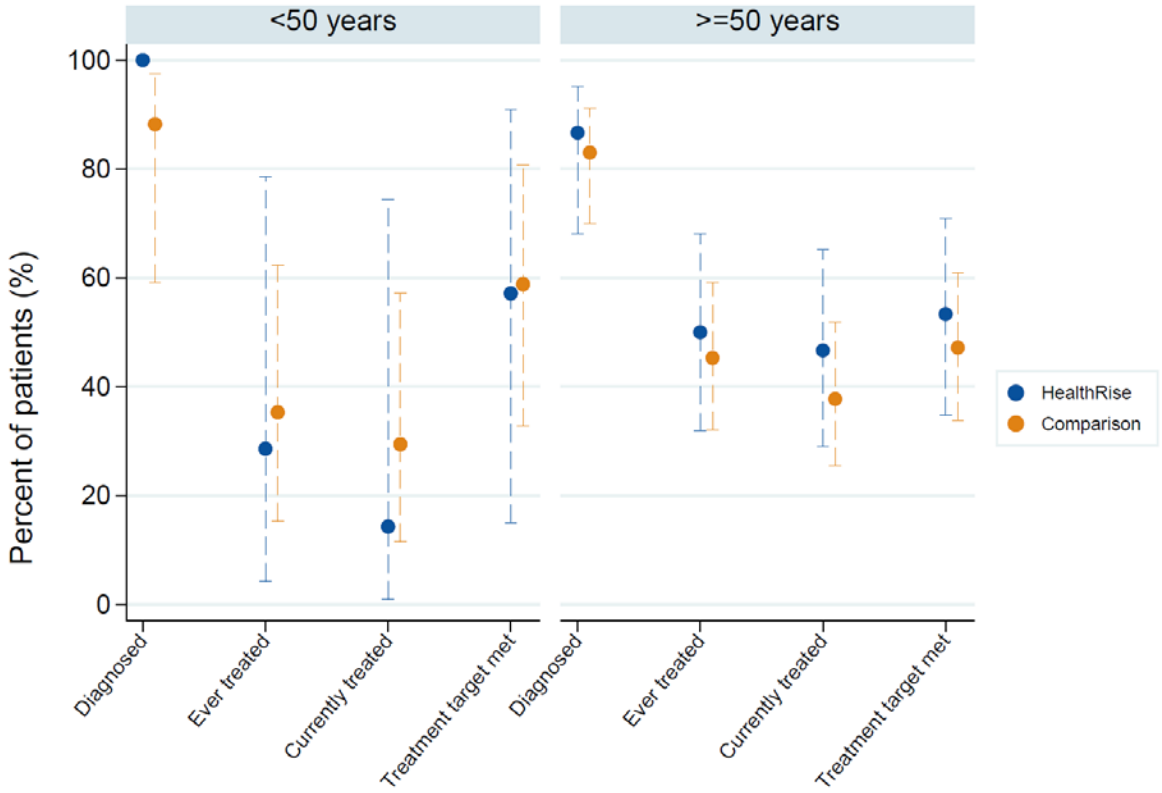

Figure 43. uMgungundlovu: Comparing the cascade of care for diabetes patients, by age, presenting at facilities located in HealthRise implementation and comparison facilities. *Only prevalent cases of diabetes (i.e., individuals who reported being diagnosed with diabetes or had an A1c measure exceeding 6.4%, a level that would elicit diabetes case management by health care providers) were included in this figure. Currently treated cases are individuals who reported currently taking their medications for diabetes as prescribed. Controlled cases are individuals who are considered a prevalent case and then have an A1c measure of lower than 8%r.*

Although none of the differences were statistically significant, trends somewhat diverged when the diabetes cascade of care was examined by sex (Figure 44). Among males, diabetes patients at HealthRise-associated facilities had higher, albeit not significantly higher, levels of diagnosis and treatment than patients at comparison facilities. For instance, 53.8% (95% CI: 24.8–80.5%) of male diabetes patients at HealthRise facilities were ever treated for diabetes, whereas 38.9% (95% CI: 18.2–64.5%) at comparison facilities had ever received equivalent treatment. However, male patients at HealthRise and comparison facilities had comparable performance on meeting treatment targets (about 62% to 67%). The opposite trend took place for female diabetes patients, with patients at comparison facilities generally recording higher, though not statistically significantly higher, levels of diagnosis and treatment than female patients presenting at HealthRise facilities. The percentage of female patients with A1c levels lower than 8% were similar across facility groups (approximately 42% to 48%).

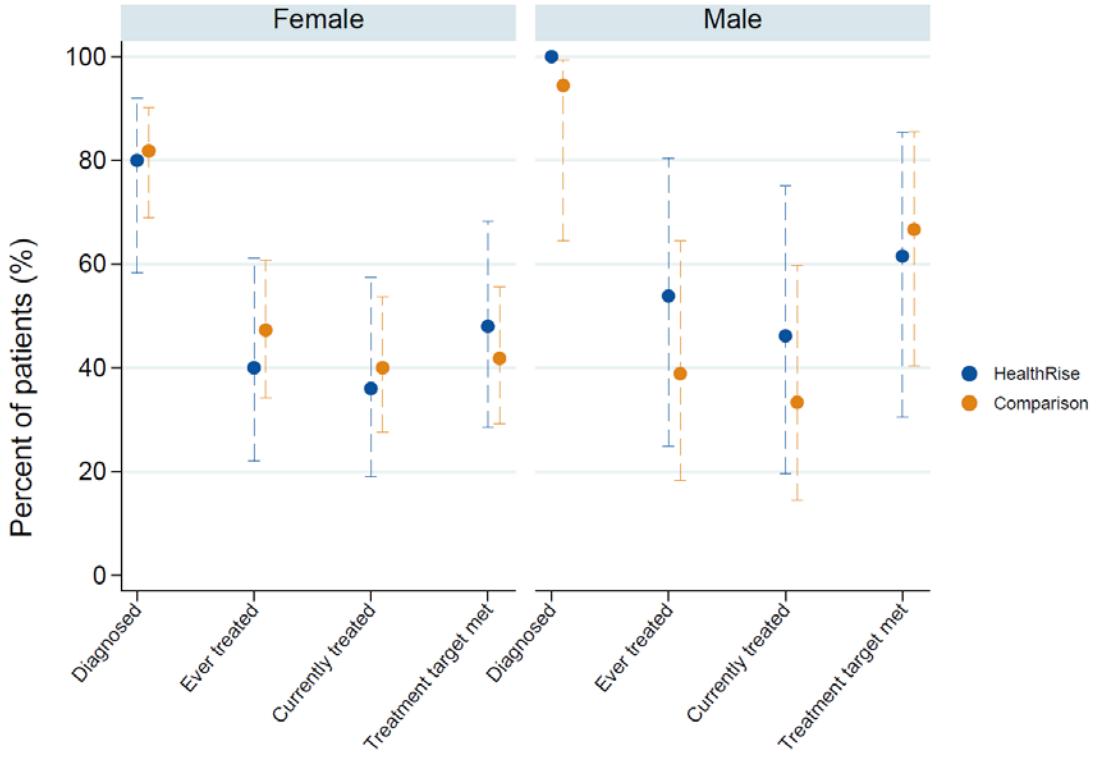

Figure 44. uMgungundlovu: Comparing the cascade of care for diabetes patients, by sex, presenting at facilities located in HealthRise implementation and comparison facilities. *Only prevalent cases of diabetes (i.e., individuals who reported being diagnosed with diabetes or had an A1c measure exceeding 6.4%, a level that would elicit diabetes case management by health care providers) were included in this figure. Currently treated cases are individuals who reported currently taking their medications for diabetes as prescribed. Controlled cases are individuals who are considered a prevalent case and then have an A1c measure of lower than 8%.*

Hypertension cascade of care. Hypertension patients presenting HealthRise and comparison facilities did not significantly differ across cascade of care metrics (Figure 45). What is striking is the severe drop-off between diagnosis – approximately 87%–88% among hypertension patients at both facility groups – and ever receiving treatment for hypertension. For patients at HealthRise facilities, this represented a 43-percentage-point decline between diagnosis and ever being treated, from 88.1% (95% CI: 77.6–94.0%) of hypertension patients with a diagnosis to 44.8% (95% CI: 33.1–57.1%) ever having received treatment. A very similar pattern occurred for hypertension patients 50 years and older (Figure 46), and trends by sex also followed parallel patterns to the overall hypertension cascade of care (Figure 47).

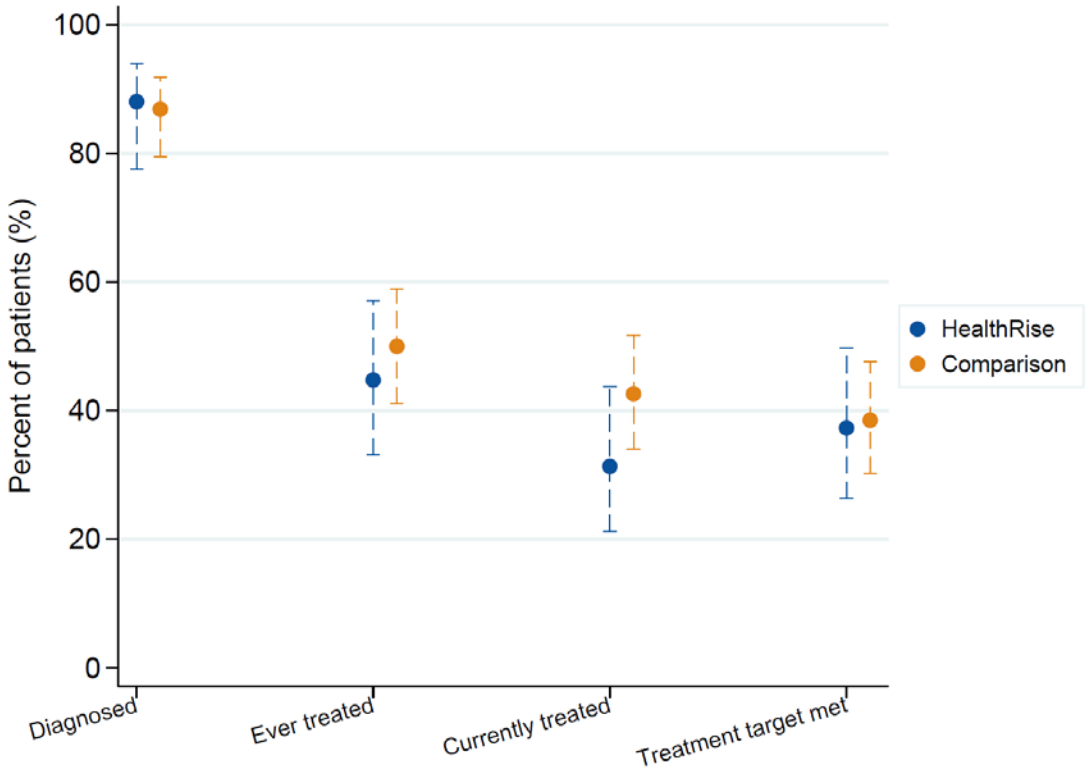

Figure 45. uMgungundlovu: Comparing the cascade of care for hypertension patients presenting at facilities located in HealthRise implementation and comparison facilities. *Only prevalent cases of hypertension (i.e., individuals who reported being diagnosed with hypertension or had blood pressure measures that equaled or exceeded 140 mmHg for systolic or 90 mmHg for diastolic) were included in this figure. Currently treated cases are individuals who reported currently taking their medications for hypertension as prescribed. Controlled cases are individuals who are considered a prevalent case and then have blood pressure measures below 140 mmHg for systolic and 90 mmHg for diastolic; if only systolic measures were available for a given individual, then only the 140 mmHg threshold was applied.*

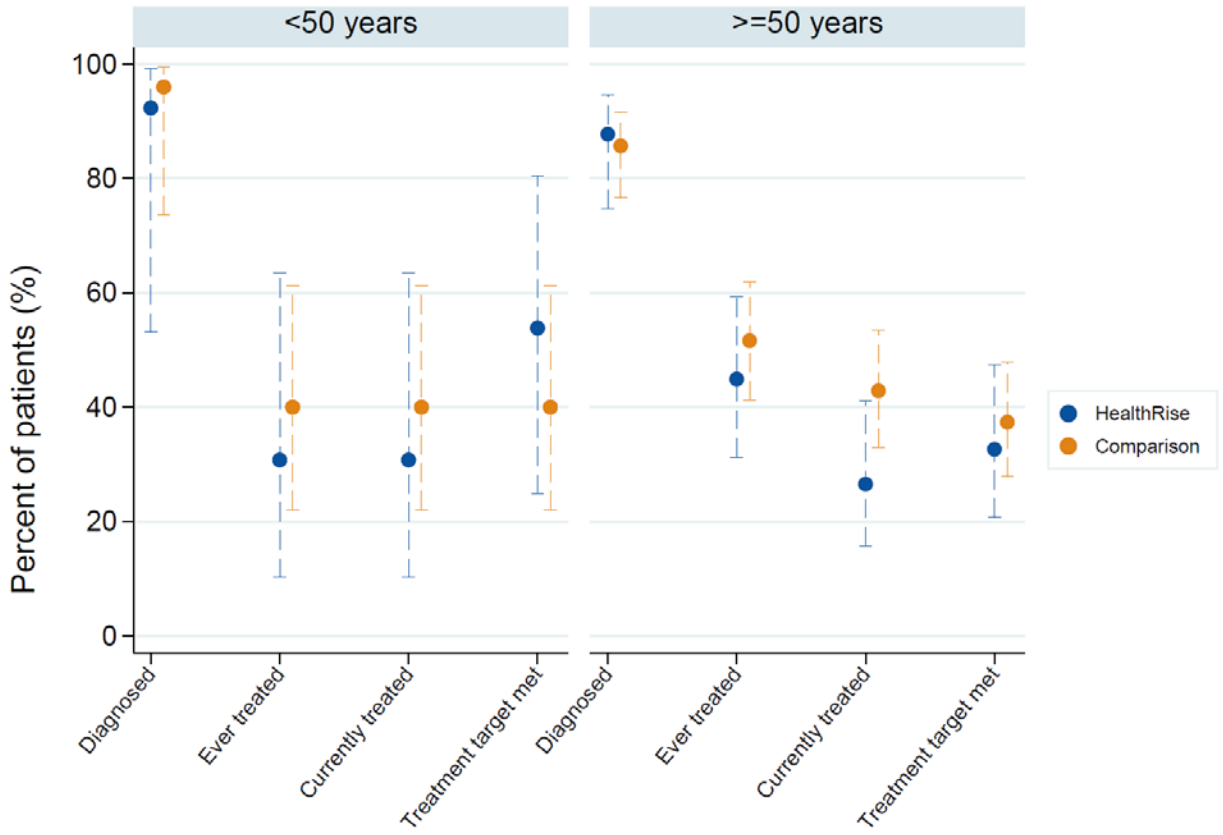

Figure 46. uMgungundlovu: Comparing the cascade of care for hypertension patients, by age, presenting at facilities located in HealthRise implementation and comparison facilities. *Only prevalent cases of hypertension (i.e., individuals who reported being diagnosed with hypertension or had blood pressure measures that equaled or exceeded 140 mmHg for systolic or 90 mmHg for diastolic) were included in this figure. Currently treated cases are individuals who reported currently taking their medications for hypertension as prescribed. Controlled cases are individuals who are considered a prevalent case and then have blood pressure measures below 140 mmHg for systolic and 90 mmHg for diastolic; if only systolic measures were available for a given individual, then only the 140 mmHg threshold was applied.*

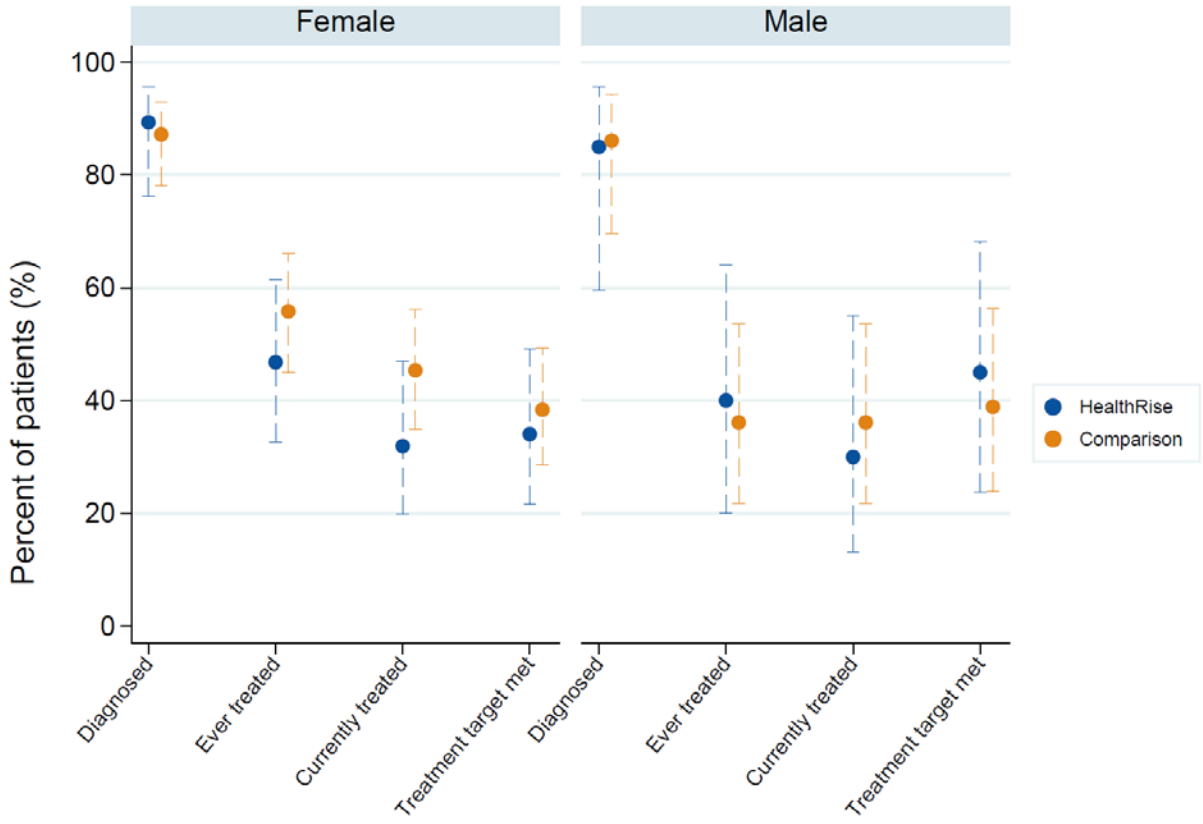

Figure 47. uMgungundlovu: Comparing the cascade of care for hypertension patients, by sex, presenting at facilities located in HealthRise implementation and comparison facilities. *Only prevalent cases of hypertension (i.e., individuals who reported being diagnosed with hypertension or had blood pressure measures that equaled or exceeded 140 mmHg for systolic or 90 mmHg for diastolic) were included in this figure. Currently treated cases are individuals who reported currently taking their medications for hypertension as prescribed. Controlled cases are individuals who are considered a prevalent case and then have blood pressure measures below 140 mmHg for systolic and 90 mmHg for diastolic; if only systolic measures were available for a given individual, then only the 140 mmHg threshold was applied.*

Qualitative

In uMgungundlovu, four focus group discussions were held with patients (one was with community members who may or may not have been active patients) at intervention facilities, and two focus group discussions were held with patients at comparison facilities. Key informant interviews were conducted with six staff from intervention facilities and nine staff from comparison facilities, including frontline caregivers, nurses, and managers. In Pixley ka Seme, key informant interviews were conducted with five staff from intervention facilities and seven staff from comparison facilities; no patient focus group discussions were held. In South Africa, interviews and focus group discussions did not concentrate specifically on the impact of the HealthRise interventions, but instead on NCD care and health care more broadly in these communities. Key

themes emerging from the South Africa intervention site qualitative data are presented below, and comparisons are drawn to data collected in non-intervention facilities and at baseline.

Themes

NCD screening and care

Facility staff described the majority of their NCD-related care as screening and checkups, including the provision of medication. Most facilities also offered nutrition counseling, some by a dietician. Outreach activities, encompassing a mix of health education, screening, and medication delivery, occurred at varying frequency – from weekly to monthly – across facilities, often led by community caregivers (CCGs) or Ward-Based Outreach Team (WBOTs); some staff mentioned the role of HealthRise grantees in these activities. Support groups were active in some but not all facilities. NCD patients were described as being identified through a combination of screening patients coming to the facility for other concerns, seeing patients complaining of symptoms of diabetes and hypertension, referrals from other providers, and those identified through outreach activities. Many female patients reported learning they had diabetes during prenatal appointments.

> "First when patients come to the clinic, we screen them. Check their BP and HGT (test for sugar levels) and if the BP is raised then that patient is fast tracked to see the nurse in the consulting rooms. Then we give health education on BP. We try to make them understand the condition or illness first and advise on healthy lifestyle and a change in eating habits. We then give them time to adjust to the new diet, we do not start treatment immediately. They are given a return appointment date in two weeks for checkups. If the pressure is still high, we ask them to come back, and it is after these intervals that treatment is initiated." – *Nurse*

> "Some people just faint, go to the clinic to find out what is wrong with them and they get checked and find out that they are sick. Some know already that they have BP and go to the clinic to seek treatment." – *Patient*

> "Project Hope working here at the clinic. And they are the ones that's going like for instance they go outside, check on those people who are like diabetics and CVDs; see how they're doing; they go they do the blood test, they do the sugar and then they come back." – *Facility manager*

Provider-patient relationships

While facility staff mostly described relationships between facilities and communities as positive, both staff and patients raised issues with these relationships. Many providers described patients as impatient with waiting times and as having unreasonable expectations for the number of patients limited staff can attend to in a timely manner. Providers also described patients as stubborn about making changes and unwilling to listen to their advice on lifestyle modifications to reduce NCD risk factors such as poor diet, smoking, and alcohol use. Patients described providers as generally helpful and providing good care, but frequently having a poor attitude and being slow to attend to patients. Both providers and patients mentioned patients avoiding follow-up care for fear of being reprimanded by nurses for defaulting on medication or missing appointments. For CCGs in particular, patients discussed concerns that they could not be trusted and expressed fears that things shared with CCGs would not remain confidential.

> "We as health care workers are always on the bad side with the community. It doesn't matter how much we try and do the right thing, it's never enough to satisfy them." – *facility administrator*

> "They are very good but there are times when nurses act silly and drag their feet and just spend time talking on their cell phones." – *patient*

> "It's not good and it's also not bad, it's in between. There are some patients who understanding our working conditions that maybe we have shortage of medication at that particular time and maybe we are busy because this is the only clinic in the community, but there are some patients who do not understand, they would say that we are slow or do not care about the patients." – *Facility manager*

> "Sometimes it is even difficult to talk to the care givers about your problems, the reason for that is because when you tell all your problem to the care giver you will be digging your own grave, you will hear the community members talking about the very same problems that you have told the care giver, people would be talking behind your back because you opened up to that care giver, care givers would even cook up the story." – *Patient*

> "The community leaders do not provide us with the necessary support even though we ask them to support us to engage with the community better, but they don't. Instead they side with the community. We inform them about our initiatives, programs from the government and our plans on how we are going to implement in the community just like the appointment system, we ask the clinic committee and the leaders to assist us to get the community to adhere to their treatment, but they don't help us. The community fights with us instead of working with us." – *Facility manager*

Role of traditional medicine and the private sector

Patients described a clear role for traditional healers alongside care provided through the formal sector. Traditional healers were often described as more accessible, living close to patients' homes, as opposed to typically long distances to reach health facilities with long waiting times. While ease of access was the main reason cited for visiting traditional healers, there was also a pervasive idea that there are conditions for which traditional medicine is more appropriate, such as those caused by witchcraft, but also conditions for which a traditional healer is inadequate. "Stomach cleaning" was discussed as a common practice within patient groups, using *inyongo* mixture or milk or water. Patients characterized private sector facilities and providers as generally better than the public sector, particularly because of more timely service, but also more expensive. Another advantage to the private sector that was mentioned is not requiring a referral from a clinic in order to access hospital care.

> "If one doesn't have cash, he can't get to the hospital. We then use the services of prophets and traditional healers." – *Patient*

> "If you have TB you will never go to the traditional healer, that is an obvious fact." – *Patient*

> "Private doctors are good, and they assist you very quick because you pay them." – *Patient*

Challenges to effective NCD care

Several major challenges to providing and accessing NCD care were mentioned repeatedly by both patients and staff. Transport was the most frequently cited problem – for patients needing to reach facilities and for clinic staff to go out into communities and transport patients to other providers. Patients described difficulties in finding and paying for transport, including buses that run only once a day and unaffordable taxi rides. Many staff mentioned the need for additional or reliably functioning ambulances to service their facilities. Other frequently mentioned barriers to care were patients' inability to get time off of work to attend appointments; long wait times; staff shortages; medication stock-outs; and equipment that was lacking,

outdated, or in poor condition. Patients and staff mentioned challenges arising from the mix of patients using the same facilities – children are often prioritized, leading NCD patients to be kept waiting longer, and younger patients coming for HIV-related care tend to arrive earlier than older NCD patients, also adding to their wait times.

> "I personally skip some appointments when I do not have transport money or money for food because you can't come to the clinic on an empty stomach." – *Patient*

> "You find that some patients come here at 2am to start queuing then they spend the entire time without eating or taking medication so by the time we check them their vital signs are high. So it is not easy to see if the treatment is working or not. Sometimes their emotions would also be high because they would be agitated and tired for standing in the line for a long time." – *Facility manager*

> "We are 'short-staffed' but that's a forbidden word." – *Nurse*

> "When you need 5 packs of pills, they give will only you 4. They never give you a full amount of what you need" – *Patient*

> "The child is the priority here at the clinic, when the child get here and they find that the child is very sick they would first take the child and they are supposed to be focusing on grannies who are diabetic or who have High Blood but that is not happening, those chronic patients are just not their priority." – *Patient*

> "Elderly patients are mostly affected since the adoption of the strategy to centralize care for all chronic patients including HIV+ patients to mitigate issues of stigma and discrimination. Now the older patients have to wait longer for their medication as the young ones come to the clinic earlier than them." – *Nurse*

Challenges reported specifically by facility staff included patients' poor or inconsistent adherence to medication, poor diet, smoking, and alcohol use. Staff from some facilities described using CCGs or WBOTs to attempt to trace patients who miss follow-up appointments or do not refill their medications. The vast majority of patients, in contrast, reported strong commitment to following their treatment regimen, but more ambivalence toward following diet and exercise advice. Most mentioned being aware of the need to eat more fruits and vegetables, but cited expense as a barrier to healthy eating, and an understanding of the importance of, but limited commitment to, exercise.

> "I have noticed that they do not follow the advice given, they stick to their old habits and find it difficult to adapt to healthy eating habits." – *Frontline caregiver*

> "We all want to live, no one has to be reminded to take medicine." – *Patient*

> "We would love to eat healthier, like have enough vegetables for example, beetroot and others, but we don't have money to buy them." – *Patient*

> "You give health education to patients. You tell them how to eat and, and how to take care of themselves...But, eish it's difficult...they smoke a lot...So sometimes you feel that…it's like you're not doing anything because they come with the same problems, same every time." – *Nurse*

> "I do not even try to exercise because when I start running my BP shoots sky high." – *Patient*

Recent improvements in health services

Facility staff spoke positively about the impacts of recent government investments and other programs that have improved health services, including HealthRise programs. Several staff specifically mentioned the

CCMDD program, which they credit with improving patients' access to medicines by making these available through more convenient pickup points, and also WBOTs, for going out in communities, referring patients to the facilities, and gathering valuable information. Patients, on the other hand, did not mention recent improvements or notable changes in health services from their perspective.

> "Expectra has played a very important role in training care workers on how to screen the community. And they have also trained them on formulation of support groups in the community to discuss their issues." – *Frontline health care provider*

> "Project Hope is helping us to reach some of our goals." – *Nurse*

> "NGOs which help us a lot of tracing the people and now they're taking over what Project Hope was doing." – *Facility manager*

Ways to improve health services

Both facility staff and patients had many ideas about ways that health facilities and health services could be improved; there was substantial alignment between the priorities expressed by staff and patients. Several ideas focused on addressing noted barriers to care, most importantly, increasing the number of staff to address chronic shortages and reduce wait times, as well as reducing the frequency of medication stock-outs, replacing and repairing inadequate diagnostic equipment, and improving clinical infrastructure in many ways.

> "The place is too small. There are areas that we cannot use because they are not conducive for the work that we do. Maybe if the budget could be used to renovate those work spaces. As for equipment, not just increased but improved equipment as well." – *Nurse*

> "We would like to have a special sister for diabetes or hypertension, one sister to see the children, one sister to treat TB, HIV, there must a sister for every department…help with transport for the patients, have some pickup points where they can bring the patients to the clinics, and get us more staff, especially for the old people." – *Nurse*

Both from staff and patients, there was enthusiasm for expanding the use of CCGs to improve access and quality of care and for establishing support groups specifically focused on NCDs or clubs for group exercise and other health-promoting activities. Patients also expressed interest in expanding the use of mobile clinics as another strategy to bring care closer to where people live. However, regarding both CCGs and mobile clinics, there was a desire not only for additional services but also for more comprehensive services that go beyond the provision of medication to include health promotion, screening, and checkups.

> "We need family health teams who would be able to link all the needs of the family to relevant programs. Community health care workers also need to be included." – *Frontline caregiver*

> "We need to have home visits. They should know how people live. Is there anyone working at home? How do they survive? Where do they get water?" – *Patient*

> "We do have a mobile clinic, but it comes once or twice, they problem is that they do not check patients for BP, they only give them medication" – *Patient*

Ways to improve community health

Many staff expressed a desire to improve health awareness in communities by providing health education through a variety of mechanisms including outreach, media, cooking demonstrations, and developing new

health information tools. Staff also discussed the need to build stronger relationships with communities to work together to spread health-promotion messages. Patients echoed these desires for additional education and greater connection to the clinics.

> "Maybe the government could provide training for our community leaders such as our local chief or leader, counsellor, reverends, etc. about health issues and that they can provide support because they are well known, respected, trusted, and supported by the community....health information such as pamphlets that we get from the district are not enough. We want to teach the community, but we can't. Sometimes the pamphlets are written in English, and some of our community members cannot read English. We also do not have health promoters who will go around the community to distribute this information to the community. We only do that once a month, so maybe if we had health promoters, they could plan more awareness days and help us provide more services. So, information is key, the community needs to be taught so they can know what is expected from them." – *Frontline caregiver*

> "I would like the clinics to teach people about chronic sickness, everyone not just us so that people will not panic, so that they will know what to do next and they should also encourage people to go test at the clinics, they shouldn't be afraid to test for any type of sickness, even if they are not sick." – *Patient*

Comparison facilities and baseline

Patient focus group discussions and staff interviews at comparison facilities echoed many of the same themes described above and overall, responses from the two groups of participants were very similar. The same challenges were raised and many of the same ideas were presented to improve community health and quality of care. While there were many complaints about infrastructure in intervention facilities, these complaints were slightly more escalated in comparison facilities, with staff mentioning major sewage problems and lack of water and electricity. Staff in comparison facilities were more likely than those in intervention sites to describe outreach activities and adherence clubs as part of the core work of the facility.

Themes arising from the endline interviews and focus group discussions align with key findings from baseline data collection. At baseline, the key barriers to care identified were transportation, staff shortages, wait times, and missing equipment, all of which were confirmed at endline. Patients' concerns about confidentiality when speaking to health workers were also expressed at both baseline and endline.

United States

Quantitative

Rice County

Diabetes cascade of care. HealthFinders showed some improvements in terms of the percentage of patients meeting treatment targets since baseline (Figure 48), with 43.5% (95% CI: 33.6–53.9%) of patients with A1c levels lower than 8% at baseline and 50.0% (95% CI: 39.7–60.0%) at endline. Patients in the comparison group had somewhat higher levels of diabetes control at both baseline and endline than HealthRise patients; however, due to overlapping confidence intervals, these were statistically indistinguishable differences. For both HealthRise and comparison patients, about 25% saw decreases in A1c that equaled or exceeded 10% since baseline measurements. Male HealthRise patients showed moderate improvement in diabetes control since baseline (Figure 49), though these changes were not statistically significant (i.e., 39.0% [95% CI: 24.9–55.2%] controlled at baseline to 51.2% [95% CI: 35.7–66.6%] at

endline). Female HealthRise diabetes patients had smaller gains, though a somewhat higher percentage had A1c levels lower than 8% at baseline (47.1% [95% CI: 33.5–61.1%]). Both sexes of comparison patients had slightly higher, though not significantly higher, levels of diabetes control over time. For patients less than 50 and those 50 years or older (Figure 50), somewhat varied trends emerged. While the percentage of HealthRise diabetes patients aged 50 or older meeting treatment targets was relatively constant at baseline and endline (approximately 42%–44%), diabetes control moderately – albeit not significantly – improved for HealthRise patients less than 50 (i.e., 45.2% [95% CI: 30.5–60.9%] at baseline to 57.1% [95% CI: 41.3–71.6%]). Comparison patients generally showed somewhat higher levels of diabetes control than their HealthRise counterparts, particularly among the older age group.

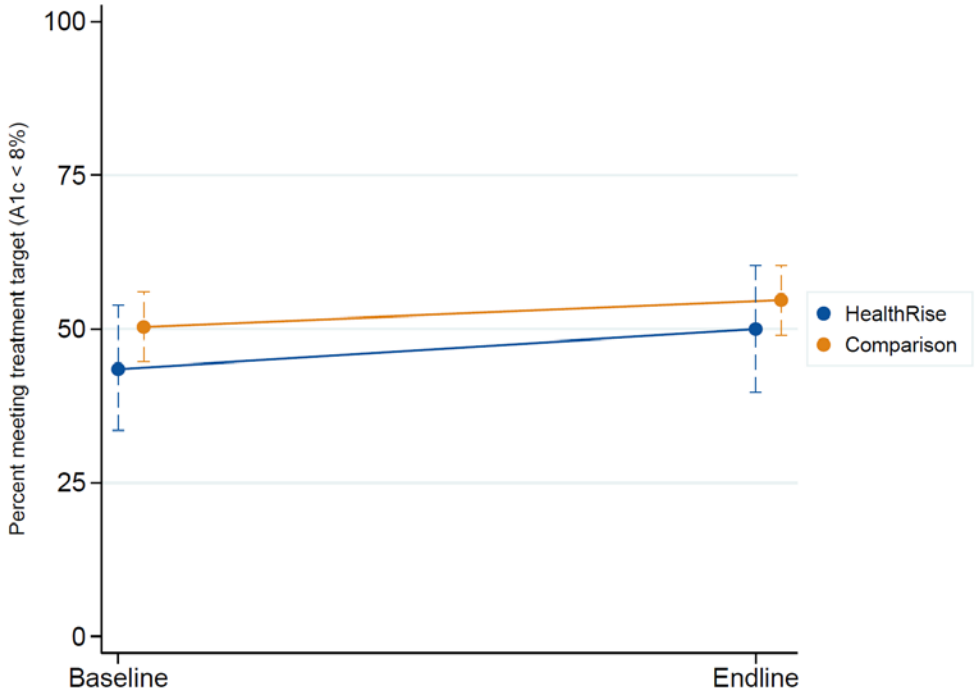

Figure 48. Rice County: Comparing diabetes control among HealthRise and comparison patients at baseline and endline. *Controlled cases are individuals who are considered a prevalent case and then have an A1c measure less than 8%. Prevalent cases were either individuals who reported being diagnosed with diabetes or had an A1c measure exceeding 6.4, a level that would elicit diabetes case management by health care providers.*

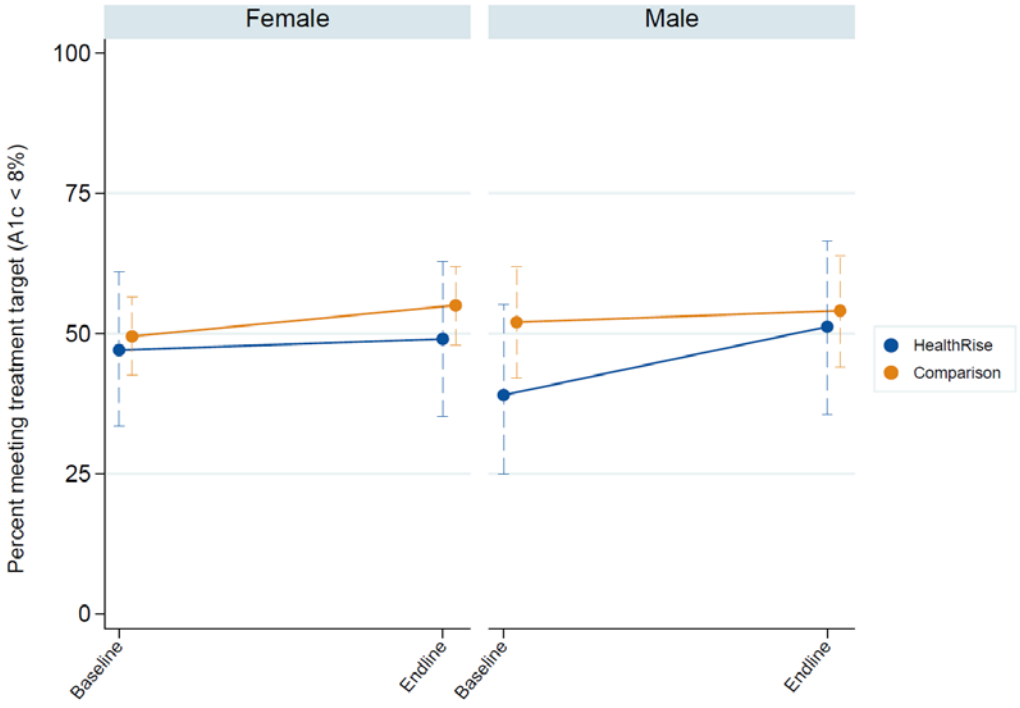

Figure 49. Rice County: Comparing diabetes control among HealthRise and comparison patients at baseline and endline by sex. *Controlled cases are individuals who are considered a prevalent case and then have an A1c measure less than 8%. Prevalent cases were either individuals who reported being diagnosed with diabetes or had an A1c measure exceeding 6.4, a level that would elicit diabetes case management by health care providers.*

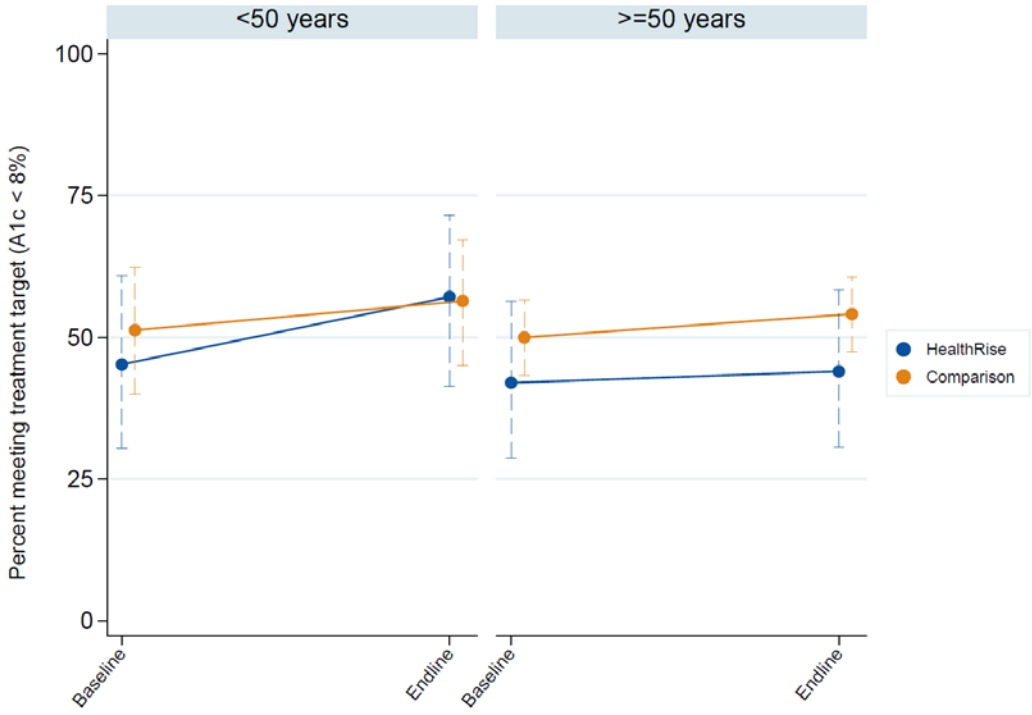

Figure 50. Rice County: Comparing diabetes control among HealthRise and comparison patients at baseline and endline by age group. *Controlled cases are individuals who are considered a prevalent case and then have an A1c measure less than 8%. Prevalent cases were either individuals who reported being diagnosed with diabetes or had an A1c measure exceeding 6.4, a level that would elicit diabetes case management by health care providers.*

Hypertension cascade of care. Hypertension prevalence was generally lower among HealthRise patients than among comparison patients, which suggests that the comparison group selected may not be the HealthFinders patients. With this comparison group, we found that hypertension control for HealthRise patients was lower than that of comparison patients (80%–82%) at both time points, indicating that HealthRise patients may have been facing steeper health challenges than comparison patients; nonetheless, Rice County saw marked improvements in the percentage of HealthRise hypertension patients meeting treatment targets. At baseline, 45.1% (95% CI: 33.7–57.0%) of HealthRise hypertension patients met treatment targets, while 62.0% (95% CI: 49.9–72.7%) were considered controlled at endline. Somewhat more HealthRise patients saw their systolic blood pressure decrease 10% or more (33.8% [95% CI: 23.6–45.8%) by endline than comparison patients (21.1% [95% CI: 15.5–28.0%]). Among HealthRise patients, there were no substantial differences by sex in terms of hypertension control (Figure 52): both female and male HealthRise patients saw gains of about 14 to 19 percentage points in the percentage of hypertension patients meeting treatment targets. Conversely, about 80%–81% of female comparison patients had controlled hypertension at baseline and endline; for the latter, however, confidence intervals overlapped with those of female HealthRise patients. Male comparison patients showed significantly higher levels of hypertension control than male HealthRise patients at each time point. HealthRise patients 50 years and older trended toward higher levels of hypertension control (Figure 53), from 48.9% (95% CI: 34.6–63.4%) at baseline to 66.0% (95% CI: 50.9–78.4%) at endline. While comparison patients aged 50 and older generally recorded higher levels of

hypertension control, the gap between comparison and HealthRise patients narrowed by endline for this age group. HealthRise patients less than 50 years old showed some, albeit not significant, gains in hypertension control by endline; nonetheless, overall levels were comparatively lower.

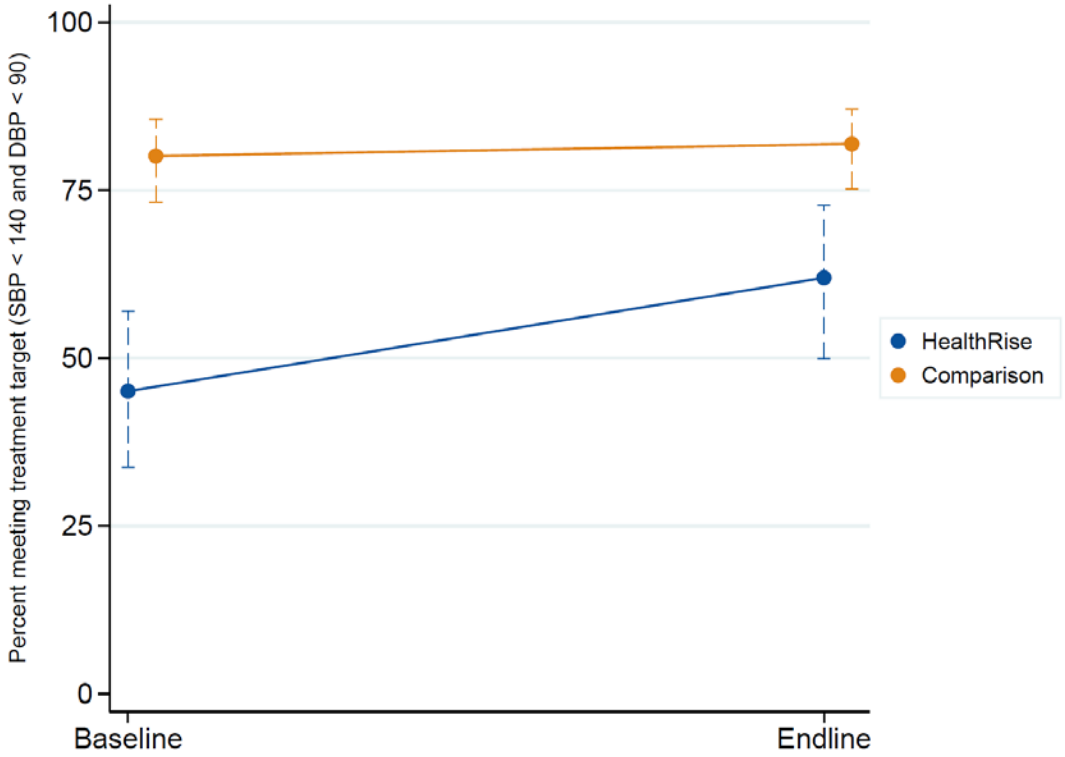

Figure 51. Rice County: Comparing hypertension control among HealthRise and comparison patients at baseline and endline. *Controlled cases are individuals who are considered a prevalent case and then have blood pressure measures below 140 mmHg for systolic and 90 mmHg for diastolic; if only systolic measures were available for a given individual, then only the 140 mmHg threshold was applied. Prevalent cases were either individuals who reported being diagnosed with hypertension or had blood pressure measures that equaled or exceeded 140 mmHg for systolic or 90 mmHg for diastolic.*

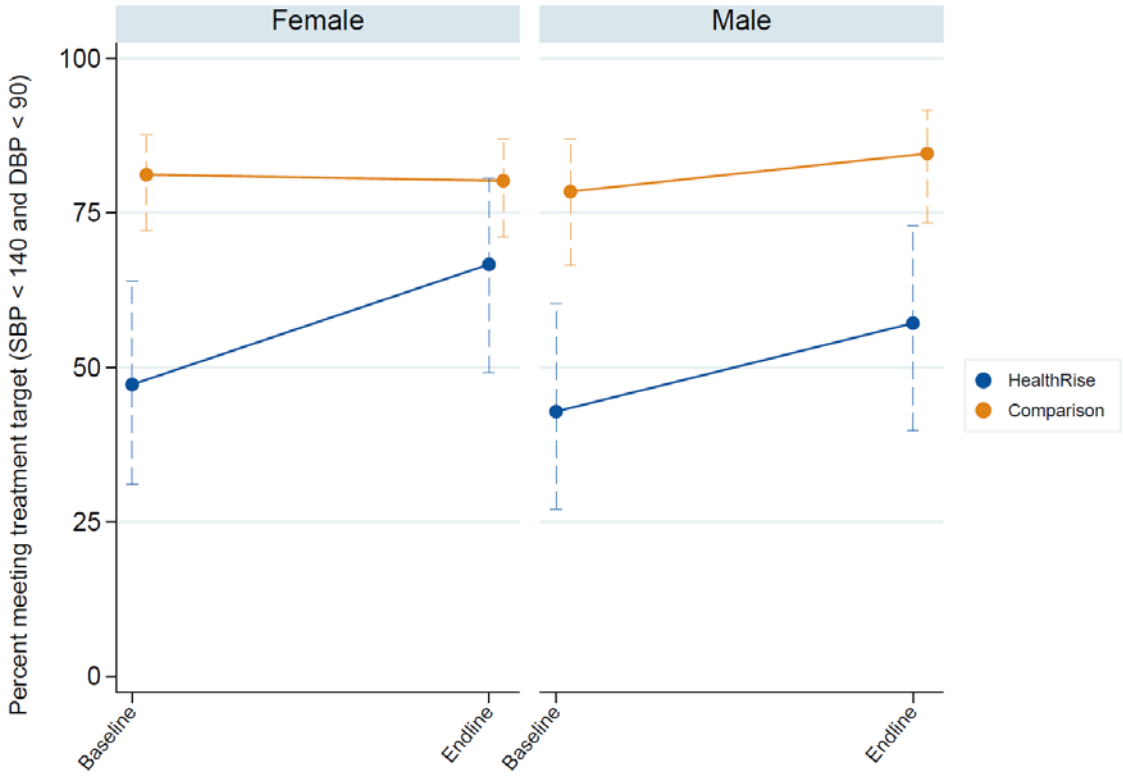

Figure 52. Rice County: Comparing hypertension control among HealthRise and comparison patients at baseline and endline by sex. *Controlled cases are individuals who are considered a prevalent case and then have blood pressure measures below 140 mmHg for systolic and 90 mmHg for diastolic; if only systolic measures were available for a given individual, then only the 140 mmHg threshold was applied. Prevalent cases were either individuals who reported being diagnosed with hypertension or had blood pressure measures that equaled or exceeded 140 mmHg for systolic or 90 mmHg for diastolic.*

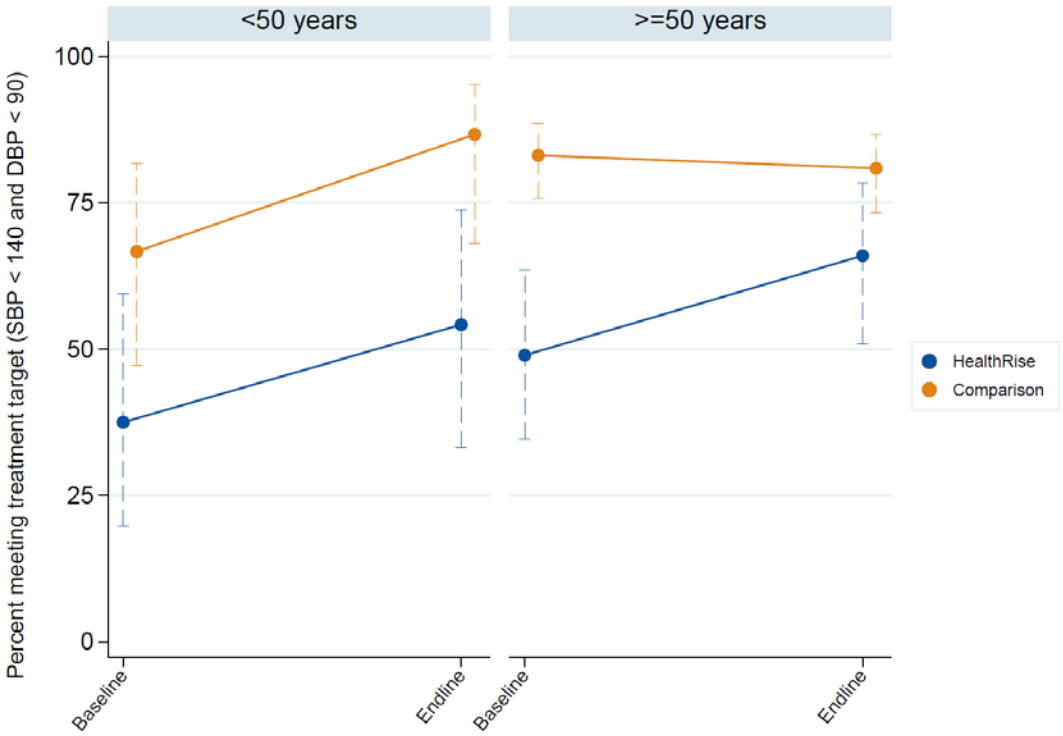

Figure 53. Rice County: Comparing hypertension prevalence and control among HealthRise and comparison patients at baseline and endline by age group. *Controlled cases are individuals who are considered a prevalent case and then have blood pressure measures below 140 mmHg for systolic and 90 mmHg for diastolic; if only systolic measures were available for a given individual, then only the 140 mmHg threshold was applied. Prevalent cases were either individuals who reported being diagnosed with hypertension or had blood pressure measures that equaled or exceeded 140 mmHg for systolic or 90 mmHg for diastolic.*

Ramsey County

Diabetes cascade of care. The percentage of HealthRise patients with controlled diabetes (i.e., A1c less 8% level) significantly improved, 4.9% (95% CI: 1.1–18.4%) at baseline to 26.8% (95% CI: 15.1–43.0%) at endline (Figure 54). This trend was particularly notable as comparison patients saw somewhat plateauing rates of control, with 26.8% (95% CI: 17.6–38.5%) at baseline and 29.6% (95% CI: 19.9–41.5%) at endline; further, the percentage of comparison patients with controlled diabetes was significantly higher than that of HealthRise patients at baseline. From baseline to endline, 56.1% (95% CI: 40.2–70.9%) of HealthRise patients recorded 10% or larger declines in their A1c levels; during a similar period of time, 33.8% (95%: 23.6–45.8%) of comparison patients experienced 10% or greater decreases in A1c. Conversely, a somewhat lower percentage of HealthRise patients saw more than 10% increases in A1c since baseline (7.3% [95% CI: 2.3–21.2%]) than comparison patients (29.6% [95% CI: 19.9–41.5%]).

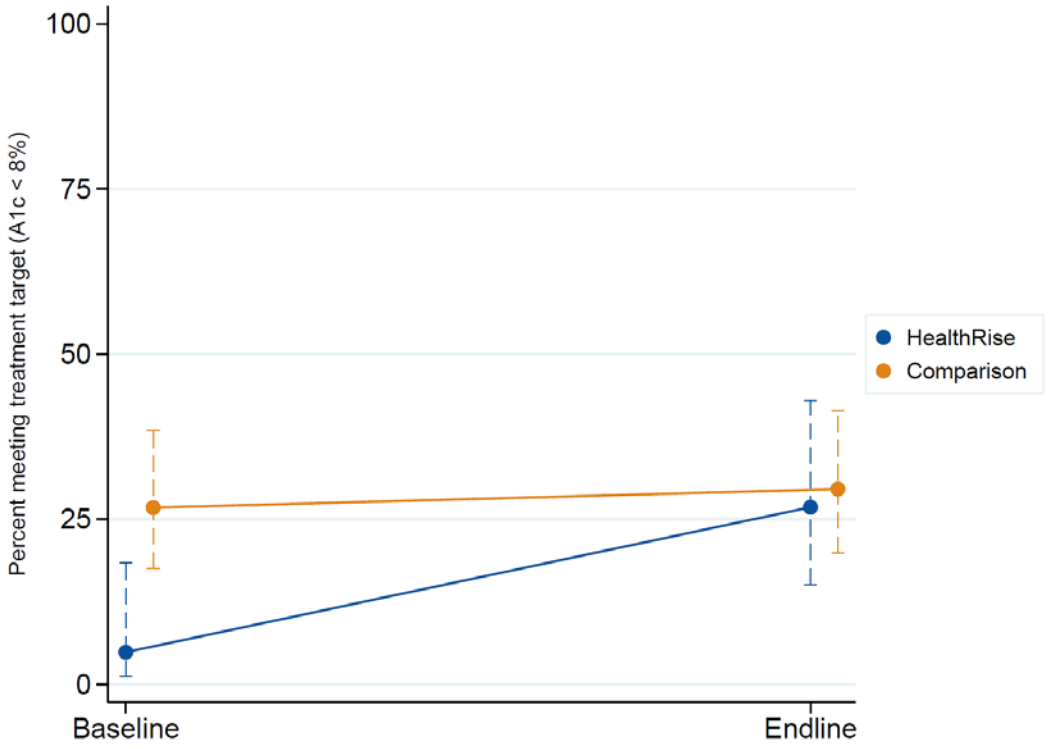

Figure 54. Ramsey County: Comparing diabetes control among HealthRise and comparison patients at baseline and endline. *Controlled cases are individuals who are considered a prevalent case and then have an A1c measure less than 8%. Prevalent cases were either individuals who reported being diagnosed with diabetes or had an A1c measure exceeding 6.4, a level that would elicit diabetes case management by health care providers.*

Fairly similar patterns emerged by sex (Figure 55), though the progress made by female HealthRise patients was somewhat more pronounced than the trend for male HealthRise patients. This gain was not statistically significant for female HealthRise patients, it nonetheless provided a signal of progress since baseline, when no female diabetes patients were meeting treatment targets. For HealthRise patients 50 years and older, which constituted the majority of the patient population, moderate increases for diabetes control took place since baseline (Figure 56). Though these changes were not statistically significant, the improvement from 6.5% (95% CI: 1.5–23.9%) at baseline to 22.6% (95% CI: 10.7–41.6%) at endline showed the opposite trend experienced by comparison patients. For HealthRise patients younger than 50, which only included 10 patients, diabetes control rose to 40.0% (95% CI: 12.5–75.7%) by endline; again, this trend contrasted with comparison patients, for which a somewhat smaller percentage of patients had A1c levels lower than 8% at endline.

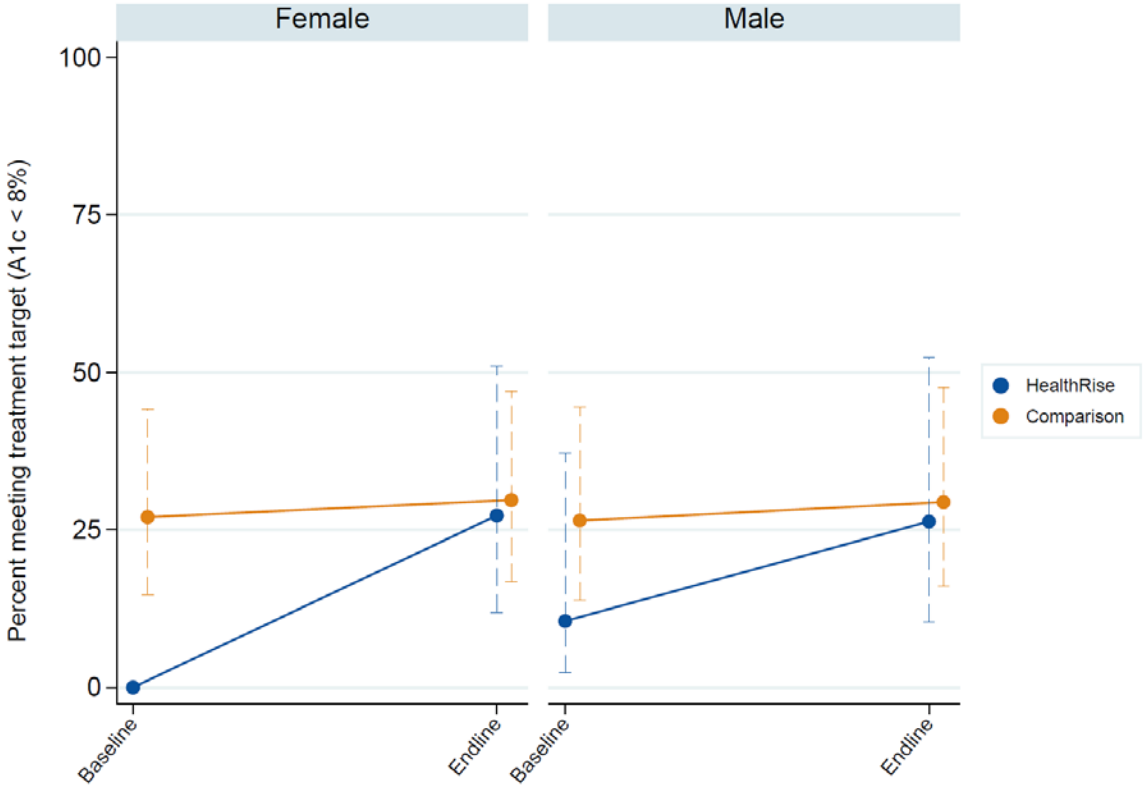

Figure 55. Ramsey County: Comparing diabetes control among HealthRise and comparison patients at baseline and endline by sex. *Controlled cases are individuals who are considered a prevalent case and then have an A1c measure less than 8%. Prevalent cases were either individuals who reported being diagnosed with diabetes or had an A1c measure exceeding 6.4, a level that would elicit diabetes case management by health care providers.*

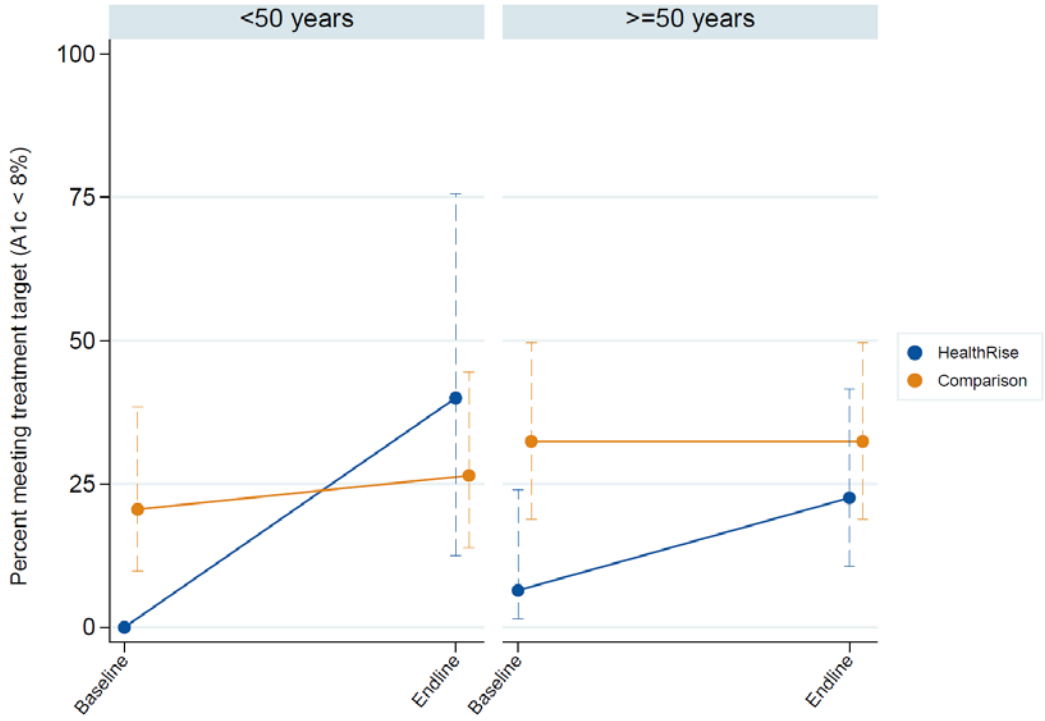

Figure 56. Ramsey County: Comparing diabetes control among HealthRise and comparison patients at baseline and endline by age group. *Controlled cases are individuals who are considered a prevalent case and then have an A1c measure less than 8%. Prevalent cases were either individuals who reported being diagnosed with diabetes or had an A1c measure exceeding 6.4, a level that would elicit diabetes case management by health care providers.*

Hypertension cascade of care. At baseline, 19.0% (95% CI: 6.7–43.6%) of HealthRise hypertension patients met treatment targets (Figure 57); by endline, this percentage increased to 47.6% (95% CI: 26.3–69.8%). More moderate gains occurred among comparison patients, who experienced somewhat higher levels of hypertension control at baseline (34.5% [95%: 23.1–47.9%]) than HealthRise patients. By endline, HealthRise and comparison patients had more similar levels of hypertension control (43-48%). Of note, 52.4% (95% CI: 30.2–73.7%) of HealthRise hypertension patients recorded declines in systolic blood pressure of 10% or more, while 31.0% (95% CI: 20.2–44.4%) of comparison patients showed similar progress. For HealthRise hypertension patients, 9.5% (95% CI: 2.1–34.0%) saw more than a 10% increase in systolic blood pressure; 27.6% (95% CI: 17.4–40.8%) of comparison patients experienced such increases.

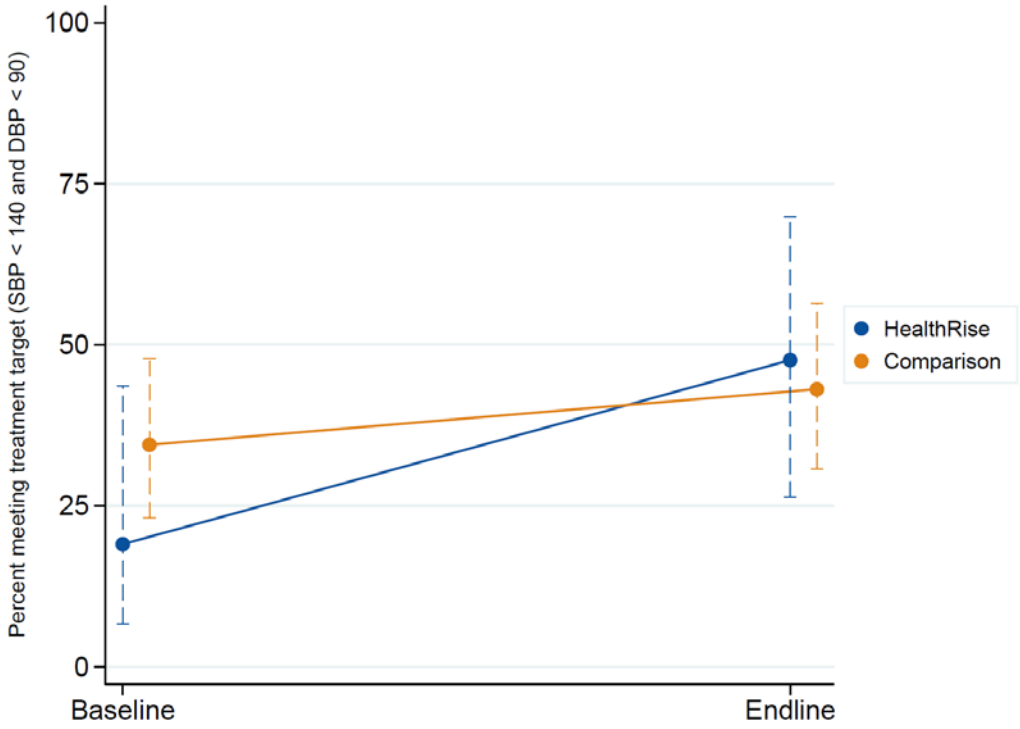

Figure 57. Ramsey County: Comparing hypertension control among HealthRise and comparison patients at baseline and endline. *Controlled cases are individuals who are considered a prevalent case and then have blood pressure measures below 140 mmHg for systolic and 90 mmHg for diastolic; if only systolic measures were available for a given individual, then only the 140 mmHg threshold was applied. Prevalent cases were either individuals who reported being diagnosed with hypertension or had blood pressure measures that equaled or exceeded 140 mmHg for systolic or 90 mmHg for diastolic.*

Both female and male HealthRise patients with hypertension improved levels of control from less than 25% at baseline to approximately 46%–50% at endline (Figure 58); due in part to the small sample sizes by sex, fairly large confidence intervals accompany each estimate. Somewhat different trends emerged by sex among comparison patients, with males experiencing fairly flat levels of hypertension control. When considering hypertension control patterns by age group (< 50 years and 50 years or older), trends varied somewhat among HealthRise and comparison patients (Figure 59). For HealthRise patients 50 years and older, hypertension control improved, albeit not significantly, from 23.5% (95% CI: 8.1–51.8%) to 47.1% (95% CI: 23.5–72.0%). Conversely, comparison patients of a similar age saw control levels ranging from 35%–40% over time. Although HealthRise patients under 50 years old also experienced advances in hypertension control, the relatively small sample size of these patients (4 people) made these results less conclusive.

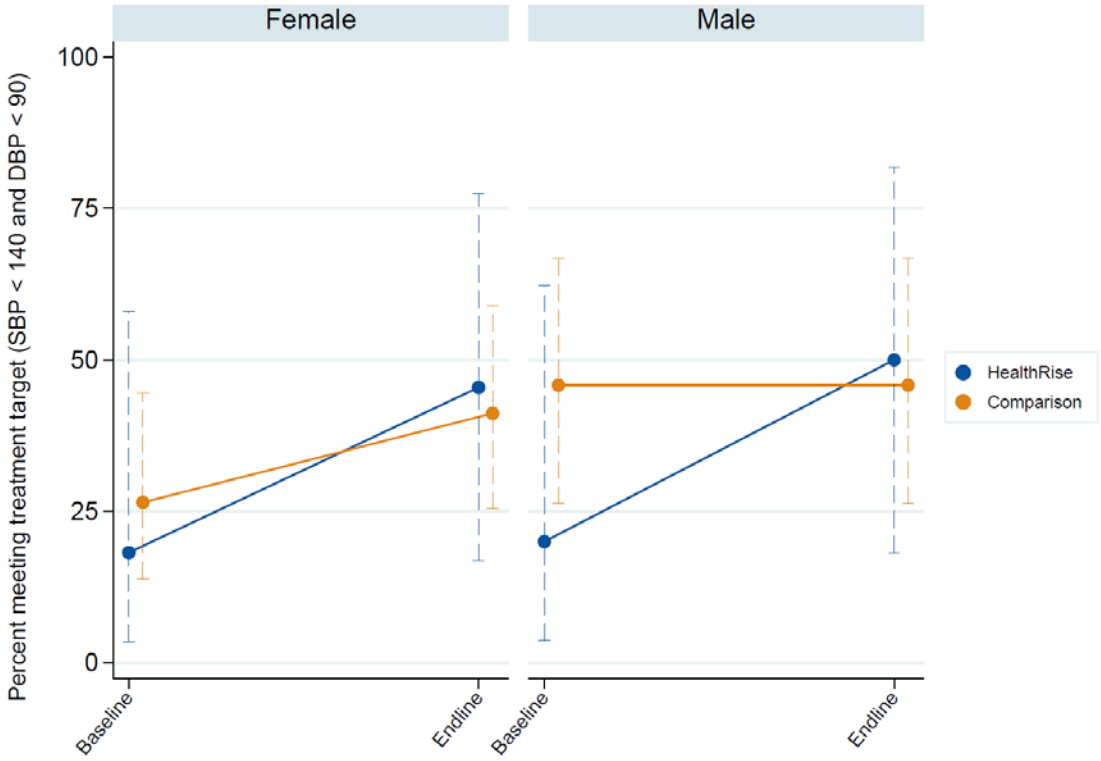

Figure 58. Ramsey County: Comparing hypertension control among HealthRise and comparison patients at baseline and endline, by sex. *Controlled cases are individuals who are considered a prevalent case and then have blood pressure measures below 140 mmHg for systolic and 90 mmHg for diastolic; if only systolic measures were available for a given individual, then only the 140 mmHg threshold was applied. Prevalent cases were either individuals who reported being diagnosed with hypertension or had blood pressure measures that equaled or exceeded 140 mmHg for systolic or 90 mmHg for diastolic.*

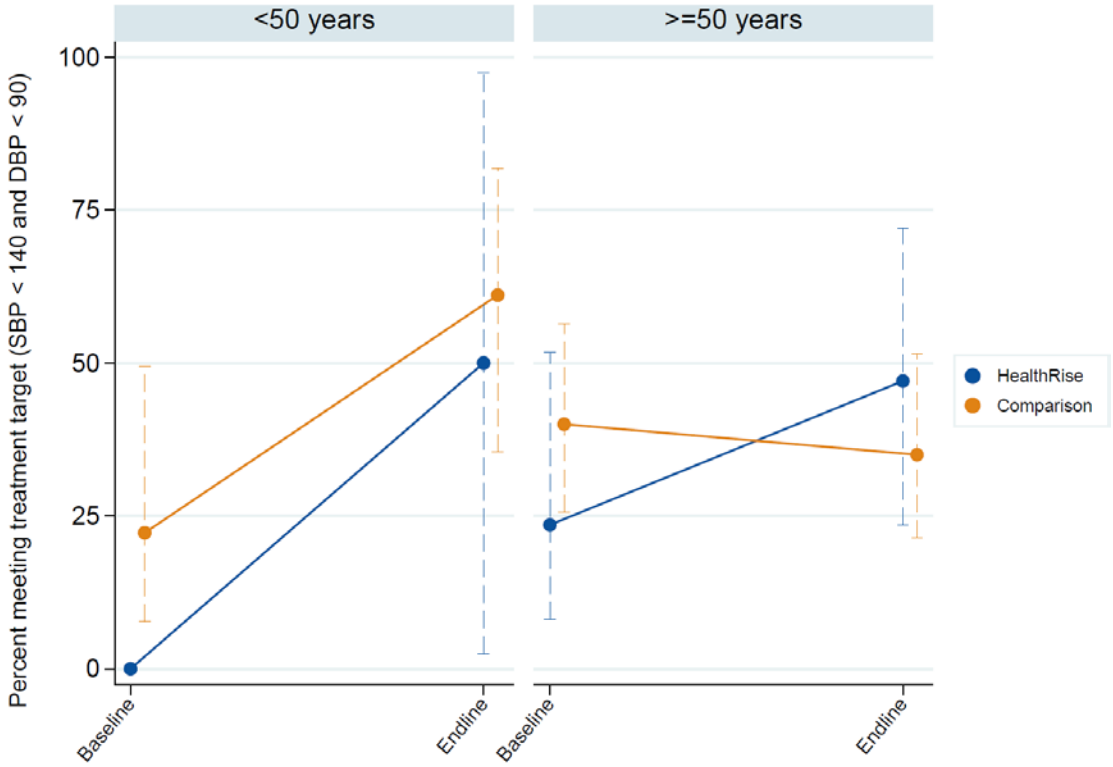

Figure 59. Ramsey County: Comparing hypertension control among HealthRise and comparison patients at baseline and endline by age group. *Controlled cases are individuals who are considered a prevalent case and then have blood pressure measures below 140 mmHg for systolic and 90 mmHg for diastolic; if only systolic measures were available for a given individual, then only the 140 mmHg threshold was applied. Prevalent cases were either individuals who reported being diagnosed with hypertension or had blood pressure measures that equaled or exceeded 140 mmHg for systolic or 90 mmHg for diastolic.*

Emergency department visits and hospitalizations. In tracking the percentage of patients with emergency department or hospitalization visits, as well as average number of visits, from 2014 to 2018 (Figures 60 and 61), no conclusive patterns emerged for HealthRise patients versus comparison patients. In general, a higher percentage of HealthRise patients had at least one emergency department visit or hospitalization each year than comparison patients; however, these results likely reflect myriad factors, which could include HealthRise patients being in more ill health than comparison populations (which may have led them to enroll in the program in the first place) and HealthRise patients having more frequent contacts with the health care system.

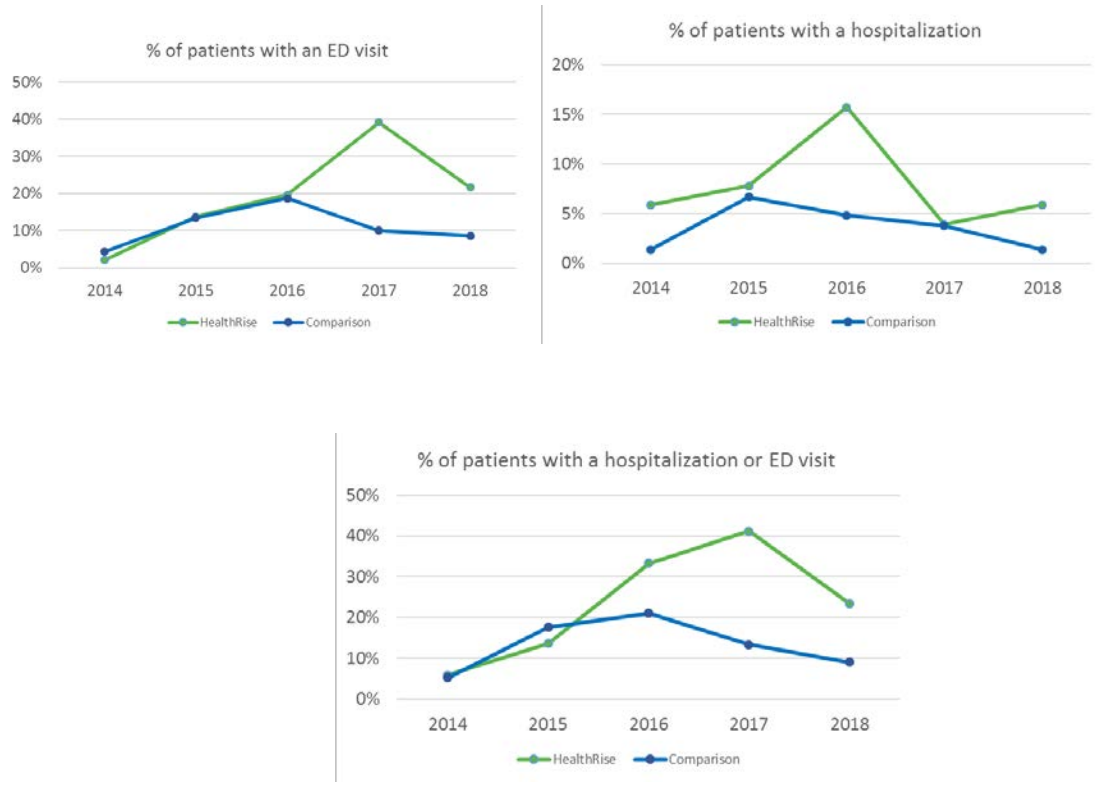

Figure 60. Ramsey County: Comparing the percentage of HealthRise and comparison patients with hospitalizations and/or emergency department visits, 2014–2018

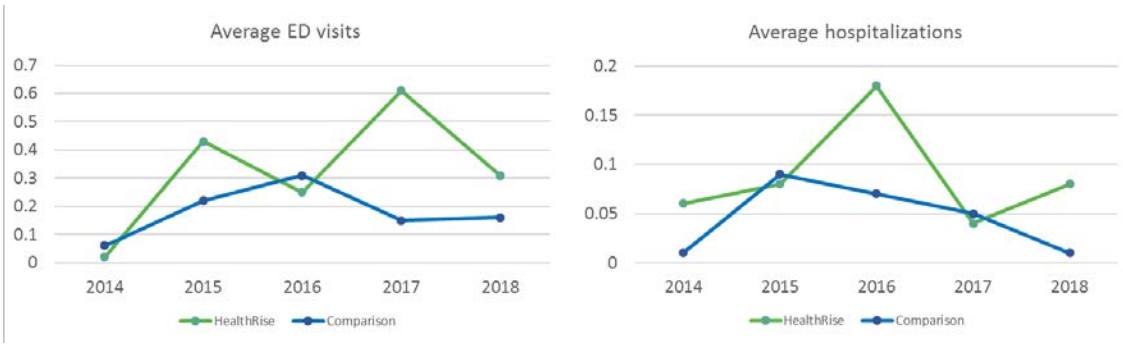

Figure 61. Ramsey County: Comparing average hospitalizations and emergency department visits among HealthRise and comparison patients, 2014–2018

Hennepin County

Diabetes cascade of care. By endline, HealthRise patients saw significant gains in diabetes control (Figure 62), improving from 23.3% (95% CI: 14.1–36.0%) at baseline to 45.0% (95% CI: 32.6–58.0%) at endline. In contrast, comparison patients saw essentially unchanged levels of diabetes control during this timeframe (consistently staying at 77%). Since baseline, 43.3% (95% CI: 31.1–56.4%) of HealthRise patients recorded A1c declines of 10% or greater, while 30.8% (95% CI: 10.2–63.5%) of comparison patients saw comparable decreases in A1c. However, 13.0% (95% CI: 6.7–24.9%) of HealthRise patients experienced increases in A1c

that exceeded 10% between baseline and endline measures; for comparison patients, 7.7% (0.8–46.9%) registered such increases in A1c.

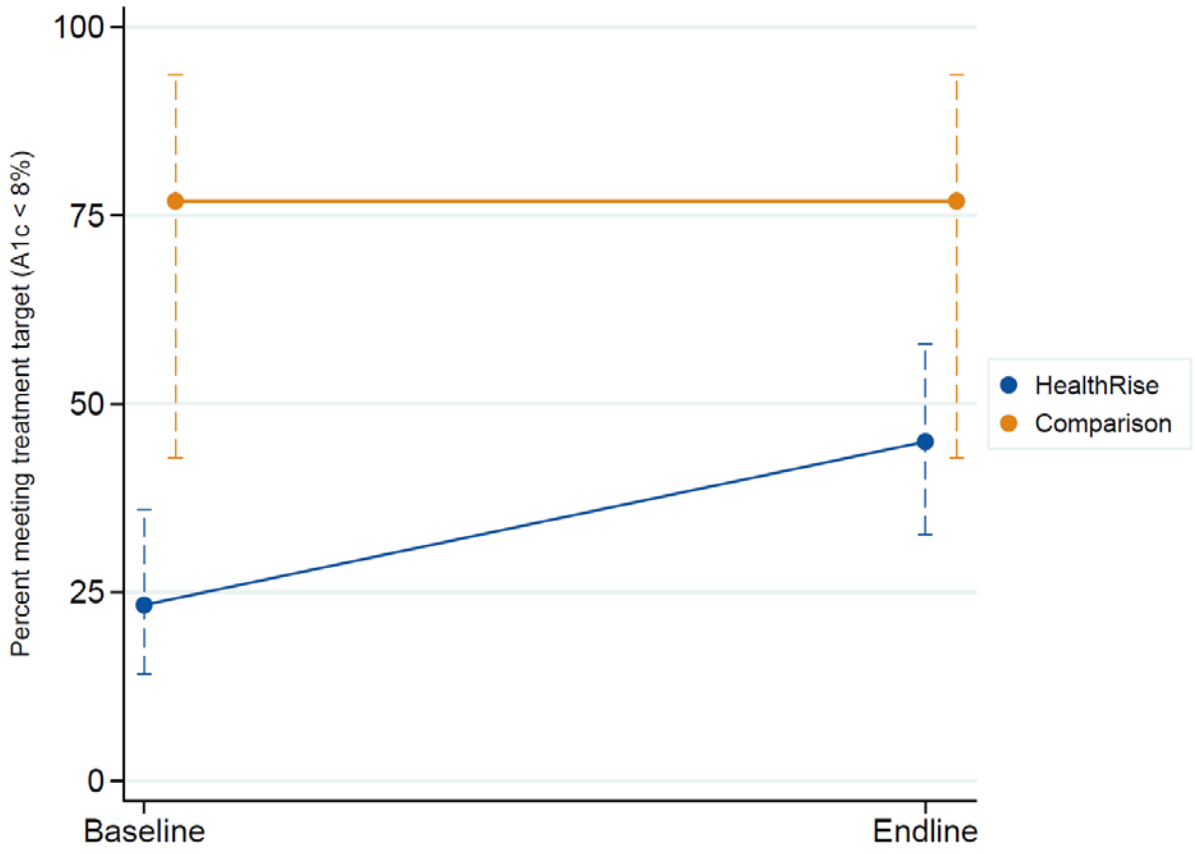

Figure 62. Hennepin County: Comparing diabetes control among HealthRise and comparison patients at baseline and endline. *Controlled cases are individuals who are considered a prevalent case and then have an A1c measure less than 8%. Prevalent cases were either individuals who reported being diagnosed with diabetes or had an A1c measure exceeding 6.4, a level that would elicit diabetes case management by health care providers*

Diabetes control somewhat diverged by sex (Figure 63), with female HealthRise patients showing slower progress since baseline while male HealthRise patients recorded significant gains. At baseline, 23.1% (95% CI: 10.1–44.4) of male HealthRise patients with diabetes were considered controlled, but by endline, 57.7% (95% CI: 37.2–75.8%) had A1c lower than 8%. Relatedly, 38.5% (95% CI: 21.1–59.3%) of male HealthRise patients recorded A1c declines of 10% or greater by endline; among male comparison patients with diabetes, 20.0% (95% CI: 0.8–88.9%) achieved similar decreases in A1c.

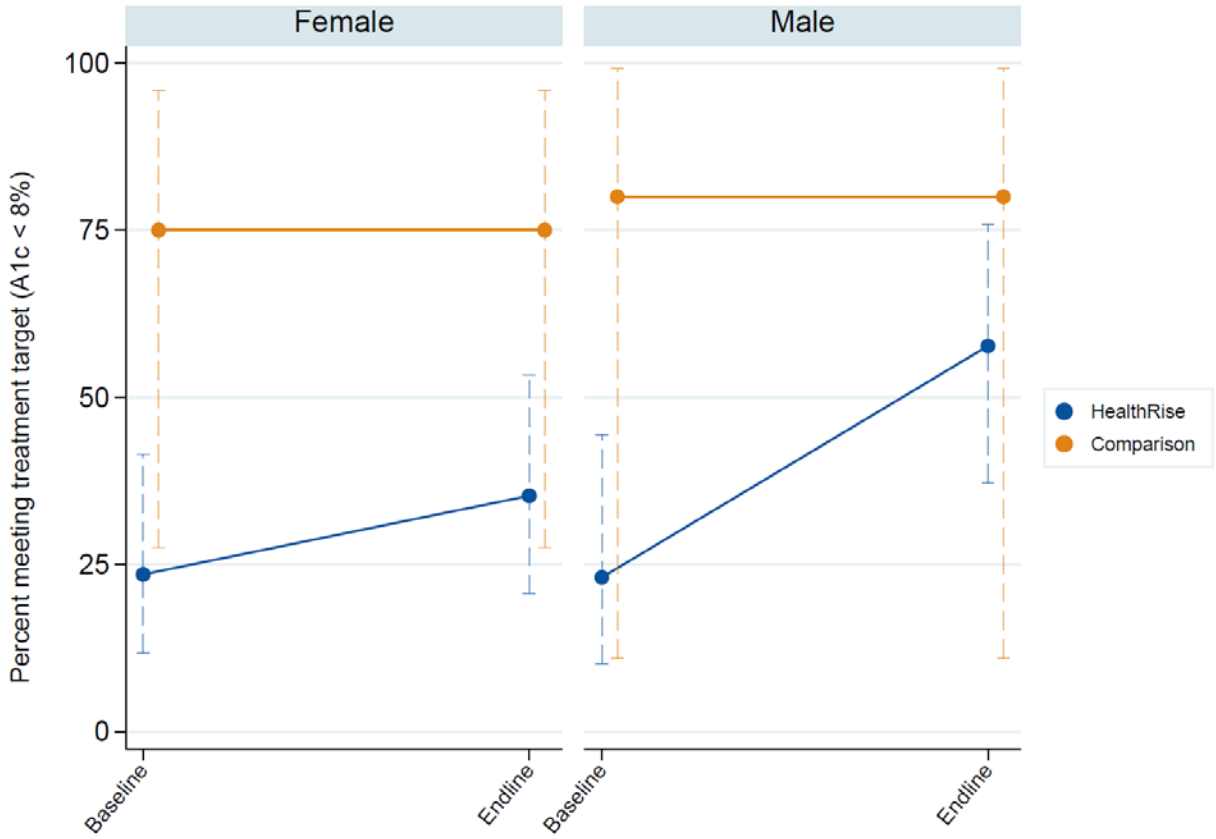

Figure 63. Hennepin County: Comparing diabetes control among HealthRise and comparison patients at baseline and endline by sex. *Controlled cases are individuals who are considered a prevalent case and then have an A1c measure less than 8%. Prevalent cases were either individuals who reported being diagnosed with diabetes or had an A1c measure exceeding 6.4, a level that would elicit diabetes case management by health care providers*

HealthRise patients aged 50 and older documented significant progress in diabetes control (Figure 64), rising from 26.8% (95% CI: 15.1–43.0%) of patients with an A1c lower than 8% at a baseline to 53.7% (37.9–68.7%) by endline. Comparison patients aged 50 and older saw essentially no change, with about 50% of patients with controlled diabetes at each time point. HealthRise patients aged 50 and older had significantly lower levels of diabetes control at baseline, but essentially matched comparison patients by endline. Smaller sample sizes among patients under 50 years old made it challenging to determine any substantive patterns among HealthRise and comparison groups; in general, HealthRise patients trended toward improvements whereas comparison patients (n=2) met diabetes treatment targets at both time points.

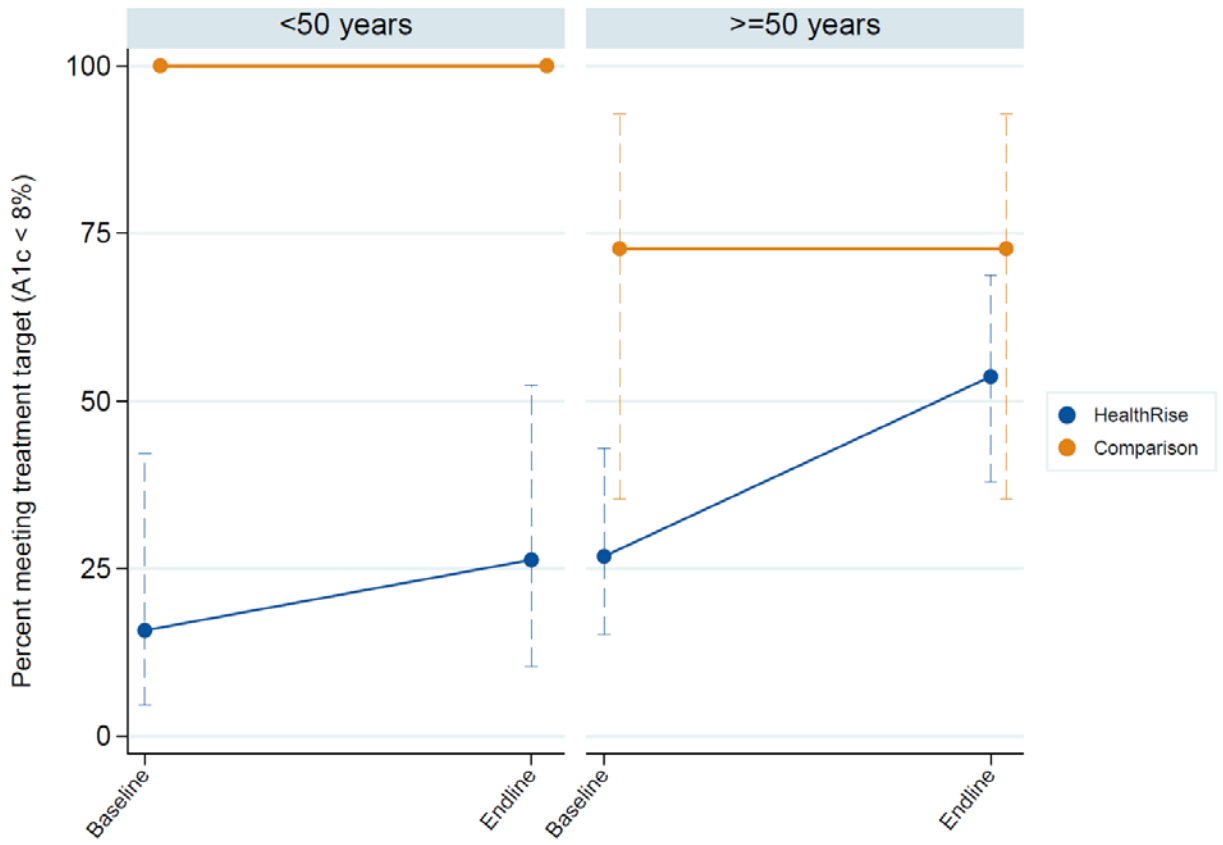

Figure 64. Hennepin County: Comparing diabetes control among HealthRise and comparison patients at baseline and endline by age group. *Controlled cases are individuals who are considered a prevalent case and then have an A1c measure less than 8%. Prevalent cases were either individuals who reported being diagnosed with diabetes or had an A1c measure exceeding 6.4, a level that would elicit diabetes case management by health care providers*

Hypertension cascade of care. From baseline to endline, HealthRise hypertension patients recorded significant progress in meeting treatment targets (Figure 65), improving from 55.8% (95% CI: 44.4–66.7%) to 75.3% (95% CI: 64.2–83.8%). In contrast, comparison patients saw essentially no change in meeting treatment targets over time. When hypertension control patterns were considered by sex (Figure 66), patterns somewhat diverged for HealthRise and comparison patients. Both female and male HealthRise hypertension patients saw moderate gains in meeting treatment targets (i.e., 19 to 20 percentage point increase), with males improving from 61.3% (95% CI: 42.4–77.3%) to 80.6% (95% CI: 61.9–91.5%) of patients meeting hypertension targets by endline. In contrast, comparison patients, especially males, experienced non-statistically significant decreases in hypertension control since baseline. For HealthRise patients 50 years and older (Figure 67), hypertension control significantly increased, from 51.0% (95% CI: 36.8–65.1%) at baseline to 79.6% (95% CI: 65.5–88.9%) at endline. In contrast, comparison patients in the same age group had levels of hypertension control slightly decrease by endline, from about 86% to 79%. HealthRise patients under 50 years old had essentially the same levels of hypertension control over time, whereas comparison patients of similar age trended toward improvements; however, due to sample small sample sizes for this age group, confidence intervals were quite wide and thus it is difficult to interpret these findings.

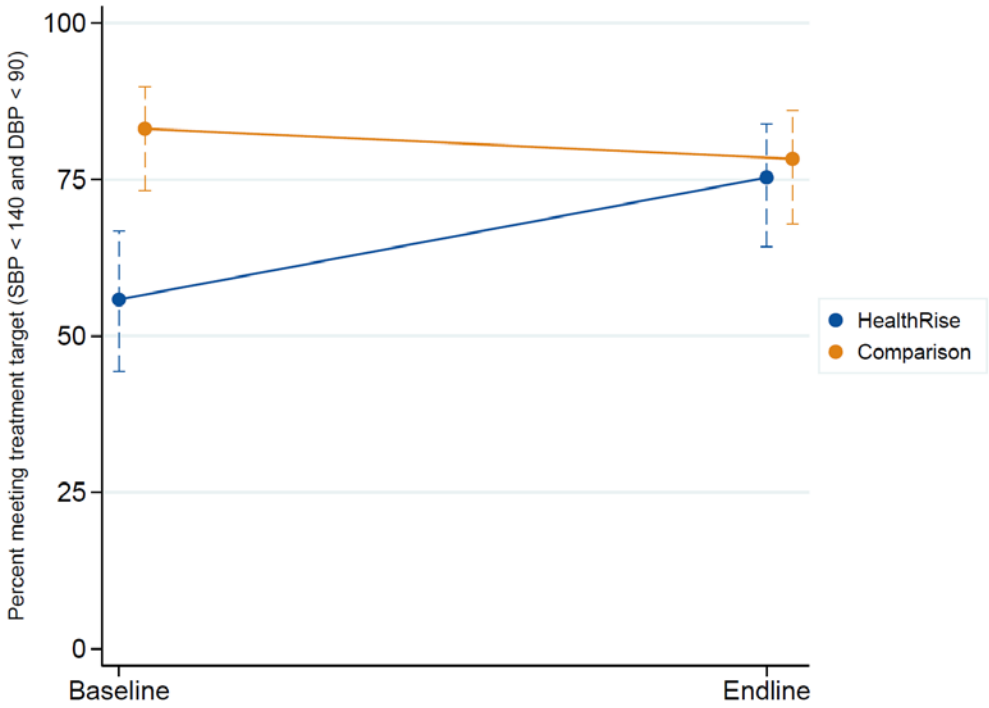

Figure 65. Hennepin County: Comparing hypertension control among HealthRise and comparison patients at baseline and endline. *Controlled cases are individuals who are considered a prevalent case and then have blood pressure measures below 140 mmHg for systolic and 90 mmHg for diastolic; if only systolic measures were available for a given individual, then only the 140 mmHg threshold was applied. Prevalent cases were either individuals who reported being diagnosed with hypertension or had blood pressure measures that equaled or exceeded 140 mmHg for systolic or 90 mmHg for diastolic.*

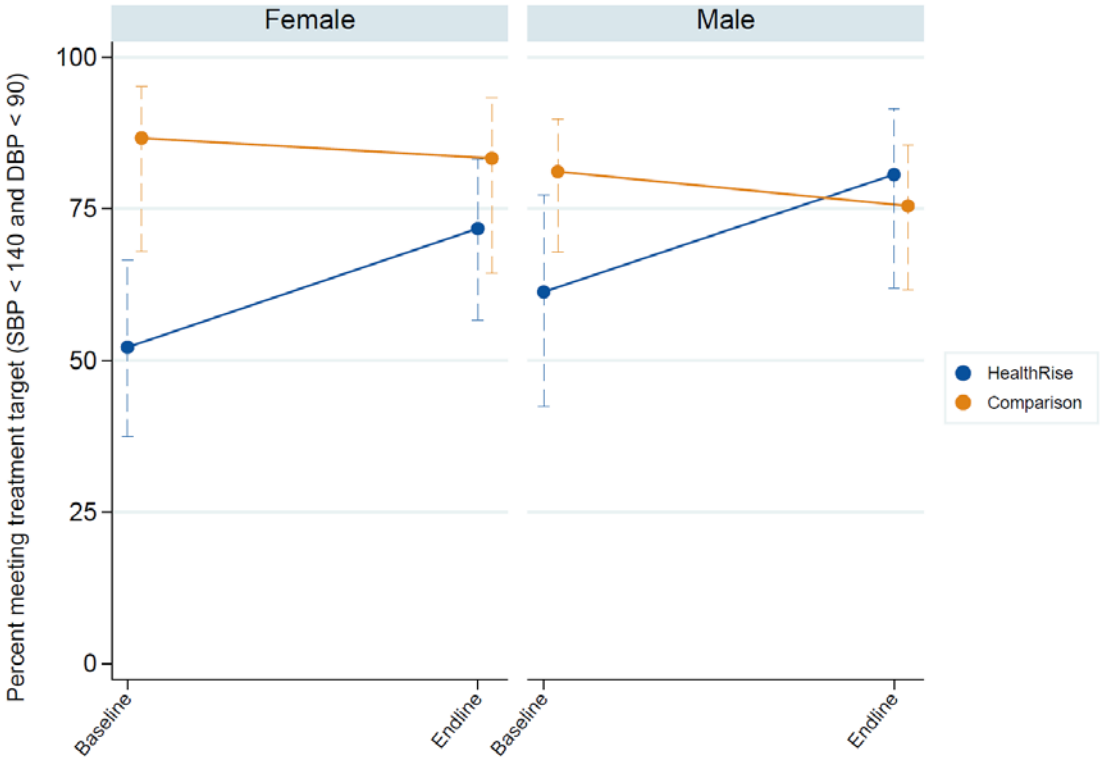

Figure 66. Hennepin County: Comparing hypertension control among HealthRise and comparison patients at baseline and endline by sex. *Controlled cases are individuals who are considered a prevalent case and then have blood pressure measures below 140 mmHg for systolic and 90 mmHg for diastolic; if only systolic measures were available for a given individual, then only the 140 mmHg threshold was applied. Prevalent cases were either individuals who reported being diagnosed with hypertension or had blood pressure measures that equaled or exceeded 140 mmHg for systolic or 90 mmHg for diastolic.*

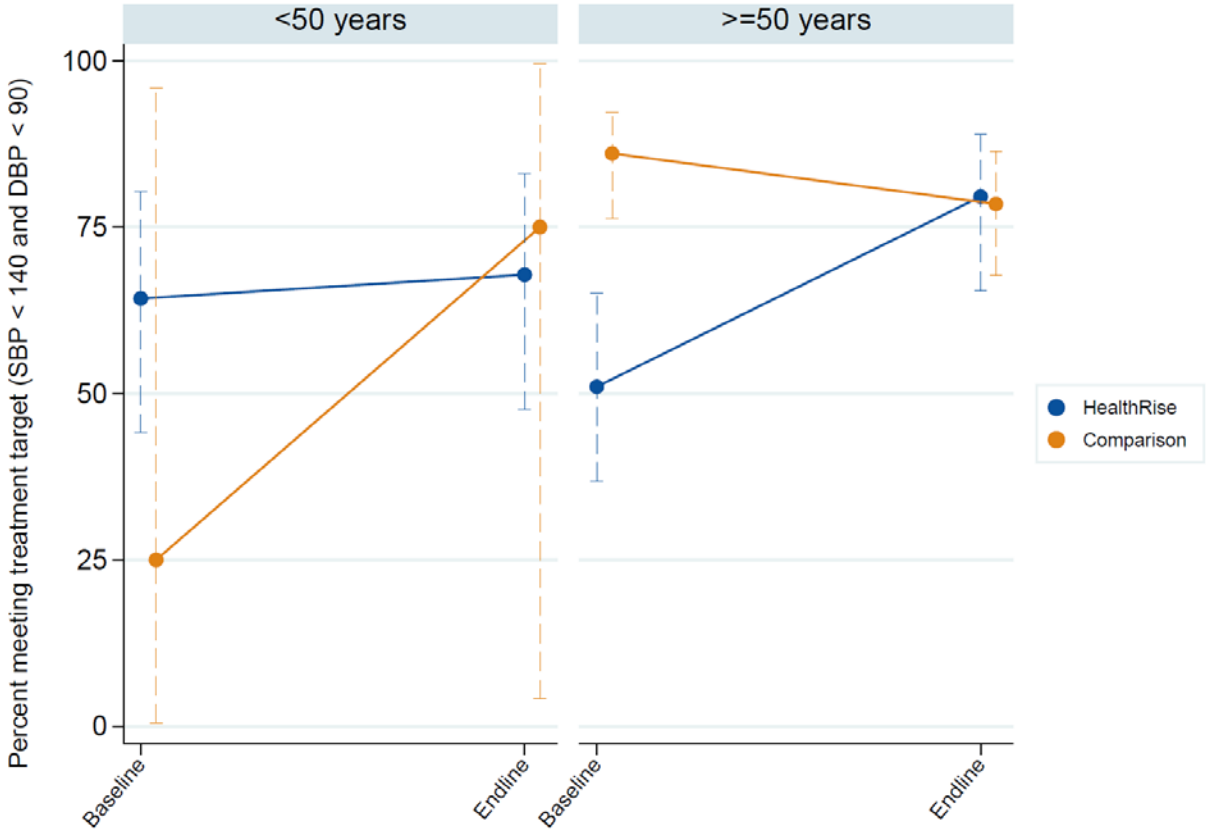

Figure 67. Hennepin County: Comparing hypertension control among HealthRise and comparison patients at baseline and endline by age group. *Controlled cases are individuals who are considered a prevalent case and then have blood pressure measures below 140 mmHg for systolic and 90 mmHg for diastolic; if only systolic measures were available for a given individual, then only the 140 mmHg threshold was applied. Prevalent cases were either individuals who reported being diagnosed with hypertension or had blood pressure measures that equaled or exceeded 140 mmHg for systolic or 90 mmHg for diastolic.*

Emergency department visits and hospitalizations. From baseline to endline, no clear-cut patterns emerged regarding the percentage of patients with emergency department visits or hospitalizations (Figures 68 and 69). While HealthRise patients generally averaged more visits and a higher percentage of patients had at least one emergency department visit or hospitalization, it could not be determined whether these trends reflect other important factors (i.e., greater access and thus more contacts with the health care system; fundamentally different health needs and challenges being experienced by population).

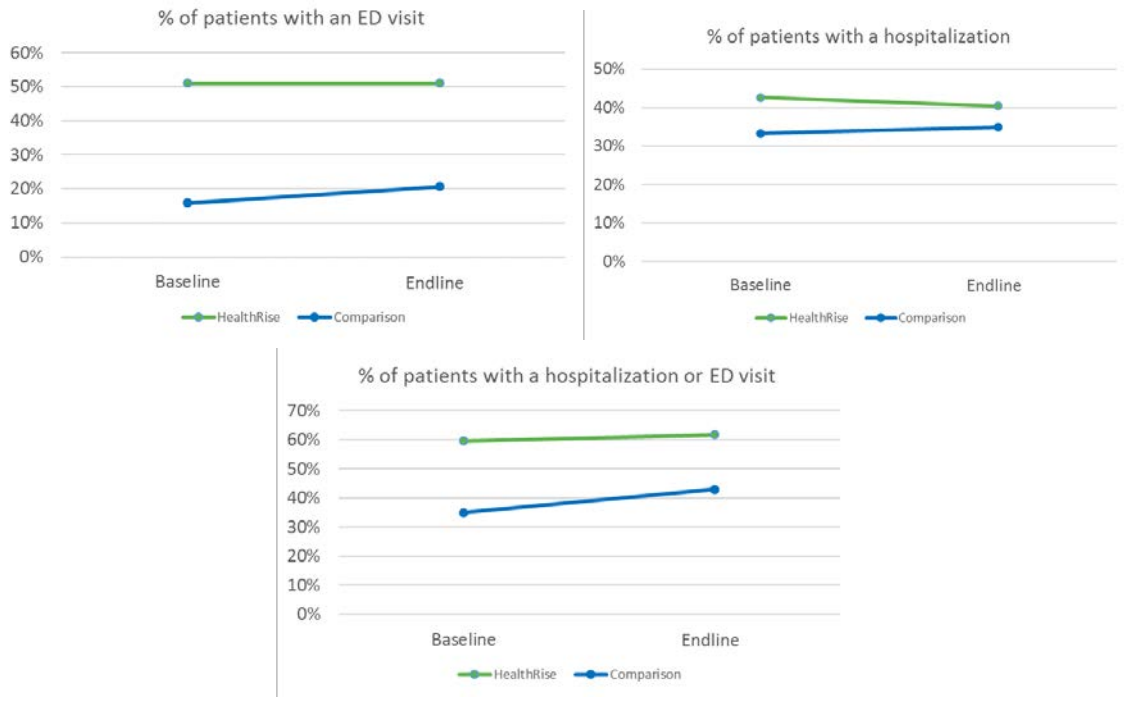

Figure 68. Hennepin County: Comparing the percentage of HealthRise and comparison patients with hospitalizations and/or emergency department visits, baseline and endline

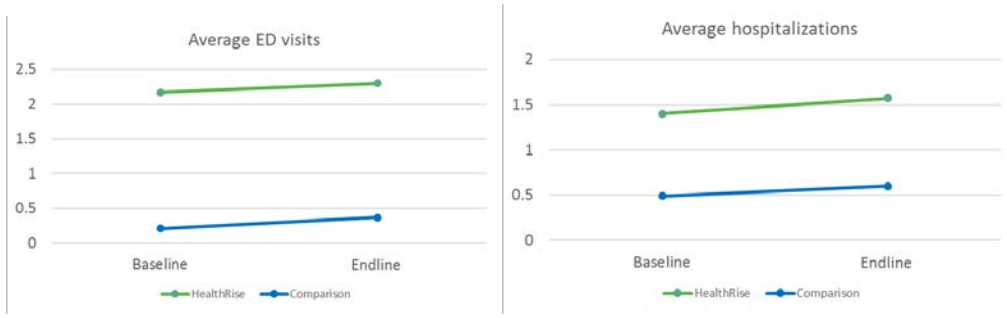

Figure 69. Hennepin County: Comparing average hospitalizations and emergency department visits among HealthRise and comparison patients, baseline and endline

Qualitative

In the United States, key informant interviews were held with 20 administrators, clinic-based providers, and in-home providers, representing each of the three grantee organizations, as well as with three policymakers whose work relates to all three sites. No patient focus group discussions were conducted, nor were any qualitative data collected from comparison locations. Key themes emerging from the US qualitative data are presented below. The US was unique in also having a midline qualitative assessment conducted in January and February 2018; key findings from the endline evaluation are also compared with the midline qualitative findings.

Themes

Key features of HealthRise programs

Interviewees consistently described the in-home providers – community health workers (CHWs) and community paramedics (CPs) – as central to the success of the HealthRise model. Clinic-based providers described the immense value of information gained by meeting patients outside the clinic, and CHWs were viewed as critical to bridging language and cultural divides with patients. Other key components of the HealthRise model were the emphasis on care coordination and extending care outside the clinic, and the focus on social determinants of health, particularly food access and nutrition. Interviewees discussed the time investment needed to build strong relationships, both between providers and patients and across care teams. In working with patients, consistency was mentioned as particularly critical to seeing improvements.

> "…through care coordination, communication, and use of frontline health workers…in ways we've never been able to before, connect[ing] with families and follow[ing] up with specific patients to help them really understand and manage their chronic disease." – *Clinic-based provider*

> "There are so many hard things about managing diabetes...it takes so much time for any patient to fully understand how to put the different parts of diabetes treatment together...giving people the time they need to really understand all the components of diabetes control...that's where our CHWs have really been massive assets." – *Clinic-based provider*

> "If 80% of health happens outside the clinical setting, what are the ways we can foster healthy environments that allow individuals more capacity and agency to focus on these chronic diseases?" – *Administrator*

Program strengths

Overall, interviewees were overwhelmingly positive about HealthRise and mentioned several key strengths of the program. The global dimension and opportunity for international learning were considered novel and exciting aspects, particularly because HealthRise is one of the earlier programs to generate evidence on the impact of CHWs and CPs in the US, where this research is still very nascent. In particular, this program introduced many clinical staff to in-home providers for the first time and demonstrated the value of this type of provider in improving patient care. By the end of the program, staff felt strong relationships had been built between these different types of providers. Interviewees described the HealthRise care model as creating opportunities to deliver care not possible during the limited time of a clinical interaction and reported many patients expressing gratitude for the extra support they received.

> "The global aspect is quite unique…utilizing similar strategies in different countries with very different health systems but with a similar population focus and similar workforce approaches…. I'm not aware of other projects that have attempted that across a set of different jurisdictions and landscapes." – *Policymaker*

> "I'm hopeful that the data that comes out of HealthRise will really move the discussion...demonstrating that frontline workers do make a difference in outcomes for underserved populations, that's been a huge gap in the policy discussion...most of the efforts are grant funded, one off, and don't include a rich evaluation...I think that will be incredibly influential in policy discussions going forward." – *Policymaker*

> "I will go to the ends of the Earth to support the CHWs." – *Clinic-based provider*

> "The home visits contributed to more rational use of clinic time…and improved care on my end. From listening to CHWs, I have a better understanding of what's going on in people's lives." – *Clinic-based provider*

Challenges

Several key challenges were consistently raised in the interviews. Two of these related to program design: difficulty communicating between the large number of organizations involved in HealthRise and the pressure to meet expectations for improvements in clinical outcomes in a short time period. As described above, because many people involved were previously unfamiliar with in-home providers, this presented difficulties. Some clinical providers were initially skeptical about the value of in-home providers and why they would be added to the care team. Within the grantee organizations, there was a lack of experience managing CHWs and CPs, which required administrators to learn and make adjustments. Data sharing was another major challenge mentioned repeatedly by interviewees – with difficulties arising from the lack of interoperability across health systems and different electronic medical record (EMR) systems. Providers, both clinic-based and in-home, mentioned challenges arising in their work specifically with patients. Many of the HealthRise patients were facing other major difficulties in their lives, such as financial or employment problems or strained personal relationships, which took priority over their health. Relatedly, it was difficult to support patients in maintaining positive changes when they face systemic barriers to health and health care.

> "It was too short of a time...it took forever to get these communities up and running, get people hired...people quit, etc...need a longer lifespan than three years...to show enough impact to indicate policy change." – *Policymaker*

> "We've learned that a lot of the hurdle we have to get past is educating other health care providers on what we do…what is a CP and how can we be part of their team and help to better serve their patients...the ones who do now understand our role...they are our champions, they get so excited...we definitely see resistance in the beginning." – *CP*

> "The workforce innovation, what it takes to implement that - more technical assistance on what it takes to introduce CHWs and CPs could have been helpful…because these roles are relatively new in the US." – *Policymaker*

> "One of the largest hurdles and barrier to successful implementation was the lack of cohesive patient data systems…you need layers of permission, use agreements, consent, you can't compare across systems, you can't look at anybody's system but your own...if somebody could fix that, we could do a lot more good." – *Administrator*

> "It's hard to shift people's attention to these things....a standard family has one working one shift, one working the other shift, someone home for their kids all the time, and avoiding INS, staying away from police, putting food on the table, keeping kids off chemicals, way down the line is fruits and vegetables....a lot of higher priorities." – *Clinic-based provider*

The challenges noted above apply to all three grantee organizations; however, there were other issues encountered by only one or two of the grantees. Interviewees affiliated with HealthFinders mentioned the long time period spent consenting patients to enroll as a challenge during the initial phase of the program. In addition, the CPs employed by HealthFinders lacked the necessary language skills to communicate with their patient population, which also posed a challenge. At PUC, interviewees discussed problems with CHW turnover, including a gap when no CHWs were employed. Interviewees from Regions also mentioned problems with CHW turnover as well as turnover in program management staff. In addition to the EMR interoperability issues discussed above, both PUC and Regions had the additional challenge that there were

no centralized EMRs that were accessible to the full care team, and in-home providers were not even able to write in these records. Interviewees from Regions also mentioned regretting that initial patient consent forms did not include access to data from the EMR system covering all hospitals (Epic Care), which would have facilitated examining impacts on hospital admissions.

> "It's a Catch-22 because demand for CHWs is growing...but if you can't offer a full-time position, they will soon be recruited by an organization that can offer full-time work...we invested a lot of time in recruiting and training." – *Administrator*

> "That was probably one of my biggest frustrations…how we were going to document had not been worked out before we started seeing patients…we really had nowhere to document for the first many months...not only was I trying to keep up with current documentation but going back to old visits, trying to get them in...the documentation piece was really challenging." – *CP*

Impacts of HealthRise

The qualitative data revealed ways HealthRise affected staff, patients, and relationships, some of which are difficult to capture with quantitative indicators. Clinical providers described the immense value of the information gained from home visits in improving the quality and efficiency of clinical interactions, particularly how such visits could elucidate patient misconceptions, e.g., about medication dosing, after clinical appointments. Most staff did not describe major changes in their workload as a result of HealthRise. Many interviewees expressed the belief that it was valuable to pair a CP with a CHW, whom they viewed as having complementary skill sets. Home visits were also found to facilitate the connection of patients with non-clinical resources, such as housing, that could improve their health. Having positive impacts on patients was of course a primary goal of HealthRise, and staff shared many stories of individual patients whose health had improved, even if not captured by clinical indicators, and whose lives had changed for the better. These impacts were described as extending beyond enrolled patients to also positively affect their families. As a result of the many positive impacts and experiences grantees had with HealthRise, several organizations and institutions that were exposed to the program reported working to institutionalize or adopt CHWs and/or CPs as part of their care model.

> "Our CHWs have taken us from a thinner level of communication and trust to a much deeper one…they've really been able to come to a deeper evaluation of people's problems and concerns." – *Clinic-based provider*

> "There's just a synergy when you combine the two...the CP and the medical side and the CHW looking at the social issues...it was kind of exponential how much benefit we were able to provide versus just one or the other." – *CP*

> "We have nutritionists and a diabetic educator in the clinic, but patients for a variety of reasons are not always open to meeting with them….to have somebody go to their house and figure out what their specific food interests are and come up with recipes, that was great." – *Clinic-based provider*

> "The Latino community is very appreciative of the opportunity." – *CHW*

> "I wish there was a happiness scale…how do you measure that? Where do you measure that? Where do you write that down?...that's the key element that we're providing and working on, but yet we have no way to track." – *CHW*

Ideas for improvement

Some of the ideas for improving HealthRise arise directly from challenges encountered while implementing the program. The most common idea raised was the need to develop EMR software better tailored to care teams that include in-home providers, in order to facilitate communication between different types of providers and coordinate home-based and clinical care. Interviewees also frequently mentioned the need for more resources to support mental health, as many of the enrolled patients also suffered from diagnosed or undiagnosed mental health conditions. The in-home providers discussed additional types of trainings that would better support them in their role – specifically, motivational interviewing training, which some received and found very valuable, and support for coping with emotionally challenging situations they encountered or that were shared by patients they visited. Lastly, interviewees discussed the need to identify the ideal duration for frequent patient home visits; based on their experiences, they believed there was an amount of time that was too short and too long and the prescribed duration required fine-tuning.

> "EMRs are designed around providers and reimbursements, our model is around holistic care coordination across contexts. The tools we have been using are imperfect, we're looking for other tools that might be able to plug in to our model better...We haven't found yet the silver bullet." – *Administrator*

> "Would be nice to add in a mental health component…we saw a lot of barriers associated with mental health and didn't feel super well equipped." – *CP*

> "We were a lot of times the one that would receive the initial response of what they were really going through...for example, sexual abuse in the home...I wish there would have been more training for us...we didn't know how to sufficiently respond...if you don't respond correctly, they may not open up again...the training or the debriefing after...would have been nice. It was very hard." – *CHW*

Expanding on the HealthRise model

Looking forward, interviewees had several ideas about how the HealthRise model could be expanded and adapted to new locations and conditions. Overall, they were very enthusiastic about CHWs and CPs and suggested that they be used in as many places as possible. Interviewees expressed the belief that there was potential for in-home providers to add value particularly in caring for patients with other chronic diseases and mental health conditions or to facilitate telehealth visits with a specialist and an in-home provider present. Other comments relating to future applications of the HealthRise model focused on financing issues. Many interviewees mentioned the challenge of identifying sustainable sources of funding for CHWs and CPs, describing existing payment systems acting as a hurdle to paying for in-home providers. There was a general consensus that CHWs and CPs are highly cost-effective, but that a lack of concrete data proving this remains a barrier and that more evidence supporting their utilization is needed.

> "I think it should be implemented everywhere…that's the response we're getting from our partners, from others in the health care setting…everyone is saying 'CHW! I need 7 of you in my facility!'…everyone has a million questions about how to get it started, set up...I definitely think it's a model to follow." – *CHW*

> "We're aggressively moving into providing more mental health care, plugging it into our model that we've perfected during HealthRise…Behavioral health, mental health, and chemical dependency are NCDs, similar to diabetes in that it's all about what happens in the meantime." – *Administrator*

> "Always challenges in trying to find sustainable funding and build a model that can leverage sustainable funding and continue…part is a policy issue, part is the way our system is structured…for CHWs and CPs, there is

> Medicaid payment available to reimburse, but it's not sustainable…any project like this is going to run into that challenge." – *Policymaker*

> "Looking at the global dimension, what is it in the other countries...what is that has made CHWs so integral and accepted...how can the US move in that direction? Are the systems so different that there can't be lessons learned or is there a lot that could be integrated in future projects that seek to move CHWs into a more mainstream role?" – *Policymaker*

The endline interviews confirmed key findings from the midline assessment. The midline interviews, which reflected staff perspectives as well as those of five patients, identified several of the same strengths, successes, and challenges. Successes included the value of pairing CHWs and CPs as a team, the strong relationships built between providers and patients, and introducing in-home providers as a new role in the health system. Noted challenges included documentation, data sharing, and the need for substantial time to develop relationships and achieve measurable results. The following recommendations from the midline assessment were substantiated by the endline evaluation:

- CP and CHW home visits improve patient care
- Need to address prevalent mental health issues among patients
- Need mechanisms to sustainably fund in-home providers
- Longer time period is required for expected results
- Need to improve EMR/documentation strategy
- Educating clinical providers on CHW/CP role can facilitate acceptance and cooperation

Cross-Country Results and Conclusions

Achievements of HealthRise

There are many measures that can be used to communicate the accomplishments of HealthRise across the four countries: the number of people screened, providers trained, new programs established, medicines dispensed, home visits conducted, changes in patients' clinical indicators, and stories of changed lives or attitudes from patients and providers, among many others. The preceding chapters have described the findings from quantitative and qualitative data collected at endline in each country, providing detailed results specific to each HealthRise site. Here, we summarize major findings from the endline evaluation and aggregate these results to present the overall impacts of HealthRise across the four countries.

A few key indicators demonstrate the scale of HealthRise's global work over the five years of the program.

- **59,342** previously undiagnosed people screened for hypertension (6 sites)
- **6,441** cases of high blood pressure identified among previously undiagnosed persons (6 sites)
- **56,642** previously undiagnosed people screened for diabetes (6 sites)
- **2,563** cases of high blood sugar identified among previously undiagnosed persons (6 sites)
- **3,637** health workers trained (total from 9 sites)
- **710** support group/NCD meetings held (total from 4 sites)
- **3,139** patients enrolled for hypertension with blood pressure controlled at last appointment (total from 9 sites)
- **1,034** patients enrolled for diabetes with blood sugar controlled at last appointment (total from 9 sites)

These numbers exemplify the scope and reach of HealthRise and the large numbers of lives touched by its various programs. Tens of thousands of people across three countries were screened for NCDs, and well over 3,500 health workers received additional training. HealthRise helped more than 3,000 hypertension patients and more than 1,000 diabetes patients meet clinical targets and bring their condition under control. Each of these impacts has additional effects on patients' health and well-being and the ability of health systems to support NCD patients that will continue into the future.

One challenge HealthRise faced in demonstrating its impact was the relatively short time frame of implementation to observe meaningful changes in patients' clinical indicators, which can take months or years to significantly change and, particularly, to reach treatment targets. Despite this, in several sites, measurable clinical improvements were found among HealthRise patients. In Brazil, enrolled patients in both sites had statistically significant declines in blood pressure and A1c between baseline and endline. In Rice County, US, HealthRise patients had improved, although not statistically significant, diabetes control between baseline and endline. In both Hennepin County and Ramsey County, there was an increase in the proportion of patients with controlled diabetes at endline versus baseline, versus no change in this measure among comparison patients. In addition to impacts on patients, there were important observable differences in the quantity and

quality of health services offered as a result of HealthRise. In Shimla, facilities in HealthRise blocks had higher rates of e-clinic and HealthCard application availability than facilities in comparison blocks. Results from the Pixley ka Seme suggest that the implementation of HealthRise was associated with an increase in facility staff, particularly community caregivers. The demand on health services due to increased utilization related to HealthRise also had some unintended impacts that may have strained health services. For example, in Shimla, HealthRise facilities were found to have lower stocks of hypertension and diabetes medications on average at endline than at baseline.

From the qualitative data, there were many powerful stories of how patients and their families were affected by participating in HealthRise and examples of providers who grew in their ability to provide care for NCD patients or changed their perceptions about home-based providers as a result of new appreciation for their value in a care team. There were also many challenges mentioned and several suggestions for ways to improve programs. Major themes emerging from these findings across countries are presented in the following section.

Cross-Cutting Themes

Frontline Health Workers

A resounding theme from interviews and focus group discussions across countries and with all types of participants was the essential role of frontline health workers in the HealthRise model and their unique role in patient care. Furthermore, HealthRise measured the contribution of frontline health workers by capturing their value added in an objective and quantifiable way through changes in clinical outcomes for patients under their care. In the United States, HealthRise introduced many clinic-based providers and staff to CHWs and CPs for the first time, in many cases overcoming initial skepticism to demonstrate the immense value their perspective could bring to improve clinical interactions. In India, HealthRise expanded the role of ASHAs in many communities where they had previously focused only on maternal and child health and infectious diseases to include education, screening, and follow-up care for NCDs. In South Africa, community caregivers helped to improve medication adherence by bringing treatment to patients in their homes, allowing them to skip long or expensive trips to health facilities, and avoid long wait times at facilities. In Brazil, CHWs brought tablets into patients' homes, enhancing their visits by having access to additional information.

Across these various contexts, frontline health workers were praised for their ability to connect with patients and to overcome barriers of all kinds – linguistic, cultural, geographic – to provide care. A key attribute of these providers that was frequently emphasized was the immeasurable value of employing people from the communities that were served – people who understood the patients and gained their trust quickly. Another key element of the patient and home-based provider relationship was time. Many people described how much more could be accomplished in a home visit compared to a rushed or limited clinical appointment. Time was also significant in terms of the duration of frontline providers' investment in patients, strengthening these relationships over the course of multiple visits to develop better understanding of their needs and challenges.

> "All health-related programs that were given the ASHA workers, there have been advantages due to it." – *Clinic provider, India*

> "I also trust the care givers because they go door to door, they have time to check the patient thoroughly." – *Patient, South Africa*

"I worry less about my HealthRise patients, I worry less about our patients that are being followed by a CHW." – *Clinic provider, US*

"In the NCD program, we have included the ASHAs and in my opinion it is one of the best steps that have been taken by the government." – *Administrator, India*

"They ask like family members, sit close by, with love, they explain properly." – *Patient, India*

"They are not people from outside, but they are people among us. They did not come from foreign, they are our people." – *Patient, India*

"CHWs are speaking from their hearts and lived experiences...it's critical...everybody should have CHWs...I think clinics would be amazed." – *Clinic provider, US*

Patient Empowerment

Not much is known about how to measure patient empowerment in a meaningful way, and furthermore, with a measure that can serve as a proxy for health outcomes. In the sparse research on patient empowerment, a validated measure that has a clear correlation with health outcomes and can be used in diverse cultural and linguistic settings does not exist. In the absence of such a measure, qualitative findings and process indicators are used to assess the possible impacts of HealthRise on patient empowerment. Patients participating in HealthRise described many ways the program increased their knowledge about NCDs and empowered them to manage their illnesses more effectively. Likewise, providers described dramatic changes in some, but not all, patients' health, behaviors, and commitment to taking medication and attending checkups, as well as in the general level of knowledge about NCDs in communities.

Across countries, HealthRise succeeded in educating patients about symptoms of NCDs; risk factors; and disease management through healthy lifestyles and adherence to medication. Through tens of thousands of screenings in the four countries, HealthRise identified thousands of cases of hypertension and diabetes at less advanced stages and increased awareness of the importance of early detection. Selected facilities implemented patient support groups, which connected individuals with diabetes and hypertension to provide mutual support and encouragement. These groups were very well-received where they were implemented, and substantial demand was expressed to expand these to additional locations. The benefits of increased awareness and empowerment spread beyond HealthRise patients to reach their families and communities. In the US, families shared healthy eating habits by utilizing recipes learned in nutrition classes. In India, patients and providers started walking groups in their communities. As a result of the support and information provided through HealthRise, patients expressed more hope and confidence in their ability to live well despite their NCD diagnosis.

"I would like the clinics to teach people about chronic sickness, everyone not just us so that people will not panic, so that they will know what to do next and they should also encourage people to go test at the clinics, they shouldn't be afraid to test for any type of sickness, even if they are not sick." – *Patient, South Africa*

"They got a device that you take home with you to monitor your blood pressure." – *Patient, Brazil*

"I was really grateful for the program because there were so many patients who clearly just didn't get it and weren't doing well and were slipping, and I feel like the HealthRise program was really there to catch them." – *Clinic provider, US*

"After tests, I came to know and now I believe that even we can have a good life ahead." – *Patient, India*

"Each person is their own professional, knows what makes them happy, and knows what they want to work on, and we're here to listen and support that, support their goals." – *In-home provider, US*

> "Now I think that this is nothing, if I keep myself better, if I take medicines and follow abstinence and food habit I will be fine." – *Patient, India*

Health Systems

Many of the challenges raised by HealthRise patients and providers in all contexts were related to weaknesses in the broader health systems within which these programs operated. In Brazil, India, and South Africa, participants described frustrations with medication stock-outs, staff shortages, and long wait times at facilities. In the US, a major challenge raised was the relative absence of home-based providers before the program, which created uncertainty among clinic-based providers about this new role in the care team, and logistical hurdles for administrators not familiar with managing this type of staff. In all four countries, maintaining patient data, records, and reporting were described as problematic – whether it was CHWs unable to write in patient charts in the US or the inability for a patient's records to be linked across visits at public facilities in India. These various challenges emphasize the importance of a strong underlying health system to a successful program, and likewise, the need to anticipate and adopt programs to accommodate known weaknesses of the health system. Ultimately, program success may be constrained by the capacity of the health system to provide the needed staff, facilities, and services.

> "As you can see, we got here at the clinic at 6am but here we are still waiting for assistance." – *Patient, South Africa*

> "Not always we can refer a patient to the nutritionist or to the physiotherapist, there are too many patients to such a reduced team." – *Frontline health worker, Brazil*

> "We get our medicines. Sometimes when it is not available for two-three months, we buy them from the market." – *Patient, India*

> "More health workers should be hired so that the population can be easily accessed. Some people might not get facilities as there are for example 1 health worker to deal with a thousand people…There should be given funds to develop the infrastructure." – *Clinic provider, India*

> "The equipment that you use it's... it's for like in our days, not for now, not for this era." – *Nurse, South Africa*

Innovations

As a whole, HealthRise was an innovative program in many respects – in its international design, emphasis on using frontline health workers for NCD care, and public-private partnerships – among other features. Furthermore, within this overall structure, the opportunity for each country and grantee to tailor the program to the local context gave grantees the flexibility to develop further innovations; novel services and structures were explored in each of the four countries. In Brazil, this included connecting patient records across various platforms and holding exams and screenings in primary healthcare facilities, homes and workplaces; the latter was also explored in South Africa. Grantees in India started e-clinics and developed the HealthCard app, both of which are being adopted by the government following the example of HealthRise. In the US, key innovations included the NorthMarket grocery store and pairing CPs with CHWs as a dynamic team. Task-shifting and engaging community members in health care provision were tested in South Africa, Brazil, and India.

> "If one person goes ten times to the government it is counted as ten." [on benefits of HMIS advances] – *Program Official, India*

"Continuing to think outside the box, because the box isn't working for a lot of people" – *In-home provider, US*

"We check the patient's data, knowing when they went to hospital; it has become easier for us and patients." – *CHW, India*

"E-clinics give the same care as hospitals and time is saved." – *Administrator, India*

"They didn't use computers before and now they use it. And there is everything in there…the frequency we go to the health unit, the medication we take…" – *Patient, Brazil*

Care Coordination

A major emphasis of HealthRise programs in all sites was care coordination – linking different types of providers, various locations, and diverse information systems – to provide more efficient and effective care for patients. One key aspect of coordination was between clinic-based providers and in-home providers; information gained during home visits helped to improve clinical interactions, and in-home providers followed up with patients to reinforce recommendations from clinic-based providers and check in with patients who missed appointments. Largely through the use of frontline providers, care was also coordinated between traditional facility settings and mobile clinics, patients' homes, and other settings in communities where screening camps, education sessions, and support groups were held. Through the development and creative of use of new technologies, patients' data were linked across care settings and between visits, and providers were able to communicate with one another – this ranged from clinics in the US testing different EMR systems to CHWs in India filling HealthCards on mobile devices and communicating through WhatsApp, and SMS messages to facilitate communication with patients and the clinical support system in Brazil.

"I think the EMR resulted in a better way of communicating about the patient…any professional can now access the information stored in there." – *Frontline health worker, Brazil*

"We need family health teams who would be able to link all the needs of the family to relevant programs. Community health care workers also need to be included." – *Frontline caregiver, South Africa*

"A lot of what we did was design care coordination, work flows...we brought together the whole local health system...developing somewhat unique referral pathways and communication flows from referral clinics and partners...a closed loop back to our care coordination and clinic-based team." – *Administrator, US*

"Having all these people at the table meant the needs of the patients were more readily met and ultimately…that built trust with the patient, everything improved, the patient came to the clinic more and was more up front about their struggles." – *Administrator, US*

"Before the program, there was not much communication with the doctors and the nurses. Our work is usually with people from the community only. The HealthRise program has helped us in increasing our communication with officials at the clinic…Our rapport with doctors and nurses has improved." – *CHW, India*

"They do the counseling, our work becomes easier, we just need to prescribe the meds." – *Trainer, India*

"We work as a family, we help them in the areas they lack knowledge, sometimes they ask us outside of our working hours." [on working with CHWs] – *Clinic provider, India*

Social Determinants of Health

In describing the unique features of HealthRise and the key elements of its success, the social determinants of health were a pervasive underlying theme. In all four countries, the populations served by HealthRise faced many persistent challenges to their health and access to health care, including poverty, lack of education, poor housing conditions, limited access to affordable and nutritious food, a lack of reliable and efficient transportation, difficult working conditions, and strained personal relationships, to name a few. Not all HealthRise patients faced each of these challenges, but these barriers to health and health care are pervasive in the populations served in all four countries. Many of the services that HealthRise offered sought to overcome or were designed to accommodate these known barriers. The emphasis on health education in all countries helped to address knowledge gaps in part attributable to low levels of formal education. Taking care to patients in their homes was an effective strategy for overcoming transportation challenges in getting to health facilities or accommodating patients' schedules when they were unable to take time off of work. Despite these and other ways HealthRise incorporated consideration of social determinants of health into the program design, many of these factors will persistently challenge patients' ability to manage their NCDs. Maintaining health requires patients to be able to find time and safe space for exercise, afford and access healthy food, and have a reliable budget to pay for treatment, among other ongoing challenges.

> "Many of the diagnoses we were seeing were directly related to social determinants of health, particularly healthy food access and access to affordable and culturally appropriate clinical care." – *Administrator, US*

> "Hospital is far and it is expensive to get there. If one doesn't have cash, he can't get to the hospital. We then use the services of prophets and traditional healers." – *Patient, SA*

> "It also depends on our quality of life, but you need to eat healthier and exercise as well." – *Patient, Brazil*

Sustainability

A common question that arose when reflecting on HealthRise and its impact was the future of the program – will it continue? where should it expand? how should the model evolve to incorporate other conditions? who will pay for it? what lessons will be adopted by local governments? These were concerns raised in all sites. In India, HealthRise was closely integrated with the government NCD program, which has already chosen to adopt some of the tools and programming developed by HealthRise. In the US, grantees described many institutions that, as a result of positive experiences with CHWs and CPs, were working to integrate these roles into their care teams. In Brazil, the HealthRise program was developed and operated in close coordination with the public health system. Moreoever, local partners in Brazil, in collaboration with the Albert Einstein Hospital, will continue to conduct certain elements of the HealthRise program and build upon existing HealthRise systems to develop machine-learning prediction models aimed at improving care for NCD patients.

Overall, participants in all countries were enthusiastic about the HealthRise model and expressed support for expanding the program to cover larger populations and to incorporate care for other NCDs, including mental health conditions. However, as a grant-funded program, each site faces the challenge to identify new sources of financing.

> "And they came to the clinic because they were told to go to the clinic...the sustainability now, of them coming to the clinic every monthly or every two months, however it happens. There is nothing like that…because we don't have like those resources" – *Nurse, SA*

"We involved government workers also so that tomorrow if the project is closed when we go, we can create a sustainable system." – *Program Official, India*

"Grant funding allows a CHW to really build those relationships…when they focus on exclusively what they can get paid for, that limits the role." – *Policymaker, US*

"The program has increased our awareness about diabetes and hypertension…now we need to keep it going" – *Frontline health worker, Brazil*

Global Challenges and Ideas for Improvement

As HealthRise was implemented, there were several challenges shared across sites. Many sites reported difficulties with participant retention and follow-up care. Retention was a problem not only for participants but also with staff, with many sites reporting particularly high turnover for CHWs. A universal frustration was the pressure to demonstrate impact through improved clinical outcomes in a relatively short implementation period, particularly among grantees that needed more time to get the program started. Staff expressed the difficulties posed by communicating among the large number of organizations involved in HealthRise globally. People also expressed the need to build recognition of and appreciation for the value of frontline workers among communities and clinical providers, who were not always initially very receptive to them.

In all four countries, differences were observed at baseline in the cascade of care by sex and age group, and at endline, many impacts were more positive for females than males. This suggests that alternative strategies may be required to most effectively encourage screening and care-seeking among different subpopulations, particularly for males as compared to females. One possible interpretation of the observed effects is that the HealthRise model, focused largely on home visits, was more effective for females, who in many communities are more likely to be at home during the day. Females are also more likely to attend a consultation or an event at a health facility, which may be driven in part by males facing greater constraints from being unable to miss work, as well as other cultural factors. Vitória da Conquista, Brazil, was the only site that designed an intervention focused on industry working men, but even with a clinic functioning during night time, it was still difficult to enroll and monitor these patients (for example, no patient from this group had more than one blood sugar/blood pressure reading recorded). In South Africa, one screening event was held at select workplaces to try to screen more males, but even this resulted in 650 females and 312 males participating. These examples highlight that the challenge is not only facility operating hours, but more broadly to develop strategies to better incorporate males into the health system.

HealthRise participants representing each country and grantee organization expressed unique ideas to improve upon the initial design and implementation of the program, but within these site-specific ideas, a few common themes emerged. First, there was a broad recommendation to incorporate mental health conditions. Providers expressed the belief that these conditions were well-suited to a similar care model and that the high prevalence of these conditions among the patient population made these important targets for additional health services. Second, HealthRise staff requested additional and ongoing trainings to improve their ability to deliver high-quality care to patients. These included requests for refresher trainings from CHWs learning how to care for their first NCD patients; suggestions to incorporate more hands-on practice with testing equipment from providers not previously familiar with conducting blood pressure and glucose tests; and the idea to more widely utilize training on motivational interviewing, which some CHWs had the opportunity to

experience and found very valuable. Lastly, although patient record systems vary drastically across the HealthRise countries, there was an overarching suggestion that these systems require improvements, whether developing new systems or implementing software or tools to improve existing systems. In particular, the hope was that such improvements could better track patient attendance and coordinate care.

Implications for Research and Policy

Research

The new data collected through HealthRise and the identified successes and challenges in providing a wide range of programs for NCD prevention and treatment point to several key areas for future research. First, there is a need for additional understanding of the best ways to train and utilize frontline health workers. Many in-home providers interviewed for HealthRise suggested additional trainings would be beneficial, others expressed the need to identify the ideal duration and frequency for home visits with patients, and many suggested additional conditions that they believe in-home providers are well-suited to provide care for. Each of these issues requires further research globally, as well as locally, to understand how these and other answers vary based on wide range of contextual factors. A second area for further research and development is continuing to advance technologies for care coordination. During HealthRise, providers in the US encountered many challenges in syncing and sharing patient information through electronic medical records; in India, providers tested a new application for collecting information on NCD risk factors from screenings, but encountered technical difficulties with the new software; and in many HealthRise sites, providers reported frequent communication via WhatsApp and texting, but network problems often delayed data uploads and information sharing. Developing new health information technologies that address these and other challenges arising from the need to collect, store, and share patient data will help to improve the coordination and timeliness of care provided to patients. A third research priority is developing measures of patient empowerment that are correlated with health outcomes and validated in diverse cultural and linguistic settings. There is not a large volume of research on meaningful measures of patient empowerment, and more work is needed in this area. Finally, there are many specific and nuanced research topics highlighted by HealthRise with regard to refining and tailoring various intervention components to be most effective and best-suited to different populations. For example, the content and key messages of street plays should be tested and examined to identify those that most successfully increase community awareness of NCD risk factors, and the accuracy of diagnoses provided through e-clinics should be compared for different conditions to identify the ideal applications of these services. These and other details of the design of the many interventions explored through HealthRise require further investigation and development to improve their effectiveness.

Policy

The needs assessment, monitoring, and endline evaluation generated substantial new evidence on the prevalence of diabetes, hypertension, and high cholesterol, as well as key risk factors, and the state of NCD care in Brazil, India, South Africa, and the United States. This valuable new information can inform facility-level and local policies in the nine communities where HealthRise programs were active; identify national priorities for the prevention and treatment of the growing burden of NCDs; and help improve the design of NCD programs and initiatives globally through the common challenges and opportunities identified across the wide range of contexts examined during HealthRise.

Specific challenges encountered in each of the nine HealthRise sites can help to set priorities and guide local and facility-level decisions regarding NCD care. At facilities in Brazil, in both Teófilo Otoni and Vitória da Conquista, A1c testing was not readily available because the public system only pays for fasting plasma glucose testing. Local governments and facilities should consider subsidizing the costs of A1c tests, which are essential to diabetes patient monitoring. Also in these two sites, medication adherence was low; policies that support improved medication adherence, including increasing the reliability or ease of accessing medications, are needed. In Shimla, India, there was a large unmet demand for patient support groups, which facilities may want to consider scaling up or establishing in places where they do not already exist. In the uMgungundlovu district of KwaZulu-Natal, South Africa, staff described unintended impacts from the adoption of a strategy to centralize care for all chronic patients, which led to longer wait times for elderly NCD patients needing to refill medications. Facilities may want to consider streamlining procedures for refilling medications or attending to these patients through a dedicated medication service. In Pixley ka Seme, in the Northern Cape, facility staff described low levels of health awareness within the community and advocated for organizing talks, health days, or other community events to increase knowledge of NCDs, risk factors, and treatment. In the US, in Rice County, there was an identified need to either train or recruit community paramedics with the necessary language skills to communicate with the patient population. In Ramsey County, many community health workers were lost to competing jobs, suggesting it may be beneficial to increase the size of the local CHW work force. In Hennepin County, CHWs were unable to write in patients' files; the local health system may need to adopt new electronic medical record software if it continues to expand the use of CHWs.

Several issues were identified that should inform health policy priorities in the participating countries at a national level. In all four locations, high rates of NCDs and key risk factors were found at baseline, reaffirming the need to continue developing and implementing policies aimed at preventing and controlling NCDs. This should include measures intended to curb consumption of harmful products, such as "sin" taxes, plain packaging for tobacco products, and improved nutrition labels, as well as expansion of screening programs to increase early detection. Many additional policies that improve access to health services and the affordability of treatment, and promote exercise and wellness should be considered and tailored on a country-specific basis. In Brazil, India, and South Africa, persistent weaknesses in the health system were encountered; staff shortages, medication stock-outs, long wait times, and difficulty accessing health facilities were common issues in all three countries. As the burden of NCDs continues to grow, it will be critical for these health systems to tackle these major weaknesses in facility infrastructure, transportation, staffing, and supplies, in order to treat these conditions more effectively. In the United States, it was evident that many providers and administrators previously had limited awareness of home-based providers and that additional work is required to increase awareness among health facility personnel, policymakers, and other health care leaders about the value of home-based providers. The findings from HealthRise suggest that greater use of community health workers and community paramedics can be a cost-effective component of care for NCDs, and possibly other conditions, in the United States and that this type of role should be greatly expanded.

At the global level, the overwhelming success of, and enthusiastic support for including home-based providers in NCD care strongly supports the wider use of frontline health workers as a component of a wide range of health programs. While continuous adaptations will be necessary as more care teams incorporate home-based care and these providers' scopes of work expand to include additional conditions, the consensus from HealthRise is that health systems in many countries and facilities in all types of communities should consider incorporating and integrating frontline health workers into their care models. A second major

implication for global policy is the need for greater emphasis in donor funding on strengthening health systems so they are better equipped to provide NCD care. Development assistance for health remains substantially skewed toward infectious diseases, which can be more readily prevented and treated through disease-specific programs. Treating NCDs requires patients to have consistent access to a well-coordinated care team and a reliable supply of medications; health systems in most low- and middle-income countries are currently ill-equipped to provide this type of care. Additional donor investments in health system strengthening are one avenue that can help support countries with low levels of domestic spending on health to improve their ability to meet the needs of the growing number of NCD patients.

Conclusion

HealthRise was an innovative initiative in many respects – the decision to focus on NCDs, which are still relatively underfunded worldwide; the cross-country design, targeting underserved communities in both the richest country in the world and three low- and middle-income countries; and the utilization of public-private partnerships in each country. Furthermore, grantees were provided substantial flexibility in designing each program, allowing each organization to implement sets of interventions that were highly tailored to the unique challenges of NCD prevention and treatment in nine different contexts. Above all, a significant feature of HealthRise was its emphasis on learning. A broad range of data were collected before, during, and after implementation, to support robust research on what worked well and to understand key challenges encountered. This endline evaluation attempts to synthesize the many lessons learned, highlight the most effective practices, point to key areas for future research, and identify policy priorities to guide future programs and interventions to prevent and treat NCDs worldwide.

Among many more detailed findings of this evaluation, HealthRise confirms the major contribution of NCDs to the global disease burden, finding a high prevalence of both these diseases and their leading risk factors in diverse communities in Brazil, India, South Africa, and the United States. Furthermore, weaknesses in the cascade of care are highlighted, with health systems not currently detecting or effectively treating most cases of diabetes or hypertension. The need for strong, well-functioning, and integrated health systems to support complex and ongoing NCD care is confirmed, and the particular benefits of incorporating home visits and having well-coordinated care are demonstrated. Several novel technological and programmatic innovations are tested, pointing to new avenues for research and development on ways to provide more efficient care and make the most of resources available in each health system. Finally, the role of communities underlies the HealthRise model, which emphasized the use of frontline health workers who have a unique connection to communities and specialize in treating disease from a more holistic perspective. The development of NCDs is deeply affected by social and environmental conditions, and combatting NCDs effectively requires health professionals partnering with communities to address social determinants of health, educate patients, instill healthy habits, improve norms around diet and exercise, and provide social support for patients and families coping with complex illnesses.

Appendix A – Supporting materials and documentation

Supporting materials and documentation are available online at the following web address:

http://www.healthdata.org/medtronic-healthrise

Appendix B – Brazil baseline household data collection

Methods

Setting

Household data collection was performed between October 2017 and December 2017 in two Brazilian municipalities: Padre Paraíso, Minas Gerais State, and Poções, Bahia State. These locations were chosen by key stakeholders given their status as underserved municipalities, their socioeconomic similarities to the intervention areas of Teófilo Otoni (Minas Gerais State) and Vitória da Conquista (Bahia state), and the presence of willing and interested government and non-governmental partners.

Sample size and sample design

Sample size was calculated based on the adult population of each municipality, considering a 95% confidence interval, a prevalence of hypertension (HTN) of 50%, and an estimated error of 3%. We aimed to survey 964 individuals in Padre Paraíso and 1,019 in Poções. Foreseeing the loss of participants due to unrealized interviews, a 15% increase in the size of the sample was stipulated.

Participants were selected through a two-stage sampling to survey a representative, noninstitutionalized sample of adults aged 30 years and older living in the urban and rural areas of both municipalities. In the first sampling stage, the probability of household selection was proportional to the number of households per census tract in each of the two locations according to the 2010 Brazilian census. In the second stage, individuals aged 30 years and older were randomly selected within the households. Only one resident was selected in each household, with equiprobability among all eligible residents.

Data collection

In both municipalities, trained research assistants conducted the surveys in the local language using computer-assisted personal interviewing software. The instrument was piloted prior to the initiation of the study. If the selected respondent was not available, the interviewers returned to the home up to two additional times. After three failed attempts at contacting the respondent, the interviewer was assigned a replacement household selected at random within the same census tract.

The household survey instrument collected information on sociodemographic background, risk factors, medical history, and knowledge, attitudes, and practices related to NCDs. Specifically, the level of physical activity was computed using the International Physical Activity Questionnaire (IPAQ). This instrument assesses the types and intensity of physical activity and sitting time that people do as part of their daily lives, which are used to estimate total physical activity in MET-min/week and time spent sitting. Individuals were then classified as minimally active, active, and highly active according to the IPAQ scoring protocol, which accounts for the total physicality of all evaluated domains (leisure time, domestic activities, and work-related and transport-related activity).

During the home visit, blood pressure (BP), random blood glucose (RBG), and anthropometric measurements, including height, weight, and abdominal circumference, were also taken by trained and certified examiners using standardized equipment and measurement techniques.

Weight and height were measured without shoes and with light clothing. Body mass index (BMI) was calculated using the formula weight (kg)/height (m^2), and participants were categorized according to BMI as

underweight (< 18.5 kg/m^2), normal-weight (18.5–24.9 kg/m^2), overweight (25.0–29.9 kg/m^2), or obese (≥ 30 kg/m^2). Waist circumference was considered as midline of the lower ribs and upper outer edge of the right iliac crest. Abdominal obesity was defined as waist circumference greater than 102 cm in men and 88 cm in women.

BP was measured in the sitting position using an electronic sphygmomanometer. Three measurements were taken at least 5 minutes apart. The mean of the highest two readings was used for analysis. As part of the interview, participants were asked if they have ever been told by a doctor or other health professional that they had HTN. Those who answered "yes" to this question were classified as having previously diagnosed HTN (Aware or Diagnosed). Subjects that answered "no" and whose average systolic blood pressure (SBP) was equal to or greater than 140 mmHg and/or the average diastolic blood pressure (DBP) was equal to or greater than 90 mmHg were classified as having unknown HTN. Final HTN cases consisted of those reporting a previous diagnosis plus those without a previous diagnosis but with a current BP above the thresholds (SBP ≥ 140 mmHg or DBP ≥ 90 mmHg). Treatment of HTN was defined as use of prescribed medications to lower the blood pressure level, at the time of the home interview, while HTN under control was defined as SBP lower than 140 mmHg and DBP lower than 90 mmHg.

RBG was estimated at the time of the interview by using a standardized digital glucometer, using the capillary fingerprick method. If subjects reported ever having been told by a health provider that they had DM (except during pregnancy), they were considered as having previously diagnosed DM. Individuals not reporting a previous diagnosis that reported being on fasting (defined as no caloric intake for at least eight hours) were considered to have diabetes if RBG ≥ 126 mg/dl. If not fasting, DM was defined as RBG ≥ 200 mg/dl and at least one reported diabetes symptom (unexplained weight loss, polydipsia, or polyuria). Treatment of DM was defined as use of prescription medications to lower the blood glucose level, at the time of the home interview. Control of DM was defined as RBG < 183 mg/dl (approximately A1c = 8%).

Ethics

Ethical approval was obtained from the University of Washington and local institutional review boards in Padre Paraíso (University Hospital of the University of Minas Gerais) and Poções (Federal University of Bahia). Written informed consent was obtained prior to participating in the study and was recorded in the survey software. Illiterate patients had consent information presented orally, and oral consent was documented in the presence of an unbiased witness.

Analysis

Data were weighted to account for differential selection probabilities and survey nonresponse; weights were poststratified to the adult population of Padre Paraíso and Poções based on age group and sex as estimated by the 2010 Brazilian Census. Prevalence of hypertension, diabetes, and other risk factors and characteristics are presented as percentages. Chi-square tests were used for bivariate analysis between diabetes and hypertension prevalence and selected variables like age, gender, BMI, diet, educational status, physical activity, tobacco, and alcohol consumption. Logistic regression analysis was used to evaluate the association between the variables statistically significant in the bivariate analysis and presence of DM and HTN. All statistical analyses were performed using Stata version 13. A P-value < 0.05 was considered significant.

Results

Table B1: Characteristics of study participants in the cities of Padre Paraíso and Poções, Brazil, 2017[1]

Variables	Padre Paraíso (MG)		Poções (BA)	
	n=962	% column	n=1,019	% column
Sex				
Male	336	34.9	308	30.2
Female	626	65.1	711	69.8
Age (years)				
30-39	221	23.0	247	24.2
40-49	196	20.4	209	20.5
50-59	179	18.6	197	19.3
≥ 60	366	38.0	366	35.9
Education				
No schooling	179	18.6	217	21.3
Elementary/junior school	585	60.8	535	52.6
High school or higher	198	20.6	266	26.1
Race				
White	169	17.9	241	23.9
Black	123	13.0	171	17.0
Mixed	613	64.8	563	56.0
Asian	31	3.3	18	1.8
Indigenous	10	1.1	12	1.2
Classification (urban x rural)				
Urban	616	64.0	809	79.4
Rural	346	36.0	210	20.6
Private health insurance				
Yes	130	13.5	138	13.6
No	830	86.5	879	86.4
Covered by the Family Health Program				
Yes	930	97.8	926	91.8
No	21	2.2	83	8.2
Freq. Family Health Program visits (past year)				
Monthly	794	86.8	432	48.7
2 to 6 times	95	10.4	246	27.7
Once	13	1.4	83	9.4
Never	13	1.4	127	14.3
Needed care within last year				
Yes	669	69.5	758	74.6
No	293	30.5	258	25.4
Physical activity				
Inactive	150	22.3	146	17.9
Minimally active	135	20.1	231	28.5
Highly active	387	57.6	435	53.6
Tobacco use				
Yes	116	12.1	129	12.7
No	845	87.9	888	87.3

[1] This table consists of survey unweighted data.

Alcohol consumption				
Less than daily	950	98.9	1007	99.0
Daily	11	1.1	10	1.0
BMI				
Underweight	39	4.1	24	2.4
Normal	399	41.7	369	37.4
Overweight	335	35.0	351	35.5
Obese	183	19.1	244	24.7
Central obesity				
Yes	384	39.9	495	48.6
No	578	60.1	524	51.4
Rate health				
Bad	78	8.1	81	8.0
Moderate	395	41.1	448	44.0
Good	488	50.8	489	48.0
Hypertension				
Yes	586	60.9	600	58.9
No	376	39.1	419	41.1
Diabetes				
Yes	101	10.5	108	10.6
No	861	89.5	911	89.4

Table B2: Estimated prevalence of diabetes among adults aged ≥ 30 in Brazil, 2017[2]

Variables	Padre Paraíso (MG) n = 101		p-value	Poções (BA) n= 108		p-value
	Total DM %	CI (95%)		Total DM %	CI (95%)	
Sex						
Male	9.3	6.5, 13.3		9.2	6.4, 13.1	
Female	9.3	7.1, 11.9	0.964	10.0	7.9, 12.6	0.717
Total	9.3	7.5, 11.5		9.6	7.8, 11.8	
Age (years)						
30-39	2.4	0.9, 6.5		1.7	0.7, 4.0	
40-49	9.7	5.9, 15.7	**< 0.000**	6.2	3.3, 11.3	**< 0.000**
50-59	8.2	4.6, 14.4		12.1	7.7, 18.5	
≥ 60	16.4	12.7, 21.0		18.8	14.6, 23.8	
Education						
No schooling	15.5	10.5,22.2		15.9	11.1, 22.2	
Elementary/junior school	9.9	7.5, 12.9	**0.002**	9.5	7.1, 12.6	**0.005**
High school or higher	3.8	1.8, 7.7		6.0	3.5, 9.9	
Race						
White	9.4	5.7, 15.0		9.8	6.1, 15.2	
Black	11.1	6.5, 18.5		8.6	5.2, 14.0	
Mixed	9.1	6.9, 12.1	0.542	9.9	7.5, 12.9	0.981
Asian	2.3	0.3, 15.2		9.3	2.2, 31.7	
Indigenous	0	-		6.6	0.9, 36.0	
Classification (urban x rural)						
Urban	9.9	7.6, 13.0	0.449	10.5	8.4, 13.2	0.065
Rural	8.4	5.7, 12.0		6.4	3.8, 10.4	
Private health insurance						
Yes	8.0	3.8, 16.0	0.663	12.9	7.8, 20.5	0.205
No	9.5	7.5, 11.9		9.1	7.2, 11.4	
Covered by the Family Health Program						
Yes	9.2	7.4, 11.5	0.212	9.1	7.3, 11.4	0.082
No	0	-		15.6	8.8, 26.3	
Freq. Family Health Program visits (past year)						
Monthly	9.3	7.3, 11.8		8.9	6.3, 12.1	
2 to 6 times	10.3	5.3, 19.1	0.888	6.0	3.6, 9.8	**0.024**
Once	11.7	2.8, 38.0		8.0	3.4, 17.5	
Never	5.0	0.7, 29.2		16.6	10.4, 25.5	
Needed care within last year						
Yes	10.9	8.5, 13.9	**0.019**	12.0	9.7, 14.9	**<0.000**
No	5.9	3.8, 9.3		3.5	1.7, 6.9	
Physical activity						
Inactive	12.3	7.2, 20.1		13.5	8.2, 21.4	
Minimally active	10.5	6.4, 16.9	**0.016**	5.0	2.9, 8.7	**0.018**
Highly active	5.1	3.2, 8.0		7.0	4.8, 10.2	
Tobacco use						
Yes	5.4	2.1, 13.2	0.197	9.6	5.1, 17.1	0.972
No	9.9	7.9, 12.4		9.7	7.7, 12	

[2] This table consists of weighted values for % row and CI

Alcohol consumption						
Less than daily	9.5	7.6, 11.8	0.290	9.7	7.8, 11.9	0.962
Daily	0	-		9.2	1.2,45.4	
BMI						
Underweight	10.4	2.2, 37.1	0.063	14.0	3.9, 39.1	**0.045**
Normal	6.0	4.1, 8.8		6.5	4.2, 9.8	
Overweight	10.6	7.3, 15.0		10.5	7.3, 14.8	
Obese	14.5	9.9, 20.8		13.6	9.6, 18.8	
Central obesity						
Yes	13.6	10.3, 17.7	**0.003**	14.1	11.0, 17.8	**<0.000**
No	7.2	5.1, 10.0		6.6	4.6,9.4	
Rate health						
Bad	14.7	7.3, 27.2	**<0.000**	17.1	9.5, 28.7	**< 0.000**
Moderate	14.2	10.8, 18.4		13.5	10.4, 17.5	
Good	4.8	3.1, 7.4		5.2	3.4, 7.7	
Hypertension						
Yes	12.8	10.1, 16.0	**<0.000**	13.9	11.1, 17.3	**< 0.000**
No	4.5	2.6, 7.9		4.1	2.5, 6.9	

Table B3: Estimated prevalence of hypertension among adults aged ≥ 30 in Brazil, 2017[3]

Variables	Padre Paraíso (MG) n=586		p-value	Poções (BA) n=600		p-value
	Total HTN %	CI (95%)		Total HTN %	CI (95%)	
Sex						
Male	60.4	54.6, 66		58.7	52.5, 64.6	
Female	55.2	50.7, 59.6	0.159	53.7	49.6, 57.7	0.182
Total	57.7	54.1, 61.3		56.1	52.4, 59.6	
Age (years)						
30-39	35.3	28.4, 42.8		26.1	20.5, 32.7	
40-49	51.7	43.8, 59.5	**<0.000**	50.3	42.6, 57.9	**<0.000**
50-59	66.7	58.7, 73.9		71.3	63.9, 77.7	
≥ 60	79.4	74.0, 83.9		80.7	75.5, 85.0	
Education						
No schooling	75.4	66.8, 82.4		74.1	66.4, 80.6	
Elementary/junior school	61.6	56.9, 66.0	**<0.000**	61.9	57, 66.6	**<0.000**
High school or higher	35.2	28.1, 43.1		32.8	26.7, 39.5	
Race						
White	53.4	44.6, 62.1		56.0	48.6, 63.1	
Black	70.9	61.1, 79.0		59.5	50.8, 67.6	
Mixed	55.7	51.1, 60.2	0.055	53.8	48.9, 58.6	0.185
Asian	62.7	42.6, 79.2		78.7	51.8, 92.7	
Indigenous	64.2	30.8, 87.8		76.5	48.3, 91.9	
Classification (urban x rural)						
Urban	52.9	48.4, 57.5	**0.002**	53.6	49.5, 57.6	**0.012**
Rural	64.6	58.6, 70.2		64.9	57.0, 72.1	
Private health insurance						
Yes	49.9	40.1, 59.8	0.099	53.5	43.3, 63.4	0.591
No	58.8	54.9, 62.7		56.5	52.6, 60.2	
Covered by the Family Health Program						
Yes	58.2	54.5, 61.8	0.106	55.3	51.5, 59.0	0.270
No	37.6	17.6, 62.8		62.7	49.8, 74.0	
Freq. Family Health Program visits (past year)						
Monthly	58.0	53.9, 61.9		56.6	51.0, 61.9	
2 to 6 times	63.0	51.4, 73.2	0.647	51.7	44.3, 59.0	0.655
Once	42.3	19.4, 69.1		55.5	42.8, 67.5	
Never	58.9	29.6, 83.0		58.8	48.9, 68.0	
Needed care within last year						
Yes	60.0	55.6, 64.3	0.079	59.4	55.2, 63.5	**0.004**
No	53.0	46.47, 59.5		47.6	40.6, 54.6	
Physical activity						
Inactive	59.6	50.2, 68.3		58.4	48.8, 67.4	
Minimally active	53.9	44.1, 63.5	0.567	62.1	54.6, 69.1	**0.002**
Highly active	53.7	47.9, 59.3		46.4	41.0, 51.9	
Tobacco use						
Yes	58.3	47.9, 67.9	0.903	49.9	40.0, 59.9	0.192

[3] This table consists of weighted values for % row and CI

No	57.6	53.7, 61.4		57.1	53.2, 60.8	
Alcohol consumption						
Less than daily	57.1	53.4, 60.7	**0.025**	56.0	52.3, 59.6	0.858
Daily	87	58.4,96.7		59.0	26.7, 85.1	
Central obesity						
Yes	63.5	57.8, 68.9	**0.021**	69.1	64.4, 73.4	**<0.000**
No	54.9	50.2,59.5		47.1	42.2, 52.1	
BMI						
Underweight	58.2	39.8, 74.7	0.079	62.1	40.3, 79.9	**<0.000**
Normal	53.8	48.1, 59.4		46.9	40.9, 53.0	
Overweight	57.3	51.1, 63.28		52.8	46.6, 58.8	
Obese	67.2	58.8, 74.6		74.6	68.1, 80.2	
Rate health						
Bad	65.6	51.8, 77.3	**<0.000**	71.8	59.2, 81.8	**<0.000**
Moderate	66.5	60.9, 71.71		65.7	60.3, 70.7	
Good	49.9	44.8, 55.0		45.5	40.4, 50.6	
Diabetes						
Yes	79.3	67.2, 87.8	**<0.000**	81.1	70.7, 88.4	**<0.000**
No	55.5	51.7, 59.3		53.4	49.6, 57.2	

Table B4: Prevalence, awareness, treatment, and control of diabetes or hypertension among males and females aged ≥ 30 in Brazil, 2017

Variables	Padre Paraíso		Poções	
	Males	Females	Males	Females
Diabetes				
	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)
Prevalence[4]	9.3 (6.5, 13.3)	9.3 (7.1, 11.9)	9.2 (6.4, 13.1)	10.0 (7.9, 12.6)
Diagnosed[5]	74.5 (55.1, 87.4)	90.1 (76.7, 96.2)	87.2 (67.0, 95.8)	91.4 (80.1, 96.6)
Treatment[6]	60.8 (42.0, 76.9)	71.3 (57.7, 81.9)	64.8 (45.5, 80.2)	71.2 (57.9, 81.6)
Control[7]	14.4 (6.6, 28.8)	40.0 (27.9, 53.5)	32.4 (18.1, 51.1)	39.0 (28.1, 51.2)
Hypertension				
	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)
Prevalence[4]	60.4 (54.6, 66)	55.2 (50.7,59.59)	58.7 (52.5, 64.6)	53.7 (49.6, 57.7)
Diagnosed[5]	55.6 (48.0, 62.3)	74.7 (69.2, 79.6)	48.1 (40.5, 55.8)	68.4 (63.0, 73.3)
Treatment[6]	34.0 (27.5, 41.2)	56.0 (50.3, 61.7)	38.6 (31.5, 46.3)	58.4 (53.0, 63.6)
Control[7]	14.5 (10.3, 20.1)	25.1 (20.5, 30.2)	10.6 (6.8, 16.1)	25.2 (20.9, 30.0)

[4] Survey weighted prevalence
[5] Survey weighted percentage of patients aware of their diagnosis among prevalent cases
[6] Survey weighted percentage of patients under treatment among prevalent cases
[7] Survey weighted percentage of patients who had their condition under control among prevalent cases

Table B5: Multivariate adjusted odds ratio for diabetes and hypertension among adults aged ≥ 30 in Brazil, 2017

Independent variables	Padre Paraíso		Poções	
	Odds ratio (95% CI)	P value	Odds ratio (95% CI)	P value
Diabetes				
Age				
30-39	1	-	1	-
40-49	3.57 (0.96-13.26)	0.057	3.63 (0.79-16.73)	0.097
50-59	2.16 (0.49-9.49)	0.307	4.68 (01.09-20.06)	0.038*
≥ 60	4.35 (1.17-16.14)	0.028*	9.72 (2.51-37.54)	0.001**
Education				
No schooling	2.36 (0.58-9.63)	0.231	1.11 (0.36-3.39)	0.846
Elementary/junior school	2.00 (0.55-7.21)	0.286	0.96 (0.36-2.51)	0.930
High school or higher	1	-	1	-
Family Heath Program visits				
Monthly	NA	NA	1	-
2 to 6 times	NA	NA	0.96 (0.39-2.32)	0.937
Once	NA	NA	0.99 (0.26-3.77)	0.997
Never	NA	NA	4.21 (1.64-10.84)	0.003**
Care last year				
No	1	-	1	-
Yes	0.95 (0.44-2.07)	0.908	2.14 (0.78-5.89)	0.137
Physical activity				
Inactive	1.75 (0.68-4.49)	0.238	1.23 (0.44-3.48)	0.688
Minimally active	1.94 (0.91-4.11)	0.084	0.35 (0.15-0.82)	0.016*
Highly active	1	-	1	-
Central obesity				
No	1	-	1	-
Yes	2.05 (0.99-4.27)	0.054	1.72 (0.56-5.20)	0.340
Rate health				
Bad	2.02 (0.64-6.41)	0.230	1.37 (0.33-5.71)	0.660
Moderate	3.22 (1.37-7.53)	0.007**	1.80 (0.82-3.95)	0.140
Good	1	-	1	-
Hypertension				
No	1	-	1	-
Yes	2.87 (1.09-7.52)	0.032*	2.93 (0.97-8.81)	0.056
Hypertension				
Age				
30-39	1	-	1	-
40-49	1.59 (0.99-2.55)	0.052	2.27 (1.35-3.83)	0.002**
50-59	2.83 (1.72-4.68)	0.000***	5.96 (3.34-10.52)	0.000***
≥ 60	4.90 (2.92-8.20)	0.000***	7.46 (4.51-13.40)	0.000***
Education				
No schooling	2.07 (1.10-3.93)	0.025*	1.46 (0.75-2.85)	0.262
Elementary/junior school	1.68 (1.08-2.59)	0.020*	1.1 (1.23-2.98)	0.004**
High school or higher	1	-	1	-
Urban x rural				
Urban	1	-	1	-
Rural	1.58 (1.10-2.29)	0.014*	1.79 (1.07-3.00)	0.026*
Care last year				
No	NA	NA	1	-

Yes	NA	NA	1.03 (0.67-1.57)	0.887
Physical activity				
Inactive	NA	NA	1.44 (0.83-2.49)	0.189
Minimally active	NA	NA	1.67 (1.07-2.64)	0.025*
Highly active	NA	NA	1	-
Alcohol				
No	1	-	NA	NA
Yes	1.10 (0.69-1.47)	0.959	NA	NA
BMI				
Underweight	NA	NA	1	-
Normal	NA	NA	0.99 (0.14-6.77)	0.999
Overweight	NA	NA	1.44 (0.20-9.98)	0.711
Obese	NA	NA	3.54 (0.46-26.73)	0.220
Central obesity				
No	1	-	1	-
Yes	140 (1.00-1.98)	0.05	1.12 (0.67-1.87)	0.663
Rate health				
Bad	1.26 (0.65-2.44)	0.482	2.71 (0.97-7.56)	0.056
Moderate	1.52 (1.06-2.19)	0.023*	1.89 (1.26-2.83)	0.002*
Good	1	-	1	-
Diabetes				
No	1	-	1	-
Yes	1.86 (0.96-3.63)	0.066	1.98 (089-4.40)	0.090

* $P \leq 0.05$; ** $P \leq 0.01$; and *** $P \leq 0.001$. NA = variable not included in the model for given outcome and location (not statistically significant in the bivariate analysis).

Appendix C – Monitoring indicator tables by site

Types	Indicators included
Process	HW/CHW trained, risk assessments, screening events, meetings, groups started, awareness activities
Outputs	Screened, measured, diagnosed, new patients, enrolled, follow up, number of measures available
Outcomes	Avg. BP/A1c, control, 10% change, category changes

Table C1: Rice County, United States

Definition	Rice County
Total number of health workers trained	9
Number of CHWs trained	2
Total number of patients enrolled either for HTN or DM, according to the definitions below	208
Number of patients with a final diagnosis of HTN that have attended at least one consultation at the health facility	87
Number of patients with a final diagnosis of DM that have attended at least one consultation at the health facility	149
Number of patients with a final HTN diagnosis with at least one BP reading available	79
Number of patients with a final DM diagnosis with at least one A1c reading available	124
Number of patients with a final HTN diagnosis with at least two BP readings available	76
Number of patients with a final DM diagnosis with at least two A1c readings available	108
Total number of patients controlled for DM or HTN, according to the definitions below	74
Number of patients enrolled for HTN with BP < 140/90 mmHg at last available reading	45
Number of patients enrolled for DM with A1c < 8% at last available reading	53
Average change in SBP, among those enrolled for HTN with at least 2 readings available (Last SBP - First SBP)	-2.51
Average change in A1c, among those enrolled for DM with at least 2 readings available (Last A1c - First A1c)	-0.47
Number of patients with SBP decrease >=10%, among those enrolled for HTN with at least 2 readings available (Last SBP - First SBP)	18
Number of patients with A1c decrease >=10%, among those enrolled for DM with at least 2 readings available (Last A1c - First A1c)	34
Number of patients with SBP increase >=10%, among those enrolled for HTN with at least 2 readings available (Last SBP - First SBP)	9
Number of patients with A1c increase >=10%, among those enrolled for DM with at least 2 readings available (Last A1c - First A1c)	21
Average change in SBP, among those enrolled for HTN with at least 2 readings available and moved to a lower BP category	-9.75
Average change in A1C, among those enrolled for DM with at least 2 readings available and moved to a lower A1C category	-1.78

Definition	Rice County (Cont.)
Number of patients whose BP has moved to a lower category, among those enrolled for HTN with at least 2 BP readings	23
Number of patients whose A1c has moved to a lower category, among those enrolled for DM with at least 2 A1c readings	31
Number of patients whose BP has moved to a higher category, among those enrolled for HTN with at least 2 BP readings	18
Number of patients whose A1c has moved to a higher category, among those enrolled for DM with at least 2 A1c readings	17

Table C2: Hennepin County, United States

Definition	Hennepin County
Total number of health workers trained	11
Number of CHWs trained	6
Total number of patients enrolled either for HTN or DM, according to the definitions below	121
Number of patients with a final diagnosis of HTN that have attended at least one consultation at the health facility	102
Number of patients with a final diagnosis of DM that have attended at least one consultation at the health facility	100
Number of patients with a final HTN diagnosis with at least one BP reading available	102
Number of patients with a final DM diagnosis with at least one A1c reading available	100
Number of patients with a final HTN diagnosis with at least two BP readings available	72
Number of patients with a final DM diagnosis with at least two A1c readings available	54
Total number of patients controlled for DM or HTN, according to the definitions below	68
Number of patients enrolled for HTN with BP < 140/90 mmHg at last available reading	55
Number of patients enrolled for DM with A1c < 8% at last available reading	26
Average change in SBP, among those enrolled for HTN with at least 2 readings available (Last SBP - First SBP)	-3.38
Average change in A1c, among those enrolled for DM with at least 2 readings available (Last A1c - First A1c)	-0.92
Number of patients with SBP decrease >=10%, among those enrolled for HTN with at least 2 readings available (Last SBP - First SBP)	22
Number of patients with A1c decrease >=10%, among those enrolled for DM with at least 2 readings available (Last A1c - First A1c)	22
Number of patients with SBP increase >=10%, among those enrolled for HTN with at least 2 readings available (Last SBP - First SBP)	13
Number of patients with A1c increase >=10%, among those enrolled for DM with at least 2 readings available (Last A1c - First A1c)	6

Definition	Hennepin County (Cont.)
Average change in SBP, among those enrolled for HTN with at least 2 readings available and showing a reduction in blood pressure	-13.44
Average change in A1C, among those enrolled for DM with at least 2 readings available and showing a reduction in blood glucose	-1.87
Number of patients whose BP has moved to a lower category, among those enrolled for HTN with at least 2 BP readings	21
Number of patients whose A1c has moved to a lower category, among those enrolled for DM with at least 2 A1c readings	22
Number of patients whose BP has moved to a higher category, among those enrolled for HTN with at least 2 BP readings	5
Number of patients whose A1c has moved to a higher category, among those enrolled for DM with at least 2 A1c readings	6

Table C3: Ramsey County, United States

Definition	Ramsey County
Total number of health workers trained	13
Number of CHWs trained	5
Total number of patients enrolled either for HTN or DM, according to the definitions below	78
Number of patients with a final diagnosis of HTN that have attended at least one consultation at the health facility	33
Number of patients with a final diagnosis of DM that have attended at least one consultation at the health facility	69
Number of patients with a final HTN diagnosis with at least one BP reading available	32
Number of patients with a final DM diagnosis with at least one A1c reading available	69
Number of patients with a final HTN diagnosis with at least two BP readings available	21
Number of patients with a final DM diagnosis with at least two A1c readings available	42
Total numbers of patients controlled for DM or HTN, according to the definitions below	16
Number of patients enrolled for HTN with BP < 140/90 mmHg at last available reading	10
Number of patients enrolled for DM with A1c < 8% at last available reading	12
Average change in SBP, among those enrolled for HTN with at least 2 readings available (Last SBP - First SBP)	-5.67
Average change in A1c, among those enrolled for DM with at least 2 readings available (Last A1c - First A1c)	-1.56
Number of patients with SBP decrease >=10%, among those enrolled for HTN with at least 2 readings available (Last SBP - First SBP)	13
Number of patients with A1c decrease >=10%, among those enrolled for DM with at least 2 readings available (Last A1c - First A1c)	23

Definition	Ramsey County (Cont.)
Number of patients with SBP increase >=10%, among those enrolled for HTN with at least 2 readings available (Last SBP - First SBP)	8
Number of patients with A1c increase >=10%, among those enrolled for DM with at least 2 readings available (Last A1c - First A1c)	3
Average change in SBP, among those enrolled for HTN with at least 2 readings available and showing a reduction in blood pressure	-21.54
Average change in A1C, among those enrolled for DM with at least 2 readings available and showing a reduction in blood glucose	-2.22
Number of patients whose BP has moved to a lower category, among those enrolled for HTN with at least 2 BP readings	10
Number of patients whose A1c has moved to a lower category, among those enrolled for DM with at least 2 A1c readings	13
Number of patients whose BP has moved to a higher category, among those enrolled for HTN with at least 2 BP readings	4
Number of patients whose A1c has moved to a higher category, among those enrolled for DM with at least 2 A1c readings	11

Table C4: uMgungundlovu, South Africa

Definition	uMgungundlovu
Number of risk assessments	4711
Number of public screening events ("health fairs") [includes workplace, household, and support group events]	7324
Total number of health workers trained: PSI + facility staff + CCGs	317
Number of CCGs trained	269
Number of support groups and/or NCD club meetings held	64
Number of DOH workers trained (includes in-facility staff who are employed by DOH)	267
Number of support groups started during the project	7
Number of War Room meetings held	26
Number of individuals who attended a screening activity and: 1) reported a previous HTN diagnosis; 2) or no previous HTN diagnosis but had a BP reading at the time of the screening activity	8456
Number of individuals who attended a screening activity and: 1) reported a previous DM diagnosis; 2) or no previous DM diagnosis but had a BG reading at the time of the screening activity	6248
Number of individuals screened for HTN who reported no previous HTN diagnosis	4782
Number of individuals screened for DM who reported no previous DM diagnosis	4591
Of those screened for HTN, the number of individuals with SBP >= 140 mmHg or DBP >= 90 mmHg (regardless of previous diagnosis)	2939
Of those screened for DM, the number of individuals with non-fasting RBS >= 11.1 mmol/L (regardless of previous diagnosis)	489

Definition	uMgungundlovu (Cont.)
Of those screened for HTN, number of individuals who didn't report a previous HTN diagnosis and measured SBP >= 140 mmHg or DBP >= 90 mmHg	1216
Of those screened for DM, number of individuals who didn't report a previous DM diagnosis and measured non-fasting RBS >= 11.1 mmol/L	129
Number of diagnosed and confirmed for HTN (regardless of previous diagnosis)	545
Number of diagnosed and confirmed for DM (regardless of previous diagnosis)	136
Number of individuals diagnosed with HTN who reported no previous HTN diagnosis	129
Number of individuals diagnosed with DM who reported no previous DM diagnosis	24
Number of patients who were referred to a clinic after screening and initiated treatment for hypertension (includes newly diagnosed individuals and individuals who reported a previous HTN diagnosis)	321
Number of patients who were referred to a clinic after screening and initiated treatment for diabetes (includes newly diagnosed individuals and individuals who reported a previous diagnosis)	72
Of those with a confirmed HTN diagnosis (new and existing), the number of individuals who received a monitoring visit with a BP measurement	64
Of those with a confirmed DM diagnosis (new and existing), those who received a monitoring visit with a blood glucose measurement	17
Number of patients enrolled for hypertension with 2 or more SBP measurements	59
Of those with a confirmed HTN diagnosis, the number of patients with SBP < 140 mmHg / DBP < 90 mmHg at the time of the most recently available measurement. (Only includes individuals with 1 or more monitoring visits.)	24
Of those with a confirmed DM diagnosis, the number of patients with RBS reading <= 7.8 mmol/L at the time of the most recently available measurement. (Only includes individuals with 1 or more monitoring visits.)	1
Average change in SBP, among those enrolled for HTN with at least 2 readings available (Last SBP - First SBP)	-5.24
Patients with SBP decreases >=10%, among those enrolled for HTN with at least 2 readings available (Last SBP - First SBP)	19
Patients with SBP increases >=10%, among those enrolled for HTN with at least 2 readings available (Last SBP - First SBP)	6
Patients whose BP has moved to a lower category, among those enrolled for HTN with at least 2 BP readings	19
Patients whose BP has moved to a higher category, among those enrolled for HTN with at least 2 BP readings	8

Table C5: Pixley ka Seme, South Africa

Definition	Pixley ka Seme
Number of risk assessments	3,816
Number of public screening events ("health fairs") [includes workplace, household, and support group events]	1,389
Total number of health workers trained: PSI + CHW + facility staff	461
Number of CHWs trained	327
Number of support groups and/or NCD club meetings held	2
Number of support groups started during the project [includes 5-step groups, garden groups, and village savings & loan groups]	94
Number of patients who attended a screening activity and: 1) reported a previous HTN diagnosis; 2) or no previous HTN diagnosis but had a BP reading at the time of the screening activity	3,789
Number of individuals who attended a screening activity and: 1) reported a previous DM diagnosis; 2) or no previous DM diagnosis but had a BG reading at the time of the screening activity	3,872
Number of individuals screened for HTN who reported no previous HTN diagnosis	2,366
Number of individuals screened for DM who reported no previous DM diagnosis	3,570
Of those screened for HTN, the number of individuals with SBP >= 140 mmHg or DBP >= 90 mmHg (regardless of previous diagnosis)	1,413
Of those screened for DM, the number of individuals with non-fasting RBS >= 11.1 mmol/L (regardless of previous diagnosis)	224
Of those screened for HTN, number of individuals who didn't report a previous HTN diagnosis and measured SBP >= 140 mmHg or DBP >= 90 mmHg	677
Of those screened for DM, number of individuals who didn't report a previous DM diagnosis and measured non-fasting RBS >= 11.1 mmol/L	71
Number of individuals diagnosed and confirmed for HTN (regardless of previous diagnosis)	142
Number of individuals diagnosed and confirmed for DM (regardless of previous diagnosis)	33
Number of individuals diagnosed with HTN who reported no previous HTN diagnosis	93
Number of individuals diagnosed with DM who reported no previous DM diagnosis	24
Number of patients who were referred to a clinic after screening and initiated treatment for hypertension (includes newly diagnosed individuals and individuals who reported a previous HTN diagnosis)	106
Number of patients who were referred to a clinic after screening and initiated treatment for diabetes (includes newly diagnosed individuals and individuals who reported a previous diagnosis)	27
Of those with a confirmed HTN diagnosis (new and existing), the number of individuals who received a monitoring visit with a BP measurement	98
Of those with a confirmed DM diagnosis (new and existing), those who received a monitoring visit with a blood glucose measurement	31
Number of patients enrolled for hypertension with 2 or more SBP measurements	88
Of those with a confirmed HTN diagnosis, the number of patients with SBP < 140 mmHg / DBP < 90 mmHg at the time of the most recently available measurement. (Only includes individuals with 1 or more monitoring visits.)	53

Definition	Pixley ka Seme (Cont.)
Of those with a confirmed DM diagnosis, the number of patients with RBS reading <= 7.8 mmol/L at the time of the most recently available measurement. (Only includes individuals with 1 or more monitoring visits.)	9
Average change in SBP, among those enrolled for HTN with at least 2 readings available (Last SBP - First SBP)	-21.47
Patients with SBP decreases >=10%, among those enrolled for HTN with at least 2 readings available (Last SBP - First SBP)	49
Patients with SBP increases >=10%, among those enrolled for HTN with at least 2 readings available (Last SBP - First SBP)	4
Patients whose BP has moved to a lower category, among those enrolled for HTN with at least 2 BP readings	74
Patients whose BP has moved to a higher category, among those enrolled for HTN with at least 2 BP readings	5

Table C6: Udaipur, India

Definition	Udaipur
Awareness activities	59,869
Number of public screening events ("health fairs")	128
Total number of health workers trained	1,060
Number of CHWs (ASHAs) trained	543
Number of support groups/NCD meetings held	258
Number of patients who attended support groups during the project	3,487
Number of individuals screened either for HTN or DM, according to the definitions below.	26,559
Number of individuals who attended a screening activity and: 1) reported a previous HTN diagnosis; 2) or no previous HTN diagnosis but had a BP reading at the time of the screening activity	26,559
Number of individuals who attended a screening activity and: 1) reported a previous DM diagnosis; 2) or no previous DM diagnosis but had an RBS or FBS reading at the time of the screening activity	18,166
Number of individuals who attended a screening activity, did not report a previous HTN diagnosis, and received a BP measurement at the time of the screening activity	26,144
Number of individuals who attended a screening activity, did not report a previous DM diagnosis, and received an RBS or FBS measurement at the time of the screening activity	17,994
Of those screened for HTN, the sum of the number of individuals who reported a previous HTN diagnosis and the number of individuals without a previous HTN diagnosis that were screened with SBP >= 140 mmHg or DBP >= 90 mmHg	1,250
Of those screened for DM, the sum of the number of individuals who reported a previous DM diagnosis and the number of individuals without a previous DM diagnosis that were screened with RBS>= 140 mg/dl	1,011

Definition	Udaipur (Cont.)
Of those screened for HTN, the number of individuals who didn't report a previous HTN diagnosis and were screened with SBP >= 140 mmHg or DBP >= 90 mmHg	835
Of those screened for DM, the number of individuals who didn't report a previous DM diagnosis and were screened with RBS>= 140 mg/dl	839
Of those screened above BP thresholds, the sum of the number of patients who reported a previous HTN diagnosis and the number of individuals without a previous diagnosis for HTN who received a confirmatory HTN diagnosis	679
Of those screened above blood glucose thresholds, the sum of the number of patients who reported a previous DM diagnosis and the number of individuals without a previous diagnosis for DM who received a confirmatory DM diagnosis	279
Number of patients without a previous diagnosis for HTN who received a confirmatory HTN diagnosis	264
Number of patients without a previous diagnosis for DM who received a confirmatory DM diagnosis	107
Number of patients who received a confirmatory diagnosis for DM and HTN and who did not report a previous diagnosis for either HTN or DM (or both HTN and DM)	26
Average time (days) between screening above BP thresholds and initial clinic visit among patients who were referred to, and visited, a health facility for HTN	4.14
Average time (days) between screening above blood glucose thresholds and initial clinic visit among patients who were referred to, and visited a health facility for DM	2.76
Number of individuals with a referral for HTN that have accessed a clinic for confirmatory testing/consultation	581
Number of individuals with a referral for HTN that have accessed a clinic for confirmatory testing/consultation within 28 days of referral	580
Number of individuals with a referral for DM that have accessed a clinic for confirmatory testing/consultation	325
Number of individuals with a referral for DM that have accessed a clinic for confirmatory testing/consultation within 28 days of referral	325
Number of individuals with a referral for HTN and DM that have accessed a clinic for confirmatory testing/consultation	203
Number of individuals with a referral for HTN and DM that have accessed a clinic for confirmatory testing/consultation within 28 days of referral	203
HTN patients with no previous diagnosis that were prescribed pharmacotherapy	297
DM patients with no previous diagnosis that were prescribed pharmacotherapy	76
Average number of follow-up visits per year for HTN patients (excludes initial visit)	2.9
Average number of follow-up visits per year for DM patients (excludes initial visit)	2.9
Patients enrolled for HTN with BP < 140/90 mmHg at last available measurement	191
Patients enrolled for DM with A1c < 8%/FPG<157/RBS<183 as last available measurement	94
Average change in SBP, among those enrolled for HTN with at least 2 readings available (Last SBP - First SBP)	1.6
Patients with SBP decreases >=10%, among those enrolled for HTN with at least 2 readings available (Last SBP - First SBP)	185

Definition	Udaipur (Cont.)
Patients with SBP increases >=10%, among those enrolled for HTN with at least 2 readings available (Last SBP - First SBP)	86
Patients whose BP has moved to a lower category, among those enrolled for HTN with at least 2 BP readings	175
Patients whose BP has moved to a higher category, among those enrolled for HTN with at least 2 BP readings	110

Table C7: Shimla, India

Definition	Shimla
Awareness activities	87,151
Number of public screening events ("health fairs")	336
Number of household visits made by ASHAs, AWWs, and ORWs	16,286
Total number of health workers trained	787
Number of CHWs (ASHAs) trained	473
Number of support groups/NCD meetings held	386
Number of individuals screened either for HTN or DM, according to the definitions below.	22,053
Number of individuals who attended a screening activity and: 1) reported a previous HTN diagnosis; 2) or no previous HTN diagnosis but had a BP reading at the time of the screening activity	22,053
Number of individuals who attended a screening activity and: 1) reported a previous DM diagnosis; 2) or no previous DM diagnosis but had a RBS or FBS reading at the time of the screening activity	22,053
Number of individuals who attended a screening activity, did not report a previous HTN diagnosis, and received a BP measurement at the time of the screening activity	20,606
Number of individuals who attended a screening activity, did not report a previous DM diagnosis, and received an RBS or FBS measurement at the time of the screening activity	21,482
Of those screened for HTN, the sum of the number of individuals who reported a previous HTN diagnosis and the number of individuals without a previous HTN diagnosis that were screened with SBP >= 140 mmHg or DBP >= 90 mmHg	3,661
Of those screened for DM, the sum of the number of individuals who reported a previous DM diagnosis and the number of individuals without a previous DM diagnosis that were screened with RBS>= 140 mg/dl	1,471
Of those screened for HTN, the number of individuals who didn't report a previous HTN diagnosis and were screened with SBP >= 140 mmHg or DBP >= 90 mmHg	2,214
Of those screened for DM, the number of individuals who didn't report a previous DM diagnosis and were screened with RBS>= 140 mg/dl	900
Of those screened above BP thresholds, the sum of the number of patients who reported a previous HTN diagnosis and the number of individuals without a previous diagnosis for HTN who received a confirmatory HTN diagnosis	2,002

Definition	Shimla (Cont.)
Of those screened above blood glucose thresholds, the sum of the number of patients who reported a previous DM diagnosis and the number of individuals without a previous diagnosis for DM who received a confirmatory DM diagnosis	627
Number of patients without a previous diagnosis for HTN who received a confirmatory HTN diagnosis	555
Number of patients without a previous diagnosis for DM who received a confirmatory DM diagnosis	56
Number of patients who received a confirmatory diagnosis for DM and HTN and who did not report a previous diagnosis for either HTN or DM (or both HTN and DM)	9
Average time (days) between screening above BP thresholds and initial clinic visit among patients who were referred to, and visited, a health facility for HTN	39.66
Average time (days) between screening above blood glucose thresholds and initial clinic visit among patients who were referred to, and visited a health facility for DM	38.63
Number of individuals with a referral for HTN that have accessed a clinic for confirmatory testing/consultation	1,373
Number of individuals with a referral for HTN that have accessed a clinic for confirmatory testing/consultation within 45 days of referral	965
Number of individuals with a referral for DM that have accessed a clinic for confirmatory testing/consultation	473
Number of individuals with a referral for DM that have accessed a clinic for confirmatory testing/consultation within 45 days of referral	333
Number of individuals with a referral for HTN and DM that have accessed a clinic for confirmatory testing/consultation	164
Number of individuals with a referral for HTN and DM that have accessed a clinic for confirmatory testing/consultation within 45 days of referral	115
HTN patients with no previous diagnosis that were prescribed pharmacotherapy	205
DM patients with no previous diagnosis that were prescribed pharmacotherapy	70
Average number of follow-up visits per year for HTN patients (excludes initial visit)	3.1
Average number of follow-up visits per year for DM patients (excludes initial visit)	3.2
Patients enrolled for HTN with BP < 140/90 mmHg at last available measurement	330
Patients enrolled for DM with A1c < 8%/FPG<157/RBS<183 as last available measurement	253
Average change in SBP, among those enrolled for HTN with at least 2 readings available (Last SBP - First SBP)	15
Patients with SBP decreases >=10%, among those enrolled for HTN with at least 2 readings available (Last SBP - First SBP)	521
Patients with SBP increases >=10%, among those enrolled for HTN with at least 2 readings available (Last SBP - First SBP)	46
Patients whose BP has moved to a lower category, among those enrolled for HTN with at least 2 BP readings	442
Patients whose BP has moved to a higher category, among those enrolled for HTN with at least 2 BP readings	66

Table C8: Teófilo Otoni, Brazil

Definition	Teófilo Otoni
Number of stakeholders' meetings during the project	300
Number of education materials produced (distance learning courses or other)	26
Awareness activities conducted	7
Number of public screening events ("health fairs")	9
Total number of tele-consults performed	31
Total number of health workers trained	384
Number of CHWs trained	243
Number of patients who attended support groups during the project	813
Number of patients who got A1c through Point of Care grant	57
Number of individuals screened either for HTN or DM, according to the definitions below	9,432
Number of individuals who attended a screening activity and: 1) reported a previous HTN diagnosis; 2) or no previous HTN diagnosis but had a BP reading at the time of the screening activity	9,244
Number of individuals who attended a screening activity and: 1) reported a previous DM diagnosis; 2) or no previous DM diagnosis but had a CBG at the time of the screening activity or a first FG at the health facility.	6,935
Number of individuals without a previous diagnosis that were measured either for HTN or DM	5,764
Number of individuals who attended a screening activity, did not report a previous HTN diagnosis, and received a BP measurement at the time of the screening activity	3,129
Number of individuals who attended a screening activity, did not report a previous DM diagnosis, and received a CBG measurement at the time of the screening activity or FG at the health facility.	5,396
Of those screened, the sum of the number of individuals who reported a previous diagnosis and the number of individuals without a previous diagnosis with readings above the screening threshold, according to the definitions below	7,445
Of those screened for HTN, the sum of the number of individuals who reported a previous HTN diagnosis and the number of individuals without a previous HTN diagnosis measured with SBP >= 140 mmHg or DBP >= 90 mmHg	6,988
Of those screened for DM, the sum of the number of individuals who reported a previous DM diagnosis and the number of individuals without a previous DM diagnosis measured with CBG >= 200 and DM symptoms; or 1st FG >= 126	1,664
Number of individuals without a previous diagnosis that were measured and screened above thresholds for either HTN or DM, according to the definitions below	982
Of those measured for HTN, the number of individuals who didn't report a previous HTN diagnosis and measured SBP >= 140 mmHg or DBP >= 90 mmHg	873
Of those measured for DM, the number of individuals who didn't report a previous DM diagnosis and measured CBG >= 200 + DM symptoms; or 1st FG >= 126	125
Number of individuals confirmed for either HTN or DM, according to the definitions below	6,630

Definition	Teófilo Otoni (Cont.)
Of those screened above thresholds, the sum of the number of patients who reported a previous HTN diagnosis and those newly diagnosed for HTN	6,305
Of those screened above thresholds, the sum of the number of patients who reported a previous DM diagnosis and those newly diagnosed for DM	1,579
Number of individuals newly diagnosed for either HTN or DM	225
Number of individuals newly diagnosed for HTN	190
Number of individuals newly diagnosed for DM	40
Number of individuals newly diagnosed for DM and HTN	5
Total number of patients enrolled either for HTN or DM, according to the definitions below	4,210
Number of patients with a final diagnosis of HTN that have attended at least one consultation at the health facility	3,992
Number of patients with a final diagnosis of DM that have attended at least one consultation at the health facility	1,028
Number of patients with a final diagnosis of DM and HTN that have attended at least one consultation at the health facility	810
Total number of patients taking the medication	2,237
Number of HTN patients taking prescribed pharmacotherapy	2,090
Number of DM patients taking prescribed pharmacotherapy	400
Number of enrolled patients with a final HTN or DM diagnosis that have attended >= 2 consultations at the health facility	2,027
Number of enrolled patients with a final HTN diagnosis that have attended >= 2 consultations at the health facility	1,914
Number of enrolled patients with a final DM diagnosis that have attended >= 2 consultations at the health facility	576
Average number of consults at the health facility among enrolled patients enrolled	2.1
Number of patients with a final DM diagnosis with at least one A1c reading available	631
Number of patients with a final HTN diagnosis with at least one BP reading available	3,196
Number of patients with a final DM diagnosis with at least two A1c readings available.	176
Number of patients with a final HTN diagnosis with at least two BP readings available	1,169
Total number of patients controlled for DM or HTN, according to the definitions below	1,821
Patients enrolled for HTN with BP < 140/90 mmHg at last available reading	1,586
Patients enrolled for DM with A1c < 8% at last available reading.	358
Average change in SBP, among those enrolled for HTN with at least 2 readings available (Last SBP - First SBP)	-1.9
Average change in A1c, among those enrolled for DM with at least 2 readings available (Last A1c - First A1c)	-0.6
Patients with SBP decrease >=10%, among those enrolled for HTN with at least 2 readings available (Last SBP - First SBP)	273

Definition	Teófilo Otoni (Cont.)
Patients with A1c decrease >=10%, among those enrolled for DM with at least 2 readings available (Last A1c - First A1c)	61
Patients with SBP increase >=10%, among those enrolled for HTN with at least 2 readings available (Last SBP - First SBP)	225
Patients with A1c increase >=10%, among those enrolled for DM with at least 2 readings available (Last A1c - First A1c)	23
Total number of patients who showed positive progress in their condition, by moving from one BP or blood glucose category to a lower BP or blood glucose category	352
Patients whose BP has moved to a lower category, among those enrolled for HTN with at least 2 BP readings	314
Patients whose A1c has moved to a lower category, among those enrolled for DM with at least 2 A1c readings	53
Total number of patients who showed decline in their condition, by moving from one BP or blood glucose category to a higher BP or blood glucose category	253
Patients whose BP has moved to a higher category, among those enrolled for HTN with at least 2 BP readings	241
Patients whose A1c has moved to a higher category, among those enrolled for DM with at least 2 A1c readings	18

Table C9: Vitória da Conquista, Brazil

Definition	Vitória da Conquista
Number of stakeholders' meetings during the project	37
Number of education materials produced (distance learning courses or other)	2
Awareness activities	35
Number of public screening events ("health fairs")	23
Total number of health workers trained (in-person trainings)	595
Number of CHWs trained (in-person trainings)	340
Number of patients who attended the health facility gyms during the project	136
Number of patients who got A1c through Point of Care grant	376
Number of individuals screened either for HTN or DM, according to the definitions below.	4,323
Number of individuals who attended a screening activity and: 1) reported a previous HTN diagnosis; 2) or no previous HTN diagnosis but had a BP reading at the time of the screening activity	4,321
Number of individuals who attended a screening activity and: 1) reported a previous DM diagnosis; 2) or no previous DM diagnosis but had a CBG or FG reading at the time of the screening activity.	4,295
Number of individuals without a previous diagnosis that got measured either for HTN or DM	3,753

Definition	Vitória da Conquista (Cont.)
Number of individuals who attended a screening activity, did not report a previous HTN diagnosis, and received a BP measurement at the time of the screening activity	2,315
Number of individuals who attended a screening activity, did not report a previous DM diagnosis, and received a CBG or FG measurement at the time of the screening activity.	3,609
Of those screened, the sum of the number of individuals who reported a previous diagnosis and the number of individuals without a previous diagnosis with readings above the screening threshold, according to the definitions below	2,866
Of those screened for HTN, the sum of the number of individuals who reported a previous HTN diagnosis and the number of individuals without a previous HTN diagnosis and SBP >= 140 mmHg or DBP >= 90 mmHg	2,633
Of those screened for DM, the sum of the number of individuals who reported a previous DM diagnosis and the number of individuals without a previous DM diagnosis and: **For VC Health Unit**: CBG>= 100 if fasting; CBG>= 140 if non-fasting. **For VC SESI**: FG >= 126 or CBG >= 140.	1,185
Number of individuals without a previous diagnosis that were measured and screened above thresholds for either HTN or DM, according to the definitions below	1,051
Of those measured for HTN, the number of individuals who didn't report a previous HTN diagnosis and measured SBP >= 140 mmHg or DBP >= 90 mmHg	626
Of those measured for DM, the number of individuals who didn't report a previous DM diagnosis and: **For VC Health Unit**: measured CBG>= 100 if fasting; measured CBG>= 140 if non-fasting. **For VC SESI**: measured FG >= 126 or CBG >= 100.	499
Number of individuals confirmed for either HTN or DM, according to the definitions below	2,234
Of those screened above thresholds, the sum of the number of patients who reported a previous HTN diagnosis and the number of patients newly diagnosed for HTN	2,237
Of those screened above thresholds, the sum of the number of patients who reported a previous DM diagnosis and the number of patients newly diagnosed for DM	730
Number of patients newly diagnosed for either HTN or DM	263
Number of patients newly diagnosed for HTN	233
Number of patients newly diagnosed for DM	44
Number of patients newly diagnosed for DM and HTN	12
Total number of patients enrolled either for HTN or DM, according to the definitions below	2,610
Number of patients with a final diagnosis of HTN that have attended at least one consultation at the health facility	2,443
Number of patients with a final diagnosis of DM that have attended at least one consultation at the health facility	1,052
Number of patients with a final diagnosis of DM and HTN that have attended at least one consultation at the health facility	885
Among patients that were enrolled after being screened, the average number of days between screening and 1st consultation at the health facility	88.5
Total number of patients prescribed pharmacotherapy	1,728

Definition	Vitória da Conquista (Cont.)
Number of HTN patients prescribed pharmacotherapy	1,566
Number of DM patients prescribed pharmacotherapy	622
Enrolled patients with a final HTN or DM diagnosis that have attended >= 2 consultations at the health facility	1,298
Enrolled patients with a final HTN diagnosis that have attended >= 2 consultations at the health facility	1,218
Enrolled patients with a final DM diagnosis that have attended >= 2 consultations at the health facility	541
Average number of consults at the health facility among enrolled patients	2.87
Number of patients with a final DM diagnosis with at least one A1c reading available.	435
Number of patients with a final HTN diagnosis with at least one BP reading available	2,062
Number of patients with a final DM diagnosis with at least two A1c readings available.	68
Number of patients with a final HTN diagnosis with at least two BP readings available	1,095
Total numbers of patients controlled for DM or HTN, according to the definitions below	995
Patients enrolled for HTN with BP < 140/90 mmHg at last available reading	845
Patients enrolled for DM with A1c < 8% at last available reading	228
Average change in SBP, among those enrolled for HTN with at least 2 readings available (Last SBP - First SBP)	-4.14
Average change in A1c, among those enrolled for DM with at least 2 readings available (Last A1c - First A1c)	-0.94
Patients with SBP decrease >=10%, among those enrolled for HTN with at least 2 readings available (Last SBP - First SBP)	206
Patients with A1c decrease >=10%, among those enrolled for DM with at least 2 readings available (Last A1c - First A1c)	33
Patients with SBP increase >=10%, among those enrolled for HTN with at least 2 readings available (Last SBP - First SBP)	81
Patients with A1c increase >=10%, among those enrolled for DM with at least 2 readings available (Last A1c - First A1c)	6
Total number of patients who showed positive progress in their condition, by moving from one BP or blood glucose category to a lower BP or blood glucose category	256
Patients whose BP has moved to a lower category, among those enrolled for HTN with at least 2 BP readings	230
Patients whose A1c has moved to a lower category, among those enrolled for DM with at least 2 A1c readings	29
Total number of patients who showed a decline in their condition, by moving from one BP or blood glucose category to a higher BP or blood glucose category	85
Patients whose BP has moved to a higher category, among those enrolled for HTN with at least 2 BP readings	80
Patients whose A1c has moved to a higher category, among those enrolled for DM with at least 2 A1c readings	5

Appendix D – Monitoring cascades of care disaggregated by sex

Table D1: Monitoring indicator cascade of care by sex – Teófilo Otoni, Brazil

Teófilo Otoni			
Hypertension			
	Males	Females	**Total**
Newly screened	1319	1810	**3129**
Newly screened positive	446	427	**873**
Newly diagnosed	91	99	**190**
Enrolled	1318	2674	**3992**
Biomarker	1020	2176	**3196**
Controlled	466	1120	**1586**
Diabetes			
	Males	Females	**Total**
Newly screened	2100	3296	**5396**
Newly screened positive	44	81	**125**
Newly diagnosed	12	28	**40**
Enrolled	300	728	**1028**
Biomarker	170	461	**631**
Controlled	91	267	**358**

Table D2: Monitoring indicator cascade of care by sex – Vitória da Conquista, Brazil

Vitória da Conquista				
Hypertension				
	Males	Females	Unknown	**Total**
Newly screened	1335	980	0	**2315**
Newly screened positive	408	218	0	**626**
Newly diagnosed	122	110	1	**233**
Enrolled	739	1697	7	**2443**
Biomarker	639	1417	6	**2062**
Controlled	231	612	2	**845**
Diabetes				
	Males	Females	Unknown	**Total**
Newly screened	1703	1906	0	**3609**
Newly screened positive	215	284	0	**499**
Newly diagnosed	17	27	0	**44**
Enrolled	313	737	2	**1052**
Biomarker	126	307	2	**435**
Controlled	63	164	1	**228**

Table D3: Monitoring indicator cascade of care by sex – Udaipur, India

Udaipur			
Hypertension			
	Males	Females	**Total**
Newly screened	11710	14434	**26144**
Newly screened positive	337	498	**835**
Newly diagnosed	94	170	**264**
Confirmed positive	222	457	**679**
Controlled	66	125	**191**
Diabetes			
	Males	Females	**Total**
Newly screened	8084	9910	**17994**
Newly screened positive	304	535	**839**
Newly diagnosed	41	66	**107**
Confirmed positive	99	180	**279**
Controlled	31	63	**94**

Table D4: Monitoring indicator cascade of care by sex – Shimla, India

Shimla			
Hypertension			
	Males	Females	**Total**
Newly screened	8517	12089	**20606**
Newly screened positive	1034	1180	**2214**
Newly diagnosed	238	317	**555**
Confirmed positive	690	1312	**2002**
Controlled	100	230	**330**
Diabetes			
	Males	Females	**Total**
Newly screened	8738	12744	**21482**
Newly screened positive	350	550	**900**
Newly diagnosed	20	36	**56**
Confirmed positive	251	376	**627**
Controlled	97	156	**253**

Table D5: Monitoring indicator cascade of care by sex – uMgungundlovu, South Africa

uMgungundlovu			
Hypertension			
	Males	Females	**Total**
Newly screened	1485	3297	**4782**
Newly screened suspected	780	436	**1216**
Newly diagnosed	43	86	**129**
Confirmed cases	126	419	**545**
Follow-up monitoring visit	14	50	**64**
Controlled	6	18	**24**
Diabetes			
	Males	Females	**Total**
Newly screened	1164	3427	**4591**
Newly screened suspected	33	96	**129**
Newly diagnosed	9	15	**24**
Confirmed cases	25	111	**136**
Follow-up monitoring visit	1	16	**17**
Controlled	0	1	**1**

Table D6: Monitoring indicator cascade of care by sex – Pixley ka Seme, South Africa

Pixley ka Seme			
Hypertension			
	Males	Females	**Total**
Newly screened	896	1470	**2366**
Newly screened suspected	295	382	**677**
Newly diagnosed	36	57	**93**
Confirmed cases	55	87	**142**
Follow-up monitoring visit	30	68	**98**
Controlled	15	38	**53**
Diabetes			
	Males	Females	**Total**
Newly screened	1243	2327	**3570**
Newly screened suspected	25	46	**71**
Newly diagnosed	4	20	**24**
Confirmed cases	5	28	**33**
Follow-up monitoring visit	8	23	**31**
Controlled	2	7	**9**

Table D7: Monitoring indicator cascade of care by sex – Ramsey County, USA

Ramsey County			
Hypertension			
	Males	Females	**Total**
Enrolled	14	19	**33**
Biomarkers	10	11	**21**
Controlled	5	5	**10**
Diabetes			
	Males	Females	**Total**
Enrolled	32	37	**69**
Biomarkers	19	23	**42**
Controlled	5	7	**12**

Table D8: Monitoring indicator cascade of care by sex – Hennepin County, USA

Hennepin County			
Hypertension			
	Males	Females	**Total**
Enrolled	44	58	**102**
Biomarkers	29	43	**72**
Controlled	23	32	**55**
Diabetes			
	Males	Females	**Total**
Enrolled	52	48	**100**
Biomarkers	26	28	**54**
Controlled	16	10	**26**

Table D9: Monitoring indicator cascade of care by sex – Rice County, USA

Rice County			
Hypertension			
	Males	Females	**Total**
Enrolled	40	47	**87**
Biomarkers	37	39	**76**
Controlled	20	25	**45**
Diabetes			
	Males	Females	**Total**
Enrolled	66	83	**149**
Biomarkers	48	60	**108**
Controlled	24	29	**53**

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