



Diabetes Supplies: Are they there when needed?

A review of the availability and affordability of the 22 essential medicines and technologies for comprehensive diagnosis and treatment of diabetes in low-resource settings.

A PUBLICATION FROM THE *NO EMPTY SHELVES: DIABETES SUPPLIES, THERE WHEN NEEDED* PROJECT.



RECOGNITIONS

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Acronyms and Abbreviations

ABCE	The Access, Bottlenecks, Costs and Equity project
ADF	Asthma Drug Facility
DALYs	Disability-adjusted life years
EML	Essential medicines list
EMTs	Essential medicines and technologies
GAP	<i>Global Action Plan for the Prevention and Control of Noncommunicable Disease 2013-2020</i>
GAVI	Global Alliance for Vaccines and Immunization
GDF	Global Drug Facility
Global Fund	The Global Fund to Fight AIDS, Tuberculosis and Malaria
HAI	Health Action International
HbA1c	Glycated hemoglobin
HCT	Hydrochlorothiazide
HMIS	Health management information system
IDF	International Diabetes Federation
IRP	International reference price
LMICs	Low- and middle- income countries
LMIS	Logistics management information system
MPR	Median price ratio
MDGs	Millennium Development Goals
NCDs	Noncommunicable diseases
NEML	National essential medicines list
NGO	Nongovernmental organization
PAHO	Pan American Health Organization
PEPFAR	United States President’s Emergency Plan for AIDS Relief
RAPIA	Rapid Assessment Protocol for Insulin Access
RHSC	Reproductive Health Supplies Coalition
SARA	Service Availability and Readiness Assessment
SCMS	Supply Chain Management System project
SDGs	Sustainable Development Goals
TB	Tuberculosis
UHC	Universal health coverage
UN	United Nations
UNFPA	United Nations Population Fund
UNICEF	United Nation Children’s Fund
USAID	United States Agency for International Development
WEF	World Economic Forum
WHO	World Health Organization

Executive Summary

Noncommunicable diseases and the No Empty Shelves project

Four noncommunicable diseases (NCDs)—diabetes, cardiovascular disease, cancer, and chronic respiratory disease—are now the leading cause of morbidity and mortality worldwide, surpassing infectious diseases such as HIV/AIDS, diarrheal disease, and lower respiratory infections. Almost three-quarters of NCD-related deaths occur in low- and middle-income countries (LMICs), where essential medicines and technologies (EMTs) to diagnose and treat NCDs are often unavailable at health facilities and are less likely to be available than EMTs for acute illnesses.

PATH recognizes the importance of consistently available, quality-assured, affordable medicines and technologies for NCDs, and is applying its long-standing expertise in the field of commodity security—assuring that health products are available when needed, where needed—to advance the NCD agenda and contribute to the World Health Organization’s (WHO) target of achieving 80 percent availability of affordable EMTs in the public and private sectors. The *No Empty Shelves: Diabetes supplies, there when needed* project is an important first step toward this goal. With an initial focus on diabetes, the project will gather evidence and mobilize the NCD and broader global health communities to improve access to EMTs for NCDs in low-resource settings.

The purpose of this report is to raise awareness of availability and affordability of EMTs for diabetes, and inspire a broad range of stakeholders at the global and national levels to take concerted action to address this issue. The report indicates that current approaches and systems for procurement and distribution of diabetes EMTs are not efficient, nor are they meeting existing needs. Diabetes EMTs are rarely available in 80 percent of public or private facilities, and are least available in the public sector, rural areas, and at the lowest levels of care.

Global burden and response

Most deaths from chronic diseases occur in LMICs, where affordable EMTs for diagnosis and treatment are scarce. For the people with NCDs in these settings, this is an untenable situation, because the very nature of these diseases requires regular, often daily, management to prevent or delay complications and extend life expectancy. The rising prevalence of diabetes and other NCDs places a huge burden on working-age populations: more than 80 percent of NCD-related deaths in LMICs occur in people under the age of 70. Time away from work, disabilities, and the costs of treatment severely erode household finances and stifle national economic development. It is estimated that 100 million people in low-resource settings are forced into poverty annually by the high costs of managing NCDs. Central among activities needed to mitigate the effects of these diseases in LMICs is strengthening national health and supply systems to ensure access to affordable EMTs.

The global community is responding to the NCD crisis. Agencies such as the United Nations and WHO are working with national governments and nongovernmental organizations to integrate prevention, care, and treatment for NCDs into broader global development agendas. Chief among the responses is the *WHO Global Action Plan for the Prevention and Control of Noncommunicable Diseases 2013-2020* (GAP), which provides guidance to facilitate the development and implementation of national NCD strategies. The GAP has set a target of achieving 80 percent availability of affordable essential medicines

and technologies for NCDs in both public and private health facilities. National governments are stepping up to include NCDs in their health programs: surveillance efforts are increasing, with 112 countries now collecting data on NCD risk factors (representing 63 percent of the 178 countries reporting data). In 2013, eighty-nine countries had an operational plan and dedicated budgets for NCDs.

Assessing essential medicines and technologies for diabetes

Diabetes is an important sentinel disease for assessing the current environment for the supply of EMTs for NCDs. More than 385 million people worldwide had diabetes in 2014, and this number is expected to increase dramatically, with the greatest increase occurring in the African region. This report presents the current understanding of availability of affordable diabetes EMTs and concludes with recommendations for a range of audiences. We included the EMTs for managing blood glucose, blood pressure, and lipids, along with those required to monitor and screen for diabetes-related complications. We assessed the peer-reviewed literature and reports from organizations involved in NCD interventions, and interviewed thought leaders, researchers, and subject matter experts in the fields of diabetes, NCDs, and health supply chain management.

We sought to answer the following questions about diabetes EMTs in low-resource settings:

- What is the evidence on availability of EMTs?
- What are the factors that affect availability of EMTs?
- What are transferable approaches used in other health sectors to increase availability of affordable EMTs?

Of the 22 products included in our review we found data on only 15, and very few products were assessed in more than one country report. This paucity of data remains a major impediment to understanding the current environment and designing ways to remedy the situation.

Table ES1. Essential medicines and technologies for diabetes.

Medicines	Technologies
Amlodipine	Blood glucose test strips
Bisoprolol	Blood pressure measurement device, with digital reader
Enalapril	Fundoscope
Hydrochlorothiazide	Glucometer
Insulin	Hemoglobin A1c analyzer
Gliclazide or Glibenclamide ⁱ	Hemoglobin A1c testing consumables
Glucagon injection	Insulin syringes with adult and pediatric needles
Metformin	Monofilament
Simvastatin	Urine glucose test strips
Tropicamide eye drops	Urine ketone test strips
	Urine protein test strips
	Weigh Scale

ⁱ According to the 19th WHO Model List of Essential Medicines, glibenclamide is not recommended for people over the age of 60 years; therefore gliclazide is the preferred sulfonylurea. Data on the availability and affordability of gliclazide is limited, thus we include both medicines to indicate availability of oral hypoglycemic drugs in low- and middle-income countries.

Availability of essential medicines and technologies for diabetes

Evidence on availability of diabetes medicines and technologies was found primarily in reports using three types of research methodologies, all of which assessed availability at single points in time:

- Rapid Assessment Protocol for Insulin Access (RAPIA): reports from five countries; limited quantitative data were collected in these studies.
- WHO and Health Action International (WHO/HAI) surveys: Seven reports analyzing multiple countries, with the number of countries assessed ranging from six to forty; plus five reports on individual countries. The surveys assessed two to seven medicines from Table ES1. They did not include any technologies.
- WHO Service Availability and Readiness Assessments (SARA): These included more detailed quantitative data than the other two types of surveys. However, only five country reports contained an appropriate breadth and depth of data on diabetes EMTs.

The research shows that availability of EMTs for diabetes is insufficient to meet the needs of the people affected by this disease, based on the WHO GAP target of 80 percent availability of affordable EMTs in public and private facilities. Even facilities offering diabetes diagnosis or treatment had limited availability of these supplies. Median availability of diabetes-specific EMTs in these facilities ranged from a low of 20.5 percent for insulin to a high of 59.5 percent for urine protein test strips (across all countries and both sectors). Multipurpose technologies, such as weigh scales, blood pressure monitoring devices, and syringes, were more available than medicines and technologies specifically used to manage diabetes. Availability was typically higher in the private sector than the public sector.

There was notable disparity in availability of EMTs across and within countries, with typically more availability in urban areas and at higher levels of health systems. As a group, these commodities were least available at the primary care level in the countries assessed—a fundamental problem considering that primary care facilities are closest to where people live and where many first seek care. Diabetes EMTs were far less available than medicines for acute disease, such as the antibiotic amoxicillin, and the greatest disparities appeared in the lowest-income countries, particularly in the African region.

Not all studies assessed technologies; those that did found that diagnostics and monitoring tools were rarely available in the public sector. While many facilities had glucometers, they often did not stock the associated blood glucose test strips, and monitoring tools were rarely available for use in the home. Evidence suggests that consumers often purchased diabetes products at private outlets due to low availability in the public sector, at prices that were substantially higher than the procurement price.

Barriers to availability of essential medicines and technologies for diabetes

Financing. Despite the fact that 68 percent of global mortality in 2012 was attributed to NCDs—and that this proportion is predicted to rise—only 1.2 percent of global development assistance for health went to NCD-related interventions in 2011. The majority of NCD services, including procurement of EMTs, are financed by LMIC government budgets. Few quantitative reports are available on insufficient funding specific to diabetes EMTs in low-resource settings, but considering the low overall funding for NCDs, it is apparent that this is a critical factor, particularly in the public sector. LMICs face many challenges in allocating funds among competing programs, in order to best address local burden of disease, donor priorities, and achievement of milestones such as the Millennium Development Goals and the GAP targets.

Health systems. The limited capacity of health systems in general in LMICs contributes to the failure to recognize, prioritize, and plan for adequate supplies of EMTs for diabetes and other NCDs. Many of these health systems evolved from a need to address acute, infectious diseases and have been slow to adapt to the changing nature of the disease burden in their countries. The consensus among reports and stakeholder opinions was that strengthening overall health systems is the best approach for improving supplies of EMTs, and that vertical programs and funding—the current norm—are not the answer.

Supply chains. The most commonly reported downstream obstructions to availability of diabetes EMTs were components of in-country public health supply chains. There is a clear need to improve the forecasting and supply planning processes (i.e., quantification) for diabetes EMTs, especially by collection of surveillance data. Strengthening the procurement capacity of LMICs is also an important task. Although there was evidence that a small sample of diabetes medicines were procured at or near the international reference price, research is needed to determine how countries can be more effective in negotiating purchase prices and limiting mark-ups along the supply chain, ultimately resulting in better prices for the consumer. Pooled procurement is an option for improving availability of these products, but overall strengthening of the supply chain management system may have greater impact.

Experience across other Health Sectors

A review of strategies undertaken by other health sectors to address availability of EMTs identified some common approaches that have contributed to improved availability of products in areas such as family planning, malaria, tuberculosis, and HIV/AIDS: donor-funded procurement, pooled procurement, and partnerships. The most visible efforts to address commodity security across various health sectors focus on changes to procurement and other elements of the supply chain, with activities occurring at global, regional, and national levels, in both the public and private sectors. While the supply chain is a major focus, these approaches also incorporate activities to address financing, shape markets, strengthen systems, change policy, and raise awareness to improve availability of EMTs. All of these factors influence availability, directly or indirectly, and will be important to consider in future efforts for diabetes and other NCDs. The differences between diabetes (and other NCDs) and infectious diseases, such as the need for lifelong treatment combined with the minimal amount of foreign assistance provided and low national budgets for diabetes programs, may require the adaptation of existing commodity security approaches along with innovation to change the future of supply security for diabetes.

Discussion

In most LMICs, availability of diabetes EMTs is far below the 80 percent GAP target and is insufficient to meet the diagnostic, monitoring, and treatment needs of people living with diabetes and accessing care in either the public or private sectors. However, published evidence is limited: national-level, representative, quantitative data are needed to improve our understanding and inform innovative solutions. When these assessments are made and the underlying causes of deficiencies are identified at country, regional, or global levels, national governments and the global community can plan appropriate responses.

The documented scarcity of diabetes EMTs in low-resource settings is the result of many factors, with inadequate financing, unprepared health systems, and elements of the in-country supply chain most notable. The limited donor funding environment for diabetes and other NCDs has left the systems for diagnosis and treatment underdeveloped compared with vertical systems such as those for malaria or HIV/AIDS. While donor assistance could help initially to ensure availability of EMTs, a more sustainable

approach may be to advocate with governments to prioritize these medicines and technologies in the annual budgeting process, by using mechanisms such as budget line items for diabetes EMTs, integrating diabetes into universal health care, and integrating consumption data into national health and logistics management information systems.

Health systems in LMICs are currently configured to address infectious and acute illnesses, but as the burden in low-resource settings shifts from infectious to chronic diseases, these systems must adjust and provide care for patients with chronic diseases at all levels, and particularly within primary care facilities. Supply chains must also be strengthened as part of activities to improve health systems; doing so holistically can benefit all health programs, including those for NCDs. Efforts to strengthen the supply chain for these products should be incorporated into broader activities to build the capacity of LMIC health supply chains. There is also potential to integrate NCD services and supplies into existing systems, such as those for HIV/AIDS. Advocacy is needed at the national government level to increase stakeholders' understanding of the burden of disease and the adjustments needed in the health and supply system to ensure that the supply of EMTs meets the demand. Furthermore, advocacy is needed to ensure governments take advantage of the opportunities that exist to leverage the investments made in HIV and other areas of health to strengthen services for people with NCDs.

Experience across other health sectors shows that there are many approaches to address the availability of EMTs. Global partnerships such as the Reproductive Health Supplies Coalition are models for approaches to improve supply security for diabetes EMTs. A similar partnership could provide comparable successes for diabetes and NCDs, and focus on advocating with governments and the private sector, improving data collection and monitoring, and building country capacity to supply these products. However, partnerships require time and financial sponsorship to establish themselves and demonstrate the added value of their role.

With the increasing prevalence of diabetes—and likely, improved diagnosis—in the future, the growing demand for diabetes EMTs is likely to outpace availability even further. Systemic and structural changes are needed to improve country capacity to respond to demand for these commodities. It is time to put chronic diseases on the same level as infectious diseases and approach health care from a holistic perspective. This requires a multisectoral, multipronged approach, including engagement and investment from the foreign aid and global health communities and the private sector to jumpstart the process. The commitment of national governments is essential to ensure that the supply of affordable diabetes EMTs is sufficient to meet the need, to help their populations suffering from diabetes and other NCDs, and to achieve goals they aspire to such as universal health coverage, the GAP, and the Sustainable Development Goals.

Turn the page to view recommended actions for improving the availability of affordable diabetes EMTs in low-resource settings.

Recommendations

The following recommendations are drawn from the literature and stakeholder opinions, and are intended to facilitate improved availability and affordability of EMTs for diabetes in low-resource settings. They are intended for a range of audiences who will facilitate improved access to these critical health products. There is natural overlap across audiences, which presents opportunities where groups and organizations can work together to achieve the GAP target of 80 percent availability of the affordable basic technologies and essential medicines, including generics, required to treat major NCDs in both public and private facilities. Priority recommendations are noted with bold text.

POLICY-MAKERS IN LOW- AND MIDDLE-INCOME COUNTRIES

Priority: Integrate diabetes and other NCDs into activities to strengthen the health and supply systems in the public and private sectors, including strategies to achieve universal health coverage. Specifically:

- Integrate diabetes and NCDs into existing surveillance and monitoring systems that provide data for the continuous supply of health commodities.
- Integrate EMTs for diabetes and other NCDs into national health and logistics management information systems, including committees focused on supply security for other sectors—consider refreshing their focus to encompass all EMTs to address the country’s particular disease burden.
- Build the capacity of supply chain managers to better understand the dynamics of diabetes EMTs and the need for ensured availability of these health products on a consistent, long-term basis.
- Ensure clinical providers and health technologists are properly trained and equipped to diagnose, treat and monitor diabetes.
- Collect evidence necessary to prioritize access to diabetes EMTs and related quality health services at the primary care level, specifically providing screening, diagnosis and treatment for these health conditions.

Ensure adequate and sustainable financing for the supply of diabetes EMTs, including consideration of a separate budget line item for diabetes EMTs and development of a national health insurance scheme for people living with diabetes.

Strengthen regulatory authorities to ensure that diabetes EMTs are safe and quality-assured.

Adopt the list of EMTs from Table ES1 and incorporate into the national essential medicines list.

Integrate and prioritize diabetes and other NCDs into health partnership programs, including those with the private sector and bilateral and multilateral donors.

Engage with civil society to ensure diabetes and NCD programs are meeting the needs of communities.

MULTILATERAL INSTITUTIONS AND TECHNICAL PARTNERS

Priority: Build the evidence base to support policy and systems change. Specifically:

- Conduct country-specific assessments on the availability, price and affordability of EMTs for diabetes and investigate the driving forces behind the findings.
- Assess private sector supply chains for diabetes EMTs, including factors affecting availability and price.
- Pilot the integration of diabetes and other NCDs into existing health systems and service delivery platforms, including supply mechanisms.
- Pilot successful approaches from other health sectors to assess their feasibility for diabetes and their impact on availability and affordability of diabetes EMTs.

Integrate and prioritize diabetes and other chronic diseases within programs focused on improving access to medicines in LMICs.

Convene global, regional and national forums to raise the profile of this issue, present and discuss evidence, and formulate strategies to minimize obstructions.

FINANCIAL CONTRIBUTORS

Priority: Include and prioritize diabetes and other NCDs within programs that support strengthening of health systems, regulatory authorities, and supply chains.

Support research to build the evidence base on availability and affordability of EMTs for diabetes and other NCDs.

Explore public private partnerships—identify where there is shared value and pilot collaborative projects to address access to EMTs and services for diabetes.

ADVOCATES

Priority: Engage civil society and empower people living with diabetes to advocate for themselves with their community leaders, policy makers and governments.

Utilize existing and future evidence as an advocacy tool to engage policy makers and drive changes in policies, systems, and financing to support improved access to affordable diabetes EMTs.

Raise awareness of poor and inconsistent availability of affordable diabetes EMTs, at both the global and national levels.

Identify country champions and build their capacity to advocate for improved availability and affordability of diabetes EMTs.

Connect the availability and affordability of diabetes EMTs to national and global development goals, such as universal health coverage, the Sustainable Development Goals, and WHO global diabetes programs, and target global networks where it may be appropriate to integrate NCDs into their mission

Introduction

Noncommunicable diseases (NCDs) result in more than 38 million deaths every year and pose a significant and growing concern for the health and quality of life of the world's population, particularly for people living in low-resource settings.^{1,2} Almost three-quarters of NCD-related deaths occur in low- and middle-income countries (LMICs),^{1,2} where essential medicines and technologies (EMTs) to diagnose and treat NCDs are often unavailable at health facilities and are less likely to be available than EMTs for acute illnesses.³ The very nature of these chronic diseases requires regular, often daily, management through medicines and treatment technologies, which must be consistently available, quality-assured, and affordable.

The World Health Organization's (WHO) *Global Action Plan for the Prevention and Control of Noncommunicable Diseases 2013-2020* (GAP) aims to reduce premature mortality from NCDs 25 percent by 2025.⁴ WHO recognizes that the availability of EMTs is critical to achieving this goal, and includes the following target in the GAP: achieve 80 percent availability of the affordable basic technologies and essential medicines, including generics, required to treat major NCDs in both public and private facilities.⁴ Addressing NCDs and providing access to quality-assured, affordable EMTs are key components of the global drive to attain universal health coverage (UHC), which requires that people can access basic health services without incurring financial hardship. It is vital to ensure availability of EMTs for the anticipated demand created by efforts to achieve UHC and meet the GAP targets.

Current approaches and systems for procurement and distribution of NCD medicines and technologies are not efficient, nor are they meeting existing needs. Research suggests that, in addition to being less available than EMTs for acute conditions, EMTs for NCDs are less available in the public sector than in the private sector and rarely achieve the GAP target of 80 percent availability in either sector.⁵⁻⁷ As global recognition of the NCD burden increases and efforts are undertaken to improve diagnosis and treatment of these diseases, innovative solutions are needed to secure the supply of affordable EMTs for NCDs.

The *No Empty Shelves: Diabetes supplies, there when needed* project

PATH recognizes the importance of consistently available, quality-assured, and affordable medicines and technologies for NCDs, and is applying its long-standing expertise in the field of commodity security—assuring health products are available when needed, where needed—to help people living with NCDs in low-resource settings attain this goal. This work is part of PATH's strategic goal to use innovation and technology to increase access to prevention, care, and treatment for NCDs, thereby reducing morbidity and mortality. To this end, PATH is implementing the *No Empty Shelves* project to gather evidence and mobilize the NCD and broader global health communities to improve access to EMTs for NCDs in low-resource settings, with an initial focus on diabetes.¹ The project will lay the groundwork for increasing the availability and affordability of these supplies and contribute to the GAP target to reduce NCD-related mortality 25 percent by 2025.⁴ The goals of the *No Empty Shelves* project are the following:

¹ This report reviews the availability of affordable EMTs to treat both Type 1 and Type 2 diabetes, as well as gestational diabetes.

1. Strengthen the global evidence base on availability of affordable essential medicines and technologies for diabetes in LMICs.
2. Raise awareness of major barriers to availability of affordable diabetes EMTs.
3. Build a network of key stakeholders committed to taking action to increase the availability of affordable EMTs for diabetes and other NCDs.

In order to foster deeper understanding of the issues and enable development of system-wide, sustainable solutions, the project has three major activities. *First*, we review the global landscape to assess the supply environment for diabetes EMTs: this is the purpose of the current report. *Next*, the project team will lead comprehensive assessments in two countries to assess the supply chain for diabetes EMTs and identify factors affecting availability from initial procurement to the end user; and to survey the availability and price of diabetes EMTs at a variety of health facilities, pharmacies, and drug shops. *Finally*, in consultation with the broader global health community, we will develop a Call to Action—built upon the evidence gathered from the landscape report and the country assessments—that will define a roadmap for future global engagement to improve the availability of affordable EMTs for diabetes and other NCDs. The project aims to secure commitments to pursue these actions from a multisectoral group of organizations. Recommended mechanisms for implementing this roadmap after the completion of the *No Empty Shelves* project also will be disseminated. By initiating coordinated action to address barriers to the availability of affordable EMTs for diabetes, PATH hopes to contribute to and accelerate attainment of the GAP’s 80 percent availability target, as well as the overall target to reduce NCD-related mortality 25 percent.⁴

Purpose of this Report

The purpose of this report is to raise awareness of availability and affordability of EMTs for diabetes, and inspire a broad range of stakeholders at the global and national levels to take concerted action to address this issue. The audience for this report includes representatives and policy makers of LMIC governments and ministries of health, the global health and NCD communities, the private for profit sector, foreign assistance donors, health workers, and people affected by diabetes. This report aims to accomplish the following:

- Assemble and discuss current evidence on availability of EMTs for diabetes in LMICs.
- Identify the most commonly cited barriers affecting availability of EMTs for diabetes in LMICs, and distinguish the root causes of those barriers.
- Incorporate the views of key stakeholders and technical experts in the fields of diabetes/NCD service delivery, research, and advocacy; global health; and public health supply chain management.
- Present approaches taken in other health sectors to improve availability of affordable EMTs.
- Discuss the findings and provide recommendations to the global community on strengthening the supply of affordable EMTs for diabetes and, where possible, for other NCDs.

Background

Disease burden

Diabetes is one of the four NCDs that have replaced infectious diseases such as HIV/AIDS, lower respiratory infections, and diarrheal disease as the leading causes of morbidity and mortality around the world. The other three are cardiovascular disease, cancers, and chronic respiratory diseases. This class of diseases is now the leading cause of deaths in all regions of the world, with the exception of Africa.¹ LMICs are burdened with 74 percent of all NCD-related mortality and recent evidence suggests that by 2030, NCD-related mortality in the African region will increase by 86 percent while mortality from infectious diseases, nutritional disorders, and maternal and perinatal complications combined will slightly decrease by 0.8 percent.¹ Consequently, these countries will be managing the double burden of infectious and chronic disease in the near future.

According to the International Diabetes Federation (IDF), 387 million people worldwide had diabetes in 2014, and this number is expected to increase dramatically, with an anticipated global diabetes prevalence of 592 million people by 2035.⁸ As with NCDs generally, by far the largest proportion of people living with diabetes—77 percent—reside in LMICs. This trend is expected to continue; in Africa alone, the prevalence of diabetes is anticipated to increase 109 percent over the next 20 years.⁹ The Middle East/North Africa and Southeast Asian regions are close behind, with anticipated increases of 96 percent and 71 percent, respectively.

While some increase in the burden of NCDs in low-resource settings is related to reduced prevalence of infectious disease and improved life expectancy, people in LMICs develop NCDs at younger ages and experience more severe outcomes than people in high-income countries.¹⁰ The rising prevalence of diabetes and other NCDs places a large burden on working-age populations; approximately 82 percent of NCD-related deaths in LMICs are premature² and as of 2013, 8 million people under the age of 60 died due to the four main NCDs.¹⁰ People burdened with NCDs at younger ages require treatment for long periods of time and face death at a young age. Time away from work, disabilities, and the costs of treatment severely erode household finances and stifle national economic development.^{2,10–12} A 2013 report from the African Union underscored the fact that the exorbitant costs of NCDs are forcing 100 million people in low-resource settings into poverty annually, stifling development in these countries.¹³ A review of 35 countries found health expenditures for people with diabetes were far more catastrophic than for those without diabetes.¹⁴ The World Economic Forum (WEF) estimates that by 2030, the four main NCDs will cost LMICs US \$14 trillion in lost output and will impoverish millions of families.¹⁵ Furthermore, the WEF estimates suggest that diabetes alone will cost the global economy US \$1.7 trillion by 2030, with LMICs bearing a larger share of the burden over time.

Increased prevalence of and mortality from diabetes and other NCDs not only compromises the economic development of LMICs, but also threatens to erode advances made toward achieving the Millennium Development Goals (MDGs), and will similarly impact progress toward the Sustainable Development Goals (SDGs) in the future.

Global response

Global agencies such as the United Nations (UN) and WHO are working with national governments and nongovernmental organizations (NGOs) to integrate prevention, care and treatment of NCDs into broader global development agendas. Key developments in this global response are highlighted below.

UN World Diabetes Day. In 2006 the UN General Assembly adopted a Resolution recognizing the serious implications of diabetes morbidity and mortality and designating 14 November as World Diabetes Day.¹⁶ The resolution marked the first time NCDs were recognized as having a serious impact on global health, specifically noting that diabetes is a “...chronic, debilitating and costly disease associated with severe complications, which poses severe risks for families, Member States and the entire world and serious challenges to the achievement of internationally agreed development goals, including the Millennium Development Goals...”.^{16(p.1)} The resolution encourages Member States to develop national strategies for the prevention, care and treatment of diabetes and set the stage for future diabetes and NCD-related activities at the global level.^{16,17}

UN Political Declaration on NCDs. In 2011, the UN General Assembly adopted the Political Declaration of the High-level Meeting of the General Assembly on the Prevention and Control of Non-communicable Diseases, committing to establish and strengthen policies and plans for the prevention and control of NCDs among its Member States.¹⁸

WHO Global Action Plan. In 2013, the World Health Assembly endorsed the *WHO Global Action Plan for the Prevention and Control of Noncommunicable Diseases 2013-2020*, which provides Member States, implementing partners, and WHO with guidance and policy options to facilitate the development and implementation of national NCD strategies.⁴ The GAP incorporates a global monitoring framework on NCDs that sets forth nine voluntary targets and 25 indicators to enable countries to monitor progress. The GAP sets specific targets for both diabetes and access to medicines, noted here:

- Reaching at least 50 percent of eligible people with drug therapy and counseling, including glycemic control, to prevent heart attacks and strokes.
- Reducing the prevalence of high blood pressure by 25 percent, or containing prevalence of high blood pressure based on national circumstances.
- Achieving 80 percent availability of the affordable basic technologies and essential medicines, including generics, required to treat major NCDs in both public and private facilities.

Establishment of the UN Interagency Task Force on NCDs. In 2013, the UN Secretary General established the UN Interagency Task Force on NCDs to coordinate activities across the UN and other multilateral organizations working to realize the commitments of the 2011 Political Declaration and implement the GAP.¹⁹

UN Review and Assessment of Progress Achieved in the Prevention and Control of NCDs. A high-level meeting in July 2014 assessed progress on NCDs since the 2011 Political Declaration, identified gaps in action, and solicited calls for the future. The outcome document from this meeting calls on UN Member States to strengthen health systems to improve universal access to health care, set national targets for 2025 that align with the nine GAP targets, and integrate NCD prevention, treatment and care approaches with those for other health programs, such as reproductive and maternal health and HIV/AIDS.²⁰

National level commitment. According to a recent WHO publication, approximately 95 percent of 178 countries reporting data have an NCD-specific unit or department within their ministries of health.²¹ Surveillance and data collection activities are increasing, with 63 percent of these countries now collecting data on NCD risk factors. Half of the 178 countries have an operational plan and dedicated budget for NCDs.^{20,21} However, countries face significant challenges implementing the strategies and policies they have developed; as noted at the 2014 UN review, this is largely attributed to limited national capacity and overburdened health systems. A WHO discussion paper also notes the lack of real growth in national funding for the health sector and the political challenges of limited funding environments.²²

Universal Health Coverage: National stewardship for NCDs can be facilitated through government commitment to achieve UHC, which aims to ensure that everyone receives necessary health services without incurring financial hardship, including services for the prevention and treatment of NCDs.²³ A UN resolution on UHC emphasizes the important role health status plays in achieving sustainable development, citing the 2011 political declaration on NCDs, the extensive impact of NCDs on health systems, and the need for access to medicines as factors supporting the need for UHC.²⁴

Millennium Development Goals. The MDGs are a set of eight goals intended to reduce poverty and improve the health and economic prospects of the world's poorest communities; however, none included specific attention to NCDs. MDG 8—to develop a global partnership for development—includes a target on providing access to affordable essential drugs in low-resource countries, which many interpret as including essential medicines for NCDs.²⁵ The MDG Gap Task Force—created to monitor the global commitments for MDG 8—notes that progress toward this target has been limited, with inadequate access to medicines in general and high prices for them in LMICs, combined with particularly poor attention given to medicines for NCDs.^{26,27}

Sustainable Development Goals. The SDGs are a series of goals and targets intended to replace the MDGs—which expire in 2015—and to broaden and diversify the aims of sustainable global development through 2030.^{28,29} A great deal of advocacy work has been undertaken to ensure inclusion of NCD concerns in the SDGs. The outcome document, entitled *Transforming our World: The 2030 Agenda for Sustainable Development*, includes goals to reduce premature mortality from NCDs and ensure access to affordable, quality-assured essential medicines.³⁰ The SDGs will be adopted at the UN General Assembly meeting in September 2015, and ongoing advocacy is focused on ensuring that NCDs are a significant health priority.

Development assistance for NCDs. To date, global investment in preventing and treating diabetes and other NCDs in LMICs has been minimal. In 2012, 68 percent of global mortality was attributed to these illnesses, yet only 1.2 percent of global development assistance for health went to NCD-related interventions in 2011.^{1,31} While other health sectors such as infectious disease, maternal and child health, and reproductive health receive significant financial support from bilateral organizations and private philanthropic foundations, international donors do not contribute comparable funding toward the prevention, care, and treatment of diabetes or other NCDs.^{31–34} For example, in its focus countries for global health investment, "...the United States government spent [US] \$44.17 in aid for each year of life lost to disability and early death from HIV/AIDS in 2010 (as measured in disability-adjusted life years, or DALYs), \$4.21 per DALY lost to malaria, and \$1.82 per DALY lost to tuberculosis, but only \$0.02 per DALY lost to NCDs".^{10(p.7)} Multilateral donors including WHO, European Union, and the World Bank are the largest sources of aid for NCDs, contributing 45 percent of foreign aid for NCDs in 2011.^{22,33} That same year, nongovernmental organizations, including private foundations, contributed 27 percent of

development assistance for NCDs, while bilateral donors—generally the main contributors of financing for health—provided only 11 percent.²²

Current funding for health is typically dedicated to individual diseases, also known as vertical funding, and this results in limited opportunities to integrate NCD interventions into the overall health system. The continued emphasis on infectious diseases along with vertical funding and limited domestic resources are possible reasons why implementation of national NCD strategies and policies in LMICs cannot keep pace with stated government intentions.

The importance of essential medicines and technologies for diabetes

The burden of diabetes in low-resource settings is increasing rapidly. While a global response is underway, it is not moving swiftly enough to keep pace with increasing prevalence. In order to mitigate the effects of the disease on populations in LMICs, activities to improve prevention, diagnosis, care, and treatment for diabetes are needed now.

Central among these activities is strengthening national health and supply systems to ensure access to EMTs for diabetes. Availability of affordable, quality-assured EMTs for diabetes is vital to improving access to treatment and must be a priority for governments.³⁵ Insufficient supply of EMTs can result in stockouts, contributing to providers' inability to treat patients according to standard treatment guidelines and to potential adverse outcomes for people living with diabetes, who require consistent and reliable access to EMTs. Similarly, if diabetes EMTs are unaffordable, patients with limited incomes may not be able to adequately or regularly treat their diabetes, increasing the risk of comorbidities and negative health outcomes. Box A on the next page describes the importance of assured access to diabetes EMTs.

Box A: Why is a continuous, life-long supply of quality-assured EMTs critical for people with diabetes?

Without daily treatment, people living with diabetes can encounter severe health consequences, including cardiovascular disease, kidney disease, blindness, amputations and death. These medicines and technologies not only help manage glucose levels, but also address common comorbidities such as hypertension (high blood pressure) and hyperlipidemia (excess lipids, or fats, in the blood). Furthermore, untreated or erratically treated diabetes can weaken the immune system, exposing patients to increased risk of contracting infectious diseases such as tuberculosis or HIV.

Landmark studies show that costly complications can be prevented or delayed with timely, comprehensive monitoring, treatment, and follow-up.^{a,b,c} The list of EMTs in Appendix B encompasses the 22 products necessary to diagnose and treat diabetes and its common comorbidities. These include glucose lowering agents such as insulin and oral hypoglycemics, as well as antihypertensives and statins. Devices such as syringes, needles, and blood glucose monitors and associated test strips are also essential for monitoring and treating diabetes. Type 1 diabetes is unique in that without exogenous insulin it will cause acute complications and death. Other forms of diabetes—such as Type 2 and gestational—can sometimes be managed without insulin. It is common for people with diabetes to be prescribed a daily treatment regimen of several medications for the rest of their life, emphasizing the importance of a continuous supply of quality affordable medicines.

For people living with diabetes of any type, EMTs will reduce the incidence of complications and the burden on themselves and their families, as well as health systems and national economies. As noted by one stakeholder,

“The only way to prevent people from having secondary complications of diabetes is to have access to and administration of essential medicines [and technologies]” (Prof. Jean Claude Mbanya, Director, Health of Population in Transition Research Group and Professor, Medicine and Endocrinology, University of Yaoundé 1)

^a The Diabetes Control and Complications Trial Research Group. The effect of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus. *New England Journal of Medicine*. 1993;329(14): 977–86.

^b Epidemiology of Diabetes Interventions and Complications Research Group. Epidemiology of diabetes interventions and complications: design, implementation, and preliminary results of a long-term follow-up of the diabetes control and complications trial cohort. *Diabetes Care*. 1999;22(1): 99–111.

^c U.K. Prospective Diabetes Study Group. U.K. prospective diabetes study 16: Overview of 6 years' therapy of type II diabetes: A progressive disease. *Diabetes*. 1995;44(11):1249-1258.

There is no designated global list of the medicines and technologies essential to the diagnosis of diabetes and the care and treatment of patients; therefore, PATH constructed one, using the WHO 2015 Model List of Essential Medicines, the WHO *Package of Essential Noncommunicable Disease Interventions for Primary Health Care in Low-Resource Settings*, clinical practice guidelines, and input from the *No Empty Shelves* project's Technical Advisory Committee. Table 1 presents the EMTs on the list, and Appendix B provides more detail on the development of the list as well as the purpose and class of each of the EMTs. The list contains the EMTs for monitoring and treating hyperglycemia common to Type 1, Type 2, and gestational diabetes, as well as EMTs for hypertension and hyperlipidemia, which are closely linked with diabetes morbidity. The literature reviewed for this report did not include detailed information on the

availability of the following EMTs from our list: bisoprolol, digital blood pressure monitoring devicesⁱⁱ, glucagon injections, monofilament, needles for syringes, tropicamide eye drops, and fundoscopes.

Table 1. Comprehensive list of essential medicines and technologies for diabetes.

Medicines	Technologies
Amlodipine	Blood glucose test strips
Bisoprolol	Blood pressure measurement device, with digital reader
Enalapril	Fundoscope
Hydrochlorothiazide	Glucometer
Insulin: short- and intermediate-acting and mixed	Hemoglobin A1c analyzer
Gliclazide or Glibenclamide ⁱⁱⁱ	Hemoglobin A1c testing consumables
Glucagon injection	Insulin syringes with adult and pediatric needles
Metformin	Monofilament
Simvastatin	Urine glucose test strips
Tropicamide eye drops	Urine ketone test strips
	Urine protein test strips
	Weigh Scale

The increasing burden of diabetes in LMICs and the resulting global response require that these EMTs are available when needed, where needed. The effectiveness of diabetes care is often used as a measure of health system performance, indicating how well health professionals are trained to diagnose and treat chronic disease, how invested patients are in managing their health, and, critically, whether or not there is sufficient access to EMTs.^{36,37} This report focuses on the latter, in the hope that a better understanding of current access to diabetes EMTs in LMICs will stimulate health system responses to improve availability and affordability of these products, and strengthen health service delivery for diabetes and, eventually, other NCDs.

Methodology

Literature review

The literature in this review was found through systematic, structured searches in PubMed, Global Health Abstracts, Google Scholar and the United States Agency for International Development (USAID) Development Experience Clearinghouse. Searches focused on English-language original papers and

ⁱⁱ The WHO Service Availability and Readiness Assessments include data on availability of blood pressure devices, but do not specify whether or not they have a digital reader. We include the data to provide a general idea of the availability of blood pressure monitoring devices in LMICs, but it may not accurately reflect availability of the desired technology.

ⁱⁱⁱ According to the 19th WHO Model List of Essential Medicines, glibenclamide is not recommended for people over the age of 60 years; therefore gliclazide is the preferred sulfonylurea. Data on the availability and affordability of gliclazide is limited, thus we include both medicines to indicate availability of oral hypoglycemic drugs in low- and middle-income countries.

reviews of access to and availability of EMTs published after 2007. Searches were restricted to literature focused on LMICs. The search included disease-specific and intervention/drug terms, combined with location, availability, and cost/affordability phrases. Sample terms include: diabetes (Type 1 and Type 2), cardiovascular disease, noncommunicable diseases, chronic disease, essential medicines, essential drugs, essential technologies, insulin, hypoglycemic agents, developing countries, low-resource settings, commodity security, and public health supply chain management.

In addition to the databases listed, we searched articles cited in literature identified in the primary searches. We also conducted searches for grey literature on the websites of organizations that address NCDs and the security of public health supplies in LMICs. These include but are not limited to: the International Diabetes Federation, the International Insulin Foundation, the NCD Alliance, the Partnership for Supply Chain Management, the Reproductive Health Supplies Coalition, the Stop TB Partnership, the Supply Chain Management System project, the USAID | DELIVER PROJECT, the World Diabetes Foundation, and the World Health Organization. Additional articles were suggested by the project's Technical Advisory Committee.

Stakeholder interviews

To broaden the range of information contributing to this global landscape report, PATH conducted semi-structured facilitated interviews with thought leaders and subject matter experts in the fields of diabetes, NCDs, public health supply chain management, and academic research^{iv}. This activity received non-research status from PATH's Research Determination Committee. The project team identified stakeholders representing national, regional, and global perspectives, and additional people were selected through recommendations from the project's Technical Advisory Committee, as well as recommendations from other interviewees. These individuals were sent detailed background information on the project and invited to provide input through telephone interviews, in-person interviews, or email response.

A semi-structured interview guide was developed for each interview. Members of the project team conducted all telephone and in-person interviews and, with the permission of interviewees, recorded the interviews and transcribed the discussions. For stakeholders who preferred to respond by email, their written response was used as the transcript. Interviewees reviewed and approved use of attributed quotations prior to publication of the report. PATH contacted 39 stakeholders about participation, and 28 interviews were completed: 23 by telephone, three in person, and two by email. The themes summarized in this report represent the collective input of these 28 stakeholders. A list of the stakeholders interviewed is provided in Appendix A.

^{iv} For a more detailed description of the methodology for the stakeholder interviews, please contact info@path.org.

Evidence on Availability of Essential Medicines and Technologies for Diabetes

Findings from the literature

Direct evidence on availability^v of diabetes medicines and technologies was found mainly in reports using three types of research methodologies: (1) the Rapid Assessment Protocol for Insulin Access (RAPIA) reports; (2) the WHO and Health Action International (HAI) surveys; and (3) the WHO Service Availability and Readiness Assessments (SARA). These reports all included evidence on the availability of several essential medicines and/or technologies for diabetes. These three types of studies were the primary source of evidence that met the search criteria for this report.

Evidence from the Rapid Assessment Protocol for Insulin Access research

The RAPIA surveys developed by the International Insulin Foundation assessed a much bigger picture than availability of diabetes EMTs: they evaluated components of health systems that influence access to diabetes care and treatment in the countries surveyed.³⁸ RAPIA research focuses primarily on Type 1 diabetes and the public sector, providing information on the burden of diabetes disease in each country, the operations of the national health system, and recommendations for improving access to prevention, care, and treatment services for diabetes. Publicly accessible RAPIA reports provided limited quantitative data on availability, with most findings presented in a qualitative format. Per RAPIA guidelines, surveys reported the availability of products on the day of the survey only; thus, they are a point-in-time assessment.³⁸ With the exception of the Philippines report cited here, limited methodology for the collection of availability data was provided in the RAPIA reports: the total number of facilities surveyed and the number by type (hospital, health center, etc.) and/or sector was not reported. These limitations should be considered when interpreting the data. Table 2 highlights the quantitative data included in each RAPIA report, focusing on the EMTs assessed from Appendix B.

A review of the four RAPIA reports (Kyrgyzstan, Mozambique, Nicaragua, and Vietnam) published since 2007, along with a modified RAPIA assessment from the Philippines, suggests that public sector availability of diabetes EMTs was variable across countries.^{39–43} For example, availability of urine glucose strips ranged from 59 percent in Nicaragua to 80 percent in Vietnam. Insulin^{vi} was available in over 90 percent of the public facilities surveyed in Kyrgyzstan and Vietnam.^{39,42,44} In the Philippines, however, insulin was available in only 20 percent of all public sector facilities; according to the author, this was because insulin was only provided at the tertiary/hospital level in the public sector.⁴³ It is difficult to obtain a general picture on insulin availability in the private sector from these data, but of note, insulin was less available in Vietnam's private sector facilities than in the public sector.

^v In the context of this report, the term “availability” refers to the product’s presence at the service delivery point; i.e., whether the essential medicine or technology is available at the point of care or purchase. Furthermore, because methodology varies across the literature, we include data on availability of any dosage form or strength of the medicines from our list, rather than only including data on specific dosage forms or strengths.

^{vi} Unless otherwise noted, availability data on insulin is not disaggregated by type (i.e. short-acting, intermediate-acting, or mixed).

Table 2. Availability of essential diabetes medicines and technologies, all RAPIAs^a.

Medicine/technology	Availability, by country and sector (% of facilities)									
	Kyrgyzstan		Mozambique		Nicaragua		Philippines		Vietnam	
	Public N=NA	Private N=NA	Public N=NA	Private N=NA	Public N=NA	Private N=NA	Public N=20	Private N=6	Public N=NA	Private N=NA
Blood glucose test strips	38		27		72					
Glibenclamide			73	93			55	67		
Glucometer	67		87		95				96 ^b	
Hemoglobin A1c analyzer	0						1	67	47	
Hemoglobin A1c testing consumables	0									
Insulin	92			21			20 ^c	83	91	49
Insulin syringes	25									70
Metformin			53	93			85	100		
Urine glucose strips	71		73 ^d		59				80	
Urine ketone strips	38		73 ^d		54				59	

^aEmpty cells indicate that no data were reported.

^bRepresents percent of facilities with either glucometer or biochemistry capability.

^cInsulin is only dispensed by tertiary level hospitals; this percentage represents a proportion of the total number of tertiary facilities assessed.

^dRepresents the combined availability of urine glucose and ketone strips.

NA=Not Available

Sources:

- Abdramova et al post 2009.³⁹
- Beran et al 2009.⁴⁰
- Beran et al 2007.⁴¹
- Beran, Binh et al 2009.⁴²
- Higuchi 2009.⁴³

Availability of diabetes EMTs was also highly variable in different areas within countries. For example, 46 percent of Mozambique’s insulin was distributed to facilities in the capital city of Maputo, even though only 6.2 percent of the population lived there at the time of the assessment.^{37,40} This proportion is, however, a significant improvement from 2003, when 77 percent of insulin in Mozambique was distributed in Maputo, and therefore unavailable in communities outside the capital.³⁷ According to the Nicaragua report, interviewees reported that insulin and other diabetes medicines were more easily accessed in urban than rural facilities, and that treatment for Type 1 diabetes was easier to access than treatment for Type 2 diabetes.⁴¹ Finally, various systemic constraints, such as requiring children with Type I diabetes to travel to Managua for their insulin supply or forcing patients who received services at a hospital to obtain insulin at a separate health center, inhibited access to diabetes medicines within Nicaragua. Access to insulin may be affected by the limited production and distribution of generic, or biosimilar, insulins; Box B provides further information on this issue.

Box B: Biosimilar insulin.

A current issue that may influence availability of insulin in LMICs is the development of generic, or biosimilar, options. Biosimilars are similar versions of already approved biopharmaceutical drugs such as insulin. Due to the complexities involved in producing biopharmaceutical drugs, including specific manufacturing processes that are proprietary to the original manufacturer, it is almost impossible to fully replicate the branded product, as is common for most generic alternatives. According to WHO, biosimilars are “...similar in terms of quality, safety and efficacy to an already licensed reference biotherapeutic product”.^a However, potential differences in manufacturing of biosimilars may alter the end product slightly, raising concerns about quality, efficacy and safety.^b

The regulatory approval process for these products is complex and challenging, requiring demonstration of a variety of similar characteristics between the biosimilar and innovator-brand products.^c

Patents for branded insulin products are expiring in the near future, facilitating an entry point for biosimilar insulins to join the global marketplace. While there are significant regulatory hurdles to overcome, availability of biosimilar insulins could potentially improve access to this key medicine, increase market competition, and reduce treatment costs.^{b,c}

^a WHO. Guidelines on Evaluation of Similar Biotherapeutic Products (SBPs);Expert Committee on Biological Standardization. Geneva: WHO; 2009. Available at: http://www.who.int/biologicals/areas/biological_therapeutics/BIO_THERAPEUTICS_FOR_WEB_22APRIL2010.pdf. Accessed July 30, 2015.

^b DeVries JH, Gough SC, Kiljanski J, et al. Biosimilar insulins: a European perspective. *Diabetes Obes Metab*. 2015;17(5):445–451.

^c Rotenstein LS, Ran N, Shivers JP, et al. Opportunities and challenges for biosimilars: what’s on the horizon in the global insulin market? *Clinical Diabetes*. October 2012;30(4):138-150.

Where data were available, they suggested that availability of essential technologies for monitoring and treating diabetes in the public sector was particularly limited. In Kyrgyzstan, Mozambique, Nicaragua and Vietnam, patients were required to purchase syringes from the private sector due to poor availability in public facilities.^{39-42,44} Information was not provided on the types of syringes assessed or availability of needles for the syringes. While most public facilities had glucometers, lack of test strips matching the glucometer prevented providers and patients from properly monitoring blood glucose levels in Kyrgyzstan, Mozambique and Nicaragua.^{39-41,44} Availability of urine ketone test strips also was limited, with Nicaragua and Vietnam demonstrating the best availability. Similarly, public sector availability of analyzers for glycated hemoglobin (HbA1c) was extremely limited with only one country approaching 50 percent availability, and testing consumables were either unavailable or not reported.

IN SUMMARY

While there are limited quantitative data from the RAPIA reports, they provide useful insights into the range of availability of some EMTs for diabetes in LMICs. Public sector availability for both medicines and technologies was widely variable across and within countries. The distribution challenges associated with insulin in Mozambique and Nicaragua may indicate that diabetes EMTs are more available in urban areas than in rural communities. As we will discuss in the following sections, these findings are reinforced by other research, suggesting highly country-specific influences on availability of diabetes EMTs.

Evidence from WHO/HAI surveys

The WHO/HAI surveys assessed the price, affordability, and availability of medicines at facilities at a single point in time, as did the RAPIA reports. Facilities at the tertiary, secondary, and primary care levels in both the public and private sectors were included in the surveys. In order to keep the number of medicines surveyed manageable, the WHO/HAI protocol calls for 50 medicines to be surveyed. Researchers selected medicines from three sources^{vii}: (1) a global core list of 14 medicines that were included in all surveys to allow for comparisons; (2) a regional core list of 16 medicines; and (3) a supplementary list of 20 medicines selected at the country level, based on importance to that country.⁴⁵ The only products from our list of EMTs included in the WHO/HAI global core list of medicines, and thus included in all WHO/HAI surveys, are glibenclamide and simvastatin. However, some of the other diabetes medicines are included in the regional and supplementary lists and were therefore included in many WHO/HAI surveys.⁴⁶ At the time this review was published, technologies were excluded from all WHO/HAI surveys; therefore, this section reports only on availability of essential diabetes medicines. We first present findings from multi-country analyses, and then from individual country analyses.

Multi-country analyses of WHO/HAI data. In this section, we present findings of seven multi-country analyses of WHO/HAI surveys, five of these reports are from the peer-reviewed literature, one is gray literature and the final analysis is unpublished. Mendis and colleagues assessed the availability of essential medicines for chronic diseases in six LMICs (Bangladesh, Brazil, Malawi, Nepal, Pakistan, and Sri Lanka), using an adapted WHO/HAI protocol and found varying availability between the public and private sectors.⁵ The following five diabetes medicines from Appendix B were included in the study: enalapril, hydrochlorothiazide (HCT), glibenclamide, insulin, and metformin. Data on the availability of the lowest-priced generic^{viii} versions of these medicines showed that:

- Enalapril ranged from 0 to 40 percent availability in the public sector and 46 to 100 percent in private facilities.
- HCT was available in over 70 percent of public sector facilities in Brazil, Malawi and Sri Lanka, but ranged from 0 to 10 percent availability in the public sectors of the remaining three countries.
- Insulin availability ranged from 0 to 50 percent in the public sector and 0 to 60 percent in the private sector across the six countries surveyed.

Specific availability data on glibenclamide and metformin were not discussed by the authors as they did not consider these medicines to be insufficiently available; unfortunately, their threshold for this decision is not provided. In all countries surveyed, chronic disease medicines were substantially more available in the private sector than the public sector, though private sector availability was also generally poor in most countries.

Two studies based on WHO/HAI data compared the availability of medicines for acute illness with those for chronic disease. In 2009, Cameron reviewed data from 36 LMICs and found that glibenclamide was available, on average, in 57 percent of public sector facilities and 71 percent of private sector facilities.⁶

^{vii} For a list of core medicines and supplemental medicines included in the WHO/HAI survey protocol, please visit <http://www.haiweb.org/medicineprices>.

^{viii} The WHO/HAI surveys collect data on the lowest-priced generic and originator brand versions of the medicines assessed. Unless otherwise indicated, data on availability of diabetes medicines is reported for the lowest-priced generic version.

Comparatively, amoxicillin^{ix}, an antibacterial medicine used to treat acute illness, was more available in both public and private sector facilities at 69 percent and 76 percent availability, respectively. A more recent analysis by Cameron and colleagues, this time across 40 countries^x, showed that chronic disease medicines were significantly less available than those for acute conditions in both the public and private sectors, though particularly in the public sector, as highlighted in Table 3.³

Table 3. Availability of medicines for chronic and acute disease across 40 countries, 2011.

Sector	Mean Availability of Lowest-priced Generic Medicines (% of facilities)	
	Chronic Disease Medicines	Acute Disease Medicines
Public	36	54
Private	55	66

N=2779 facilities (total of public and private outlets) across 40 countries
Source: Cameron et al 2011.³

Among the chronic disease medicines assessed, the authors found that glibenclamide and metformin together demonstrated 50 percent availability in the public sector and 65 percent in the private sector. These diabetes medicines were the second-most available class of medicines for chronic diseases, with anti-ulcerants being the most available and epilepsy medicines the least available. Anti-hypertensive drugs, including HCT, fell in-between, with 35 percent availability in the public sector compared with 57 percent private sector availability.³ These findings suggest that medicines for acute conditions were more available than those for chronic diseases, across both sectors and a wide range of countries.

Cameron and colleagues also found that the difference in availability of medicines for chronic versus acute diseases grew larger as a country's income level decreased. For example, medicines for chronic disease were, on average, 33.9 percent less available than medicines for acute conditions in the public sector of a low-income country, compared with 12.9 percent less available in the public sector of a lower-middle income country.³ In the private sector, chronic disease medicines were 14.8 percent less available than medicines for acute conditions in low-income countries and 5.3 percent less available in lower-middle income countries. At the regional level, the disparity was greatest in Africa, where chronic disease medicines were 38.9 percent less available than medicines for acute disease in the public sector and 16.7 percent less available in the private sector. While the authors did not provide this data for specific diabetes medicines, it can be inferred that availability of the diabetes medicines assessed was lower in low-income countries, particularly in the African region.

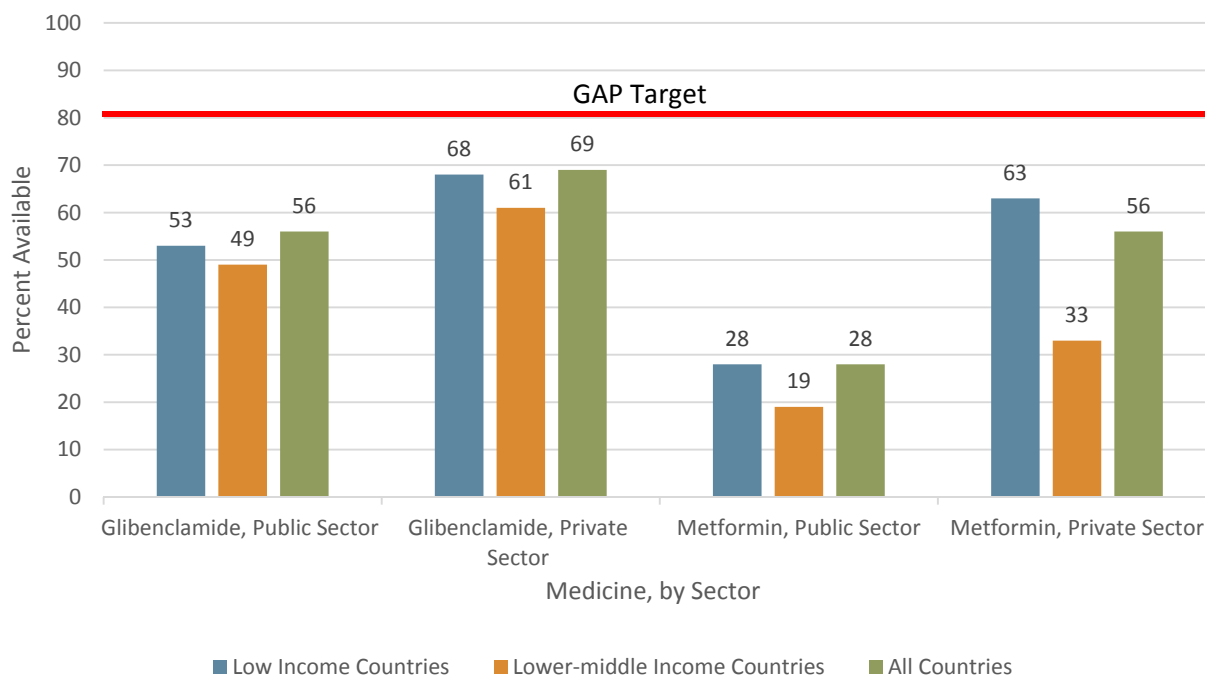
Another secondary analysis of WHO/HAI data determined the availability of cardiovascular medicines across 36 countries, compared by income level, and found the medicines to be least available in low-income countries across both sectors.⁴⁷ The lowest-priced generic version of HCT was found to be available, on average, in 15 and 51 percent of public facilities in low- and lower-middle income countries, respectively, compared with 36 and 64 percent availability in the private sector in these groups of countries.

^{ix} Where available, we present availability data for amoxicillin to demonstrate the availability of a common acute disease medicine as compared to availability of medicines for diabetes. Unless otherwise specified, data represents availability of the lowest-priced generic version of the 500mg cap/tab form of amoxicillin, per the WHO/HAI global core list of medicines.

^x The analysis included 12 low-income countries, 18 lower-middle income countries, seven upper-middle income countries, and three high-income countries.

In a 2008 secondary analysis of the WHO/HAI survey data from 33 countries, Volman found the availability rates for glibenclamide and metformin in the public and private sectors shown in Figure 1.³⁵

Figure 1: Availability of glibenclamide and metformin by sector and country classification.^a



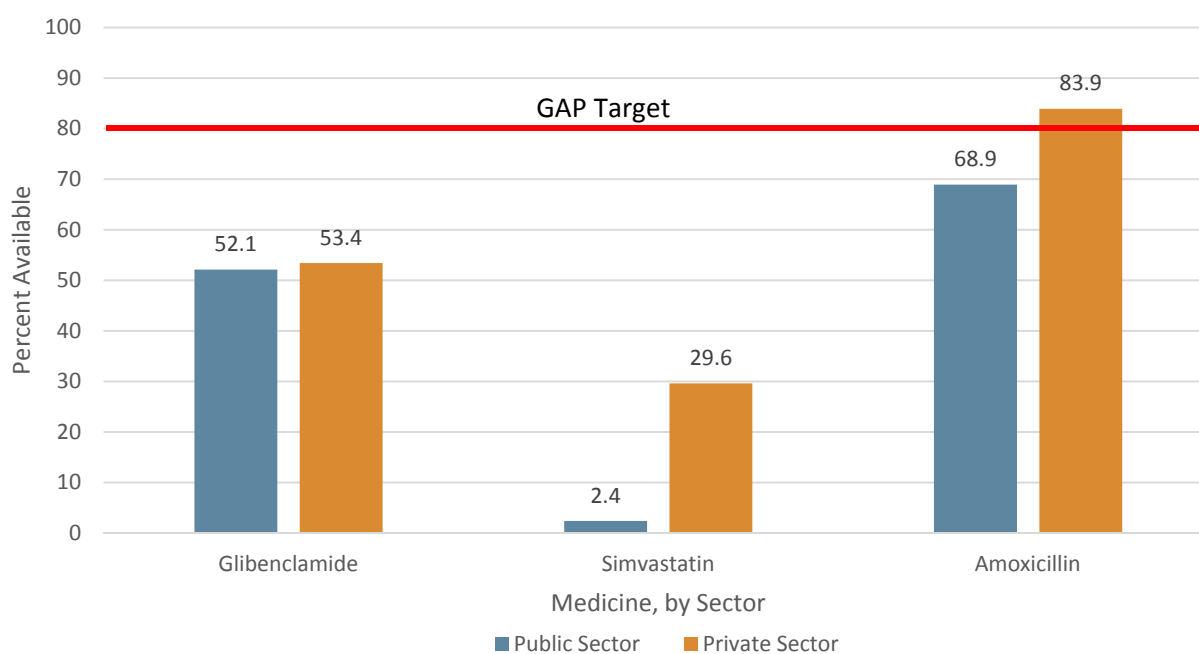
^aData represents availability of the lowest-priced generic version of each medicine
 Numbers above bars are mean proportion of facilities with availability
 N=33 countries
 Source: Volman 2008.³⁵

In contrast to other studies discussed, both medicines were more available in low-income countries than in the lower-middle income countries. Glibenclamide was more available than metformin in both sectors across all country income groups, and the availability of metformin was particularly poor in the public sectors of these 33 countries.

PATH also conducted an analysis^{xi} similar to that by Volman, extracting data from the WHO/HAI database to assess availability of medicines that are listed in Appendix B. After reviewing surveys for LMICs and assessing their inclusion of essential medicines from Appendix B, PATH determined that data on glibenclamide and simvastatin were most commonly reported—both medicines are included in the WHO/HAI core list of medicines for the surveys, and should therefore be expected to be included in all WHO/HAI country surveys.^{45,46} Twenty surveys across 17 countries included data on the lowest-priced generic version of both medicines. Seven country surveys reported public and private sector availability data for each medicine.^{48–54} Data on availability of amoxicillin was also assessed as a comparator of availability of medicines for acute versus chronic disease. Figure 2 provides the mean availability of the lowest-priced generic versions of these three medicines in the seven countries, compared with the 80 percent GAP target.

^{xi} This analysis has not been peer-reviewed or published elsewhere.

Figure 2: Availability of selected diabetes medicines and a comparator medicine by sector.^a



^aData represents availability of the lowest-priced generic version of each medicine

Numbers above bars are mean proportion of facilities with availability

N=7 countries

Source: PATH. Unpublished analysis of WHO/HAI country surveys. 2015.

On average, availability of these two medicines was clearly insufficient based on the GAP target.

However, across individual countries there was a wide range of availability:

- Glibenclamide ranged from 1.7 percent to 90 percent in the public sector and 1.7 percent to 97 percent in the private sector.
- Simvastatin ranged from 0 percent to 10 percent in the public sector and 7 percent to 83.9 percent in the private sector.

Availability of simvastatin was extremely low, particularly in the public sector. Amoxicillin was far more available than the two medicines used to treat diabetes, further reinforcing researcher’s conclusions that medicines for acute illnesses are more available than those for chronic diseases. Amoxicillin was in fact the only medicine to demonstrate mean availability above the 80 percent GAP target, though only in the private sector. Table 4 shows the availability data from each country.

Table 4: Availability of essential diabetes medicines and a comparator medicine across seven countries.

Country	Availability of Lowest-priced Generic Medicines (% of facilities)					
	Glibenclamide		Simvastatin		Amoxicillin	
	Public	Private	Public	Private	Public	Private
Bolivia	73.3	90	0	6.6	90	100
Burkina Faso	50	20.6	0	11.8	100	94.1
China (Shaanxi Province)	1.7	1.7	10	52.5	35.8	75
Colombia	93	97	7	7	100	86
Mauritius	6.7	70	0	23.3	16.7	76.7
Nicaragua	90	83.9	0	83.9	83.3	100
Sao Tome and Principe	50	11.1	0	22.2	56.3	55.6
Mean availability	52.1	53.5	2.4	29.6	68.9	83.9

Source: PATH. Unpublished analysis of WHO/HAI country surveys. 2015

IN SUMMARY

The multi-country secondary analyses of WHO/HAI survey data provide the following understanding of availability of medicines for diabetes and chronic disease in LMICs:

- Availability of essential diabetes medicines rarely exceeds the 80 percent GAP target, particularly in the public sector.
- Availability is highly variable across countries.
- Essential diabetes medicines are more available in the private than public sector.
- Essential diabetes medicines, as well as those for chronic disease more broadly, are significantly less available than medicines for acute disease, in both the public and private sectors.
- The lowest income countries, particularly countries in the African region, show the greatest disparities in availability of chronic disease medicines compared to acute disease medicines.

Individual country analyses of WHO/HAI data. Unsurprisingly, published data from single country WHO/HAI surveys contain findings similar to the multi-country secondary analyses. Surveys from China, Haiti, India, Malaysia and the Philippines^{xii} are discussed in detail below.

China (Shaanxi Province): The Shaanxi province assessment included seven medicines from Appendix B, listed in Table 5 below.⁵⁵ Two assessments were carried out, allowing for comparison of availability before and after implementation of the country's National Essential Medicines Policy. Findings on

^{xii} These surveys are reviewed here because they were published in the peer-reviewed literature and fell within the parameters of our literature review methodology.

availability of the lowest-priced generic version of each medicine in the public and private sectors are presented in the following table.

Table 5. Availability of essential diabetes medicines in Shaanxi Province, China, 2013.

Medicine	Availability of Lowest-priced Generic Medicines (% of facilities)			
	Public sector		Private sector	
	2010 N=50	2012 N=72	2010 N=36	2012 N=72
Amlodipine	22	20.8	41.7	38.9
Amoxicillin	16	26.4	77.8	83.3
Enalapril	52	56.9	94.4	87.5
Glibenclamide ^{xiii}	0	0	5.6	2.8
Gliclazide	28	30.6	52.8	58.3
HCT	70	62.5	80.6	63.9
Metformin	6	2.8	41.7	25
Simvastatin ^{xiii}	16	9.7	50	58.3

Source: Fang et al 2013.⁵⁵

Of the seven EMTs for diabetes assessed in China’s Shaanxi province, only HCT was available in more than 60 percent of public and private sector facilities in 2012. Glibenclamide, metformin, and simvastatin were each available in less than 10 percent of public facilities. Amoxicillin, the comparator medicine for acute illness, was available in just over a quarter of public sector facilities, but more than 80 percent of private sector outlets. This suggests that medicines for both acute and chronic illnesses were much less available in China’s public sector than the private sector.

Availability of diabetes-related generic essential medicines was very poor in both years, with most medicines less available at the time of the second assessment. The authors suggested this was due to a variety of factors, including reduced number of manufacturers in the market, inadequate funding for distribution, poor perceptions of the quality of generic medicines, and possible provider incentives to prescribe branded medicines. That said, branded medicines demonstrated similarly low availability in both sectors.

Haiti: Research in Haiti included six medicines in the list in Appendix B, listed in Table 6.⁵⁶ In general, availability of these medicines was poor across all sectors. Simvastatin was the least available medicine on this list, followed by amlodipine.

^{xiii} The 2012 data on availability for glibenclamide and simvastatin in the 2013 Fang et al peer-reviewed article are slightly different from the data reported in the 2012 Medicines Price, Availability and Affordability in Shaanxi Province, Western China study, available on the HAI website and presented in Figure 2 and Table 4. Reasons for this are unknown, as both documents were drafted by the same principal investigator and the 2013 publication is presumably based on the 2012 data collection.

Table 6. Availability of essential diabetes medicines in Haiti, 2013.

Medicine	Availability of Lowest-priced Generic Medicines (% of facilities)			
	Sector			
	Public N=54	Private N=35	Nonprofit N=39	Mixed N=35
Amlodipine	5.6	68.6	28.2	5.7
Amoxicillin	63	97.1	89.7	57.1
Enalapril	11.1	82.9	15.4	25.7
Glibenclamide	29.6	80	41	37.1
HCT	38.9	65.7	35.9	34.3
Metformin	20.4	62.9	15.4	8.6
Simvastatin	1.9	57.1	2.6	0

Source: Chahal et al 2013.⁵⁶

Only enalapril and glibenclamide in the Haitian facilities met or exceeded the WHO target of 80 percent availability and then only in the private sector. In all sectors, amoxicillin was more available than medicines for diabetes.

India (Delhi): The assessment included six medicines from our EMT list, and public and private sector availability for these medicines is presented in the table below.⁵⁷

Table 7. Availability of essential diabetes medicines in Delhi, India, 2013.

Medicine	Availability of Lowest-priced Generic Medicines (% of facilities)			
	Public sector		Private sector	
	State-managed N=40	City-managed N=40	Retail ^v N=40	Chain ^v N=40
Amlodipine	92.5	90	95	100
Amoxicillin	70	20	97.5	100
Enalapril	42.5	47.5	92.5	97.5
Glibenclamide	77.5	42.5	5	7.5
Gliclazide	0	35	95	97.5
Metformin	60	70	97.5	95
Simvastatin	2.5	0	40	35

Source: Kotwani 2013.⁵⁷

These data show that, except for simvastatin, diabetes medicines were generally available in Delhi; however, due to the wide variability in availability by facility, accessing the range of medications in a single facility appeared difficult. Gliclazide and simvastatin were most readily available in the private sector, while glibenclamide was significantly more available in public facilities. Simvastatin was the least available across all facilities, and was far below the 80 percent target even in retail outlets, which showed the best availability of this medicine at 40 percent. Amoxicillin was less available in the public sector than the private sector, and significantly less available than diabetes medicines in the city-managed public sector.

Malaysia: Research on medicine price and availability in Malaysia included five essential medicines from Appendix B.⁵⁸ The results for the lowest-priced generic medicines are presented in Table 8, according to the facility categories assessed by the authors.

Table 8. Availability of essential diabetes medicines in Malaysia, 2007.

Medicine	Availability of Lowest-priced Generic Medicines (% of facilities)		
	Sector		
	Public n=20	Private Sector Retail Pharmacies n=32	Dispensing Doctors n=20
Amlodipine	0	0	0
Amoxicillin ^{xiv}	0	43.8	45
Enalapril	65	34	45
HCT	0	46.9	35
Metformin	90	87.5	90
Simvastatin	0	68.8	65

Source: Babar et al 2007.⁵⁸

Public sector availability of diabetes EMTs was generally poor for both lowest-priced generic and originator brands, with exceptionally limited availability of the lowest-priced generic versions as shown in Table 8. Generic versions of amlodipine were not available in any sector, as the drug was still under patent in Malaysia at the time of the study. The originator brand of amlodipine was available in 70 percent of public sector facilities. Availability of generic amoxicillin was fairly limited, with no availability in the public sector. This may be a reflection of the fact that this survey assessed availability of a different dosage and form than the other WHO/HAI surveys.

Philippines: An assessment in the Philippines included seven medicines from the list in Appendix B, and the availability of the lowest-priced generic version of these medicines is noted in Table 9.⁵⁹ This study reported availability in ranges, rather than specific availability for each medicine assessed, so Table 9 is presented differently than the previous examples.

Table 9. Availability of essential diabetes medicines in the Philippines, 2009.^a

Range of Availability of Lowest-priced Generic Medicines (%)	Public Sector n=21	Private Sector n=27
0	HCT	
1-20	Amlodipine, Enalapril	HCT
21-50	Glibenclamide, Gliclazide, Simvastatin	Glibenclamide, Gliclazide
51-80		Amlodipine, Enalapril, Metformin, Simvastatin
81-99	Amoxicillin	Amoxicillin
100		

^aEmpty cells indicate the no data were reported.

Source: Health Action Information Network 2009.⁵⁹

^{xiv} In this survey, the form of amoxicillin assessed was amoxicillin-clavulanic acid (500+125 mg)

While this report did not provide specific availability, it is evident that diabetes EMTs were more available in the private than in the public sector. None of the seven diabetes EMTs assessed were available in a majority of public sector facilities, but four medicines were available in at least 51 percent of private sector facilities. Only the comparator medicine of amoxicillin was available in more than 80 percent of public and/or private facilities surveyed.

IN SUMMARY

Findings from five individual country surveys were similar to those from the multi-country analyses. This WHO/HAI research found that selected essential diabetes medicines from Appendix B were more available in the private sector than the public sector, and that availability of these medicines was generally insufficient using the 80 percent GAP target.^{3,5,6,47,55–59} This research also showed that acute disease medicines, such as amoxicillin, are typically more available than those for diabetes, in both the public and private sectors. While the WHO/HAI surveys in our analysis did not assess availability of technologies, and only included five to seven of the essential medicines from the list in Appendix B, there is ample evidence to conclude that essential medicines for diabetes are insufficiently available in low-resource settings.

Evidence from Service Availability and Readiness Assessments

The SARA survey is a health facility assessment tool developed by WHO to measure the availability of health services in a country, as well as the health system's readiness to address health issues.⁶⁰ SARA reports contain data on the availability of health facilities, health workers, basic equipment, essential medicines, and diagnostic capacity. They also analyze the availability of services, medicines, and technologies for specific health issues, including HIV/AIDS, family planning, maternal and child health, and, in some reports, NCDs. Most SARA reports contain data on the availability of specific diabetes-related indicators, including the availability of selected diabetes EMTs.

Our report includes SARA data from five countries: Benin, Burkina Faso, Sierra Leone, Tanzania, and Zambia. The reports include data on the availability of EMTs from Appendix B and break down that data by sector, geography, and level of health facility. Reports are also available for Mauritania, Uganda and Kenya, but they are not included here as they lack some of the key data on diabetes EMTs provided in the other reports, making it difficult to compare findings.

The reports contain data on the availability of diabetes EMTs among all facilities assessed, as well as disaggregated by facilities specifically offering diagnosis and/or treatment of diabetes. Unlike other research cited in this review, the SARA reports include quantitative data on the availability of several essential technologies for diabetes, including adult weigh scales; blood pressure apparatus; single-use syringes; blood glucose testing supplies; and urine test strips for protein, glucose and ketones. Essential diabetes medicines assessed included glibenclamide and simvastatin across all facilities, as well as metformin and insulin in facilities offering diabetes diagnosis and/or treatment. As in the RAPIA reports, insulin was not disaggregated by type. Note that the methodology did not specify whether the medicines assessed were branded or generic. Finally, there was a broad range in the number of facilities assessed in each country; while data are comparable due to similar methodologies, caution should be used when comparing findings across countries.

SARA data: all facilities. As with the RAPIA and WHO/HAI research, the SARA assessments in these five countries showed that diabetes-specific EMTs were insufficiently available. Technologies used for multiple purposes—such as syringes, adult weigh scales, and blood pressure apparatus—were most available, exceeding the GAP target, across the countries assessed. Table 10 compares total^{xv} and median^{xvi} availability of individual EMTs across countries as a proportion of all facilities.^{61–65}

Among all health facilities and across all countries, simvastatin was the least available essential medicine (median 3 percent) and blood glucose monitoring supplies were the least available technology (median 13 percent). Using amoxicillin as a comparator, both glibenclamide (median 15 percent) and simvastatin (median 3 percent) were much less available than this antibiotic (median 90 percent). Multiple indication products, such as single-use syringes and weigh scales were more available than amoxicillin, and were the most available products across countries (median 98 percent and 91 percent, respectively). Table 10 shows a wide range of availability for the package of eight diabetes EMTs across countries, with median availability of all EMTs ranging from 20.5 percent in Tanzania to 59.5 percent in Burkina Faso (far right column). Furthermore there was an even broader range of availability for individual EMTs across countries (bottom row) ranging from a median of 3 percent for simvastatin to 98 percent for single-use syringes. Excluding multiple indication products and amoxicillin, the range of availability for diabetes-specific products stretches from a median of 3 percent for simvastatin to 36 percent for urine glucose test strips, suggesting there is a large gap between the GAP target and the current availability of diabetes EMTs in some LMICs.

^{xv} Total availability data as listed in Tables 10-13 is taken directly from each SARA report.

^{xvi} Median availability data as listed in Tables 10-13 is calculated by the authors based on the total availability data from each SARA report.

Table 10: Percent availability of essential diabetes medicines and technologies across all facilities assessed in Benin, Burkina Faso, Sierra Leone, Tanzania and Zambia.^a

Medicine/ Technology	Weigh Scale (Adult)	Blood Pressure Apparatus	Single-use Syringe	Blood Glucose	Urine Protein Test Strips	Urine Glucose Test Strips	Glibenclamide	Simvastatin	Amoxicillin	Median availability, all diabetes EMTs ^b
Total availability Benin (N=189)	94	93	100	13	37	37	15	0	90	37
Total availability Burkina Faso (N=686)	94	96	99	7	61	58	3	2	90	59.5
Total availability Sierra Leone (N=210)	77	76	98	7			8	5	55	42^c
Total availability Tanzania (N=1297)	82	85	87	14	21	20	19	3	57	20.5
Total availability Zambia (N=565)	91	89	98	26	34	35	42	5	91	38.5
Median availability, all countries	91	89	98	13	35.5^d	36^d	15	3	90	

^aEmpty cells indicate that no data were reported.

^bMedian availability of all diabetes EMTs across all facilities by country excludes amoxicillin from the calculation, as it is not an essential diabetes medicine.

^cAs the Sierra Leone SARA did not analyze availability of either urine test strip, resulting in less total products surveyed, median availability of all diabetes EMTs for Sierra Leone is not directly comparable to the other countries in the table.

^dRepresents mean availability of the four countries where this data was collected

Sources:

- Republic of Benin, Ministry of Health 2013.⁶¹
- Burkina Faso, Ministry of Health 2013.⁶²
- Sierra Leone, Ministry of Health and Sanitation 2011.⁶³
- United Republic of Tanzania, Ministry of Health and Social Welfare 2012.⁶⁴
- Republic of Zambia, Ministry of Health 2010.⁶⁵

In addition to the data on general availability, the SARA findings allow for a deeper understanding of availability than can be extrapolated from the RAPIA and WHO/HAI research. Table 11 shows the percentage of diabetes EMTs available among all health facilities assessed in each country, including median availability of all EMTs by sector, geography and level of health care. These data show that diabetes EMTs were less available in rural areas and at lower levels of the health system.⁶¹⁻⁶⁵ In the majority of countries assessed, diabetes EMTs were more available in the private sector; however, in Benin and Burkina Faso, the products assessed were more available in the public sector.

While each country defines the levels of facilities differently, on the whole, diabetes EMTs were most available at the hospital (or tertiary) level across all facilities in the majority of countries, with Zambia demonstrating a high at 94 percent median availability at the tertiary level.⁶¹⁻⁶⁵ That said, Burkina Faso was an exception, where diabetes EMTs were most available at the Medical Center/secondary level, at a median of 64 percent. In general, availability at the secondary and primary care levels was more limited

and more varied than at the tertiary level, ranging from a median low of 13.5 percent at the primary care level in Zambia to the aforementioned 64 percent median at the secondary level in Burkina Faso.

When analyzed by individual product, as opposed to median availability of all diabetes EMTs, disparities emerged within countries. For instance, while Burkina Faso showed better median availability in the public sector overall, there were variations by product: glucometers and blood glucose test strips were far more available in the private than public sector (26 percent compared to 4 percent, respectively), while urine protein strips were more available in the public sector (64 percent compared to 46 percent in the private sector).⁶² Similarly, while diabetes EMTs were more available in urban areas in all countries assessed, both types of urine test strips as well as simvastatin were slightly more available in rural than peri-urban areas in Zambia. An example of disparities by product across levels of care include glibenclamide in Benin: though most available at the tertiary/hospital level (66 percent), this product was next most available at the primary care level (29 percent), while the secondary/health center level (8 percent) demonstrated the least availability of this commodity.⁶¹

The SARA data on diabetes EMTs across all facilities leads to the following conclusions:

- Diabetes-specific EMTs are less available than multiple-indication technologies.
- Diabetes-specific EMTs are less available than amoxicillin, an acute disease medicine
- There is variability in median availability for individual EMTs across countries as well as for the assessed package of diabetes EMTs across countries.
- Diabetes EMTs are least available in the public sector, rural communities, and at the primary care level; however, there is variation within countries when assessing availability of individual products in each category.
- Outliers, such as Burkina Faso—where diabetes EMTs were more available in the public sector and at lower levels of care—may be a source of best practice concerning availability of diabetes EMTs.

Table 11: Percent availability of essential diabetes medicines and technologies across all facilities, according to SARA reports, by country, sector and geography.^a

Medicine/ Technology	Weigh Scale (Adult)	Blood Pressure Apparatus ^b	Single-use Syringe ^c	Blood Glucose ^d	Urine Protein Test Strips	Urine Glucose Test Strips	Glibenclamide	Simvastatin	Amoxicillin ^e	Median availability, all diabetes EMTs ^f
BENIN (N=189)										
Sector										
Public (N=115)	92	90	100	8	40	40	6	0	93	40
Private (N=74)	98	98	100	21	29	29	30	0	86	29.5
Geography										
Urban (N=104)	95	94	100	19	39	38	27	1	89	38.5
Rural (N=85)	94	93	100	8	35	35	7	0	91	35
Level of Care^g										

Medicine/ Technology	Weigh Scale (Adult)	Blood Pressure Apparatus ^b	Single-use Syringe ^c	Blood Glucose ^d	Urine Protein Test Strips	Urine Glucose Test Strips	Glibenclamide	Simvastatin	Amoxicillin ^e	Median availability, all diabetes EMTs ^f
Hospital (N=44)	98	100	100	34	86	82	66	7	93	84
Health Center (N=103)	94	91	100	12	41	41	8	0	92	41
Primary Care (N=42)	95	98	100	11	14	14	29	0	85	21.5
Total availability Benin	94	93	100	13	37	37	15	0	90	37
BURKINA FASO (N=686)										
Sector										
Public (N=591)	94	95	100	4	64	60	3	1	94	62
Private (N=95)	94	100	95	26	46	48	6	5	64	47
Geography^h										
Urban (N=NA)										
Rural (N=NA)										
Level of Care										
Hospital/Polyclinics (N=22)	100	95	100	5	55	64	27	5	73	59.5
Medical Center (N=77)	99	99	98	38	65	63	20	4	66	64
Smaller health facilities (N=587)	93	96	99	5	61	58	2	2	91	59.5
Total availability Burkina Faso	94	96	99	7	61	58	3	2	90	59.5
SIERRA LEONE (N=210)										
Sector										
Public (N=169)	76	74	98	3			3	2	51	38.5^h
Private (N=38)	81	83	100	35			41	22	81	61^h
Geography^j										
Urban (N=NA)										
Rural (N=NA)										
Level of Care										
Hospital (N=39)	80	93	100	48			56	14	76	68ⁱ
Primary Care (N=168)	77	75	98	5			6	4	54	41.5ⁱ

Medicine/ Technology	Weigh Scale (Adult)	Blood Pressure Apparatus ^b	Single-use Syringe ^c	Blood Glucose ^d	Urine Protein Test Strips	Urine Glucose Test Strips	Glibenclamide	Simvastatin	Amoxicillin ^e	Median availability, all diabetes EMTs ^f
Total availability Sierra Leone	77	76	98	7			8	5	55	42^h
TANZANIA (N=1297)										
Sector										
Public (N=923)	80	84	86	8	16	15	12	2	55	15.5
Private (N=374)	85	88	88	28	34	32	41	7	65	37.5
Geography										
Urban (N=844)	86	91	93	27	36	35	40	9	65	38
Rural (N=453)	80	83	84	6	13	12	11	1	54	12.5
Level of Care										
Hospital (N=52)	86	91	94	35	37	47	73	19	70	60
Maternal Child Health Clinic (N=8)	85	100	69	0	25	25	39	16	44	32
Health Center (N=137)	85	86	88	21	34	33	24	4	57	33.5
Dispensary (N=1100)	81	84	86	12	19	17	16	3	57	18
Total availability Tanzania	82	85	87	14	21	20	19	3	57	20.5
ZAMBIA (N=565)										
Sector										
Public (N=399)	90	85	98	18	24	25	33	1	92	29
Private (N=166)	95	98	97	44	57	59	55	8	87	58
Geography^k										
Urban (N=205)	98	95	99	43	57	55	54	9	94	56
Peri-Urban (N=152)	97	94	100	28	21	23	46	2	90	37
Rural (N=208)	83	77	96	11	26	26	28	3	91	27
Level of Care										
National Hospital (N=3)	100	100	100	33	67	67	100	0	100	83.5
Provincial Hospital (N=8)	100	100	100	63	88	100	88	38	88	94
District Hospital (N=28)	96	96	100	79	82	86	96	29	96	91

Medicine/ Technology	Weigh Scale (Adult)	Blood Pressure Apparatus ^b	Single-use Syringe ^c	Blood Glucose ^d	Urine Protein Test Strips	Urine Glucose Test Strips	Glibenclamide	Simvastatin	Amoxicillin ^e	Median availability, all diabetes EMTs ^f
Health Center (N=471)	92	89	98	24	32	32	40	3	92	36
Health Post (N=52)	85	75	96	4	12	12	15	2	79	13.5
Total availability Zambia	91	89	98	26	34	35	42	5	91	38.5

^aEmpty cells indicate that no data were reported.

^bWhile the SARA methodology does not specify the blood pressure device should have a digital reader, as in Appendix B, we include this indicator here as a general idea of the availability of blood pressure monitoring devices in LMICs.

^cNot specific to insulin.

^dIndicates availability of both glucometer and appropriate blood glucose testing strips on day of survey and ability to conduct test onsite.

^eAs with the WHO/HAI data, we include amoxicillin here as a comparator of availability

^fMedian availability of all diabetes EMTs across all facilities by country excludes amoxicillin from the calculation, as it is not an essential diabetes medicine.

^gLevels of care are as listed in each individual report.

^hThe SARA Report for Burkina Faso reports data by region, rather than urban/rural.

ⁱAs the Sierra Leone SARA did not analyze availability of either urine test strip, resulting in fewer total products surveyed, median availability of all diabetes EMTs for Sierra Leone is not directly comparable to median availability of all diabetes EMTs for the other countries in the table.

^jThe SARA Report for Sierra Leone reports data by region, rather than urban/rural

^kGeographic data for Zambia represents the average availability within facilities in each geographic designation, calculated by the authors based on individual district data in the SARA Zambia report. The SARA Zambia collected data from four urban districts, four peri-urban districts, and nine rural districts.

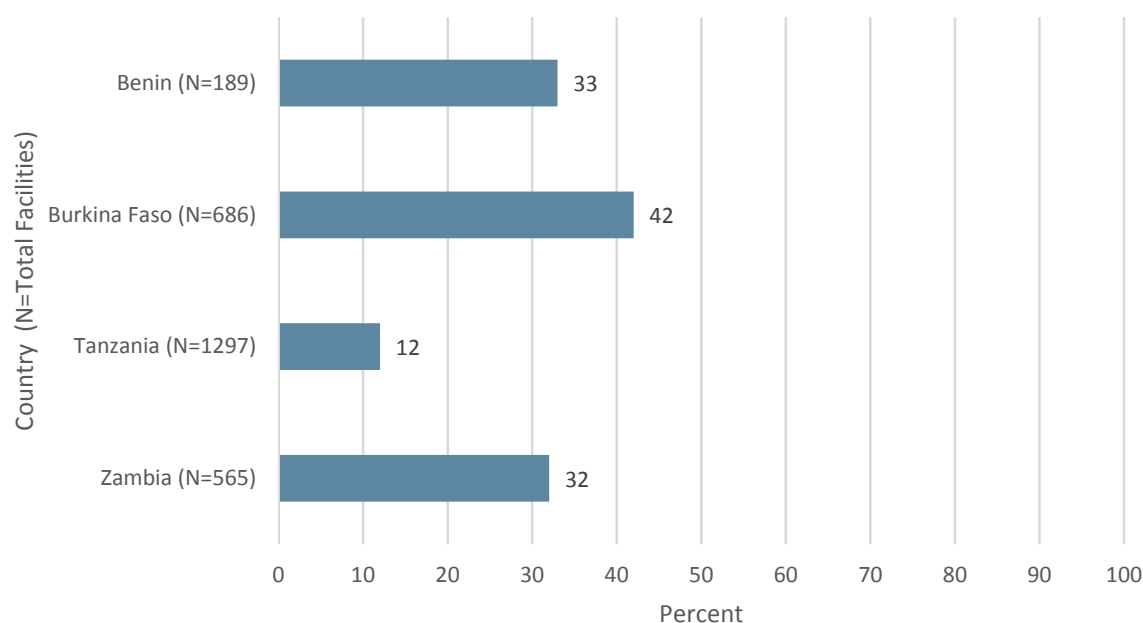
Sources:

- Republic of Benin, Ministry of Health 2013.⁶¹
- Burkina Faso, Ministry of Health 2013.⁶²
- Sierra Leone, Ministry of Health and Sanitation 2011.⁶³
- United Republic of Tanzania, Ministry of Health and Social Welfare 2012.⁶⁴
- Republic of Zambia, Ministry of Health 2010.⁶⁵

SARA data: facilities offering diabetes diagnosis and/or treatment. As noted earlier, SARA reports provide data on diabetes-specific facilities and services. Figure 3 shows the percentage of facilities providing diagnosis and/or treatment for diabetes as a proportion of all health facilities assessed. Among the four^{xvii} countries reviewed, the proportion ranged from a low of 12 percent of facilities in Tanzania to a high of 42 percent in Burkina Faso. There was, however, a wide range in the number of facilities assessed across countries, affecting the comparability of these proportions.

^{xvii} The Sierra Leone SARA did not include this particular subset of data and is thus excluded from this portion of the findings.

Figure 3: Percentage of facilities offering diabetes diagnosis and/or treatment, according to SARA data.



Sources:

- Republic of Benin, Ministry of Health 2013.⁶¹
- Burkina Faso, Ministry of Health 2013.⁶²
- Sierra Leone, Ministry of Health and Sanitation 2011.⁶³
- United Republic of Tanzania, Ministry of Health and Social Welfare 2012.⁶⁴
- Republic of Zambia, Ministry of Health 2010.⁶⁵

While there was some differentiation in the EMTs assessed, availability of diabetes EMTs within the facilities providing diabetes diagnosis and/or treatment was similar to the findings across all facilities (see conclusions above, as well as Table 10 and Table 11). Specifically, diabetes-specific EMTs, including insulin, were insufficiently available, while multiple use technologies were the most available products from our list. Table 12 compares total and median availability of individual EMTs across countries as a proportion of the facilities offering diabetes services.

Among facilities providing diabetes services, insulin was the least available medicine (median availability of 20.5 percent) and, as with all facilities, blood glucose monitoring supplies were the least available technology (median of 35.5 percent)^{xviii}. Zambia was the only country where insulin was more available than another EMT (total availability of 39 percent compared to 36 percent for metformin). Similar to the data on all facilities, products for multiple indications were the most available EMTs in facilities offering diabetes services, with blood pressure apparatus the most available EMT across countries (median availability of 96.5 percent). Again, there was a wide range of median availability for individual EMTs across countries, extending from 20.5 percent (insulin) to 96.5 percent (blood pressure apparatus). In the three countries with data on every product, there was also a wide range in median availability of the eight diabetes EMTs assessed in facilities offering diabetes services, varying from 19.5 percent in Burkina Faso

^{xviii} While urine ketone test strips had a lower median availability than blood glucose monitoring supplies, this excluded data from Zambia, which did not assess availability of this technology. Therefore, where data is available for all countries, blood glucose monitoring supplies are the least available technology.

to 50.5 percent in Tanzania. As with all facilities, when data on multiple indication products are excluded, the range of availability stretches from a median of 20.5 percent for insulin to 59.5 percent for urine protein test strips, reinforcing the conclusion that there is much work to be done to achieve the GAP target for many diabetes EMTs.

Table 12: Percent availability of essential diabetes medicines and technologies across facilities providing diabetes diagnosis and/or treatment assessed in Benin, Burkina Faso, Tanzania, and Zambia.^a

Medicine/ Technology	Weigh Scale (Adult)	Blood Pressure Apparatus ^b	Blood Glucose ^c	Urine Protein Test Strips	Urine Ketone Test Strips	Metformin	Glibenclamide	Insulin	Median availability, all EMTs
Total availability Benin (N=85)	97	97	31	52	26	22	29	7	30
Total availability Burkina Faso (N=329)	96	96	14	70	25	6	6	4	19.5
Total availability Tanzania (N=248)	84	98	40	49	44	57	52	34	50.5
Total availability Zambia (N=183)	96	95	51	67		36	70	39	68.5^d
Median availability, all countries	96	96.5	35.5	59.5	26	29	40.5	20.5	

^aEmpty cells indicate that no data were reported.

^bWhile the SARA methodology does not specify the blood pressure device should have a digital reader, as in Appendix B, we include this indicator here as a general idea of the availability of blood pressure monitoring devices in LMICs.

^cIndicates availability of both glucometer and appropriate blood glucose testing strips on day of survey and ability to conduct test onsite.

^dAs the Zambia SARA did not analyze availability of urine ketone test strips, resulting in less total products surveyed, median availability of all diabetes EMTs for Zambia is not directly comparable to median availability of all diabetes EMTs for the other countries in the table.

Sources:

- Republic of Benin, Ministry of Health 2013.⁶¹
- Burkina Faso, Ministry of Health 2013.⁶²
- United Republic of Tanzania, Ministry of Health and Social Welfare 2012.⁶⁴
- Republic of Zambia, Ministry of Health 2010.⁶⁵

To take the comparison of availability across all facilities and facilities offering diabetes services further (refer to Table 10 and Table 12, respectively), we see that, for the overlapping products^{xix}, diabetes-specific EMTs were most available in facilities providing diagnosis and treatment for diabetes. For example, while they continued to be the least available technology, blood glucose monitoring supplies were more available in facilities offering diabetes services than in all health facilities (median of 35.5 percent compared to a median of 13 percent, respectively). Glibenclamide demonstrated the most difference between facility types, with a median availability of 40.5 percent in facilities offering diabetes services compared to a median of 15 percent in all facilities. Similarly, adult weigh scales, blood pressure

^{xix} Adult weigh scales, blood pressure apparatus, blood glucose monitoring supplies, urine protein test strips, and glibenclamide.

apparatus, and urine protein test strips were all also more available in facilities providing diabetes diagnosis and/or treatment than all facilities. While it is encouraging that some diabetes EMTs were more available in facilities offering diabetes services, where they are most needed, the majority of this subgroup of EMTs did not meet or exceed the 80 percent target and were, in fact, far below that target, implying that even facilities providing care for diabetes are encumbered by limited availability of these essential products.

When looking at disaggregated availability data among facilities offering diabetes services, we see that, as with all facilities, diabetes EMTs were least available in the public sector, rural areas, and primary care facilities across the countries assessed. As discussed below, there were variations within countries in each of these categories. Table 13 provides the SARA data specific to availability of diabetes EMTs among facilities offering diabetes services in Benin, Burkina Faso, Tanzania and Zambia.

Median data show that the EMTs assessed were more available in the private than public sector, particularly in Tanzania where there was notable disparity between sectors.^{61,62,64,65} That said, there was a wide range of availability of individual EMTs across sectors within countries. Metformin represented the product with the largest single-product disparity, where it was much more available in the private sector diabetes facilities of all countries, particularly Tanzania and Zambia.^{64,65} In all countries except Zambia, insulin was more available in private sector facilities providing diabetes diagnosis and/or treatment than in public sector establishments.

At a geographic level, diabetes EMTs were generally more available in urban facilities offering diabetes services. In Zambia^{xx} (the only country to provide data on peri-urban settings) diabetes EMTs were least available in peri-urban communities (median 52 percent), with both urban (73 percent) and rural (69 percent) communities showing better median availability of the EMTs assessed. As with the public and private sectors, there were variations within countries by individual EMT assessed. For instance, insulin was more available in the rural facilities offering diabetes services in Benin than in urban facilities (12 percent compared to 5 percent, respectively). In Zambia, testing strips to monitor urine protein were most available in urban communities at 84 percent, as compared to rural facilities at 45 percent.

In all countries analyzed, EMTs for diabetes were more available, on average, at the higher level facilities providing diabetes diagnosis and/or treatment. There were a number of variations in availability between levels of health facilities offering diabetes services, for both essential technologies and essential medicines. For instance, essential medicines for diabetes (metformin, glibenclamide, and insulin) were least available at secondary facilities providing diabetes care in Benin. In Burkina Faso, glucose monitoring was most available at secondary facilities at 38 percent, as compared to 11 percent among primary level facilities offering diabetes care and only 6 percent of tertiary level facilities.

The SARA findings on availability of diabetes EMTs in facilities providing diabetes diagnosis and/or treatment show that diabetes EMTs are more available in facilities offering diabetes services than in all facilities, though at levels generally far below the GAP target. Other findings in these facilities are similar to those for all facilities, where we see that, in the countries assessed:

- Diabetes-specific EMTs are less available than multiple indication technologies.

^{xx} The SARA report for Zambia did not assess the availability of the full range of diabetes EMTs included in other SARA research, so median availability is not directly comparable with other countries.

- There is wide range in median availability for the assessed package of diabetes EMTs across countries.
- Diabetes EMTs are least available in the public sector, rural communities, and at the primary care level; however, there is variation within countries when assessing availability of individual products in each category.

Interestingly, the outliers in Burkina Faso among all facilities did not carry over when assessing availability of EMTs in facilities offering diabetes services: in these facilities, diabetes EMTs commodities were least available in the public sector and at the lowest levels of care, similar to the other countries assessed.

Table 13: Percent availability of essential diabetes medicines and technologies across facilities offering diabetes diagnosis and/or treatment, by country, sector, geography, and level of care.^a

	Medicine/ Technology	Weigh Scale (Adult)	Blood Pressure Apparatus ^b	Blood Glucose ^c	Urine Protein Test Strips	Urine Ketone Test Strips	Glibenclamide	Insulin	Metformin	Median availability, all EMTs
BENIN (N=85)										
Sector										
Public (N=40)	98	93	31	66	19	16	3	8	25	
Private (N=45)	96	100	31	41	31	40	11	33	36.5	
Geography										
Urban (N=69)	97	95	35	56	31	30	5	19	33	
Rural (N=16)	97	100	24	45	17	28	12	27	27.5	
Level of Care^d										
Hospital (N=43)	98	100	35	86	55	65	30	49	60	
Health Center (N=31)	96	95	35	62	28	11	0	8	31.5	
Primary Care (N=11)	99	100	24	24	12	48	12	36	30	
Total Availability Benin	97	97	31	52	26	29	7	22	30	
BURKINA FASO (N=329)										
Sector										
Public (N=272)	95	95	9	72	21	5	3	4	15	
Private (N=57)	99	100	38	61	44	8	13	16	41	
Geography^e										
Urban (N=NA)										
Rural (N=NA)										
Level of Care										
Hospital/Polyclinics (N=18)	100	94	6	61	44	33	22	39	41.5	
Medical Center (N=68)	99	100	38	71	41	22	19	26	39.5	
Smaller health facilities (N=243)	95	96	11	70	23	3	2	3	17	
Total Availability Burkina Faso	96	96	14	70	25	6	4	6	19.5	

	Medicine/ Technology	Weigh Scale (Adult)	Blood Pressure Apparatus ^b	Blood Glucose ^c	Urine Protein Test Strips	Urine Ketone Test Strips	Glibenclamide	Insulin	Metformin	Median availability, all EMTs
TANZANIA (N=248)										
Sector										
Public (N=137)	84	99	29	41	35	39	28	42	40	
Private (N=111)	85	96	61	64	61	78	46	86	71	
Geography										
Urban (N=155)	89	99	53	56	53	70	43	75	63	
Rural (N=93)	80	97	29	42	36	37	27	42	39.5	
Level of Care										
Hospital (N=22)	88	100	80	80	72	94	86	87	86.5	
Maternal Child Health Clinic (N=2)	100	100	0	100	32	32	32	32	32	
Health Center (N=44)	96	99	46	55	50	55	34	65	55	
Dispensary (N=180)	79	97	30	39	35	43	24	48	41	
Total Availability Tanzania	84	98	40	49	44	52	34	57	50.5	
ZAMBIA (N=183)										
Sector										
Public (N=97)	95	94	39	58		63	35	7	58^f	
Private (N=86)	97	97	63	71		69	31	54	69^f	
Geography^g										
Urban (N=89)	100	98	62	84		73	40	49	73^f	
Peri-Urban (N=42)	94	98	52	45		70	33	16	52^f	
Rural (N=52)	93	91	51	69		72	51	23	69^f	
Level of Care										
National Hospital (N=2)	100	100	50	100		100	100	50	100^f	
Provincial Hospital (N=8)	100	100	63	88		88	100	63	88^f	
District Hospital (N=22)	95	95	86	82		100	95	64	95^f	
Health Center (N=141)	95	95	48	64		68	28	31	64^f	
Health Post (N=8)	100	88	0	38		13	13	13	13^f	
Total Availability Zambia	96	95	51	67		70	39	36	68.5^f	

^aEmpty cells indicate that no data were reported.

^bWhile the SARA methodology does not specify the blood pressure device should have a digital reader, as in Appendix B, we include this indicator here as a general idea of the availability of blood pressure monitoring devices in LMICs.

^cIndicates availability of both glucometer and appropriate blood glucose testing strips on day of survey and ability to conduct test onsite.

^dLevels of care are as listed in each individual report.

^eThe SARA Report for Burkina Faso reports data by region, rather than urban/rural.

^fAs the Zambia SARA did not analyze availability of urine ketone test strips, resulting in fewer total products surveyed, median availability of all diabetes EMTs for Zambia is not directly comparable to median availability of all diabetes EMTs for the other countries in the table.

^gGeographic data for Zambia represents the average availability within facilities in each geographic designation, calculated by the authors based on individual district data in the SARA Zambia report. The SARA Zambia collected data from four urban districts, four peri-urban districts, and nine rural districts.

Sources:

- Republic of Benin, Ministry of Health 2013.⁶¹
 - Burkina Faso, Ministry of Health 2013.⁶²
 - United Republic of Tanzania, Ministry of Health and Social Welfare 2012.⁶⁴
 - Republic of Zambia, Ministry of Health 2010.⁶⁵
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IN SUMMARY

The evidence from all SARA reports reviewed supports the conclusions from the RAPIA and WHO/HAI research, namely, that diabetes EMTs are insufficiently available in both the public and private sectors, and are more available in the private sector. This was true across all facilities assessed as well as in the facilities specifically offering diabetes services. Data from all facilities showed that diabetes medicines were less available than amoxicillin, supporting the conclusion from the WHO/HAI literature that medicines for chronic disease are less available than those for acute conditions. Additional insights from the SARA data include more detail on availability in different geographic settings and levels of care, with diabetes EMTs generally more available in urban facilities and at higher levels of care. Aside from weigh scales and blood pressure apparatus, the EMTs assessed were available on a very limited basis at the primary care level, in all facilities, and in the facilities offering diabetes care. It is encouraging that the diabetes EMTs assessed were generally more available at facilities offering diabetes diagnosis and/or treatment than all facilities. However, the limited total and median availability of these products in those facilities is unsatisfactory, particularly the low availability of insulin.

Across all facilities assessed and among facilities providing diabetes-related services, the only diabetes EMTs to achieve or exceed the WHO GAP target of 80 percent availability were weigh scales, blood pressure apparatus, and single-use syringes (refer to Tables 10 and 12). No medicines were available at the 80 percent target, and the technologies available at this level are used for many health issues in addition to diabetes. The SARA evidence reinforces the RAPIA and WHO/HAI findings, confirming that EMTs for diabetes are insufficiently available in LMICs.

Evidence from additional research

A few additional studies applied methodologies different from those used in the RAPIA, WHO/HAI and SARA protocols, with their findings presented below.

Kenya: In one assessment of essential medicines availability in Kenya's public sector hospitals, 56 percent of respondents acknowledged stockouts of one to three diabetes medicines in the previous six months, and 33 percent of respondents noted stockouts of more than five medicines in the same time period.⁶⁶ Similarly, 48 percent of respondents experienced stockouts for one to three hypertensive medicines, and 33 percent noted stockouts of more than five hypertensive medicines. The number of respondents was not given, nor were the specific medicines assessed listed. While this is a weak study methodologically, it illustrates the level of published evidence.

Kenya and Uganda: The Access, Bottlenecks, Costs and Equity (ABCE) project conducted assessments of health system performance in a select group of countries, collecting data on diabetes in both Kenya and Uganda.^{67,68} While diabetes was not the focus of this research, general findings on the availability of supplies to diagnose and treat diabetes are included^{xxi}. In both countries, such supplies were most readily

^{xxi} The authors do not define what constitutes the specific package of supplies necessary to diagnose and treat diabetes.

available at the tertiary level and in private facilities. Diabetes supplies were least available at the primary care level. Facilities at the public primary care level in Kenya had, on average, 14 percent of the supplies needed to provide diabetes services. In Uganda, this same type of facility averaged 10 percent availability of these supplies. More specifically, 12 percent of public sector primary care facilities in both Kenya and Uganda had glucose test strips available on the day of the assessment, compared with 69 percent availability in the comparable private sector facilities in Kenya and 50 percent in Uganda. The ABCE findings in both countries support the findings of previously cited research on availability of diabetes EMTs, namely that they are more available in the private than public sector and that they are less available at lower levels of the health system.

Tanzania: A study on the availability and affordability of medicines for diabetes in Tanzania included both patient experience and facility assessments.⁶⁹ Of 61 public sector patients surveyed, 52 percent responded that their diabetes medicines were always available in the public sector. In comparison, 90 percent of private sector patients (n=19) stated that their medicines were always available in the private sector. Seven percent of the 61 public sector patients responded that their drugs were never available in the public sector, while none of the 19 private sector patients reported the same about the private sector.

Facility-based data on the availability of specific essential medicines, but no technologies, were also presented in the study; Table 14 below highlights these findings relative to the medicines from Appendix B. Note that the sample size is small (N=10 facilities).

Table 14. Availability of essential diabetes medicines in Tanzania, 2009.

Medicine	Availability (% of facilities)	
	Public sector N=3	Private sector N=7
Glibenclamide	0	71.4
Gliclazide	0	42.9
Insulin (Animal)	100	100
Insulin (Human)	0	42.9
Metformin	0	100

Source: Justin-Temu et al 2009.⁶⁹

The authors noted that the lack of public sector availability of certain diabetes medicines was a result of their not being included in the country's essential medicines list (EML); thus, they were not procured for public sector distribution at the time of the study. For example, while none of the oral hypoglycemic medicines from our list in Appendix B were available in the public sector, both chlorpropamide and tolbutamide were 100 percent available in each of the public sector facilities assessed because they were on Tanzania's EML at the time of the study. However, this study was published in 2009 and Tanzania's 2013 EML recommends glibenclamide and metformin as the preferred oral hypoglycemic medicines;⁷⁰ it would be useful to conduct a reassessment to determine if the revised EML has impacted availability of these products in the public sector.

Multiple Country Assessment: Between 2009 and 2011, WHO and ministries of health in eight LMICs surveyed 90 primary care facilities to assess capacity to provide NCD services, including services for diabetes.⁷¹ The surveys gathered data on infrastructure, financing, medical information systems, human resources, referral systems, and equipment, medicines and technologies. The surveys collected

availability data on 12 EMTs from our list (four technologies and eight medicines), summarized in Table 15. Note that this survey used a different definition of availability than other research presented in this report; the authors considered an EMT available if it was generally present in the facility, even if it was not available at the time of the survey.

Table 15: Percent availability of essential diabetes medicines and technologies in primary care facilities in selected locations of eight countries.

Selected Diabetes Medicines/Technologies	Benin (N=12)	Eritrea (N=6)	Sudan (N=12)	Bhutan (N=7)	Sri Lanka (N=14)	Vietnam (N=15)	Suriname (N=10)	Syria (N=14)	Median availability, all countries
Blood glucose	67	17	75	0	0	0	90	93	42
Urine albumin ^a	100	67	92	100	46	0	70	64	68.5
Urine glucose	92	67	92	100	54	0	70	71	70.5
Urine ketones	42	33	58	0	0	0	40	79	36.5
Enalapril	33	0	29	0	69	60	30	14	29.5
Amlodipine	58	0	50	0	69	87	80	0	54
HCT	75	100	36	86	69	40	90	14	72
Simvastatin or lovastatin ^b	8	0	36	0	23	47	50	7	15.5
Insulin (long-acting)	0	0	21	0	31	0	80	21	10.5
Insulin (soluble/short-acting)	0	0	29	0	31	0	80	21	10.5
Metformin	25	0	43	0	69	53	100	14	34
Glibenclamide	42	0	71	14	69	33	100	21	37.5
Median availability, all diabetes medicines/technologies	42	0	46.5	0	50	16.5	80	21	

^aMeasures urine protein.

^bThe survey assessed availability of simvastatin or lovastatin, reported as one data point.

N=90 facilities assessed across all countries

Source: Mendis et al 2012.⁷¹

Only Suriname, an upper-middle-income country, had all of the diabetes EMTs available in primary care facilities; facilities in all other countries generally lacked availability of at least one of the products. Suriname was also the only country where insulin was present at the GAP target of 80 percent. Insulin availability was generally very poor, with half of the countries having no insulin regularly available in any of the surveyed primary care facilities. Vietnam was the only country to have none of the essential diabetes technologies generally available at the primary care level. Median availability suggests that HCT (72 percent), urine glucose tests (70.5 percent), and urine albumin tests (68.5 percent) were the most available EMTs across all countries. Insulin (10.5 percent median for both long-acting and soluble) and

simvastatin (median of 15.5 percent) were the least available EMTs. While not disaggregated by country, the authors also noted that 99 percent of facilities assessed across all countries generally had adult weigh scales available.

With the exception of Sri Lanka, each country had at least one diabetes EMT available at or above the 80 percent target in primary care facilities. This was also the case in the SARA findings, though only for those multipurpose technologies such as weigh scales and syringes. The more encouraging findings in this survey as compared to the SARA findings may be a reflection of the different measure of availability.

The results of this survey are similar to the findings already presented, namely that availability of diabetes EMTs is insufficient at the primary care level in most LMICs. They are also similar to other reports in the significant variability of availability of diabetes EMTs, often ranging as much as 0 to 100 percent within countries (e.g. Benin, Eritrea and Bhutan). While the authors did not state it explicitly, these facilities were likely all public sector, since the study was conducted by the local ministries of health in collaboration with WHO. The authors noted that the surveys were not nationally representative, and may actually overestimate the readiness of primary care facilities in rural areas. The small sample size from each country may also influence the findings. These limitations, combined with the different definition of availability, must be taken into account when comparing these findings with other results presented in this report.

Multiple Country Assessment: In 2012, PATH conducted a survey among 13 of its country offices in Africa, Asia, Eastern Europe and Latin America^{xxii} to gather country-specific information on screening, diagnosis, and management systems for diabetes.⁷² Surveys were completed by PATH staff in each country, with responses based on reviews of the literature and interviews with local stakeholders. The surveys indicated supply challenges for EMTs for diabetes, with ten countries noting that at least one medicine or technology was not continuously available. Supplies were of particular concern in Ethiopia, Nicaragua, South Africa, Tanzania, Uganda, Ukraine, and Zambia. Seven country offices^{xxiii} responded that insulin was not continuously available in public sector facilities due to stockouts. As found by other researchers, glucometers and glucose strips were not always available, with six countries noting there were insufficient supplies or public sector stockouts of these technologies. HbA1c testing was available only at the tertiary level in eight of the countries surveyed. In short, this internal assessment identified limited availability of diabetes EMTs in the majority of countries surveyed and supports the findings of formal, published research.

IN SUMMARY

From RAPIA, WHO/HAI, and SARA research as well as additional individual and multi-country reports, we found that while the range of diabetes medicines and technologies assessed was not as comprehensive as that included in Appendix B, the evidence showed that the availability of diabetes EMTs is inadequate in LMICs, particularly in view of the GAP target. Common findings across the literature include the following:

- Diabetes EMTs are more available in the private than public sector, though they are insufficiently available in both sectors.

^{xxii} Cambodia, China, Ethiopia, India, Kenya, Nicaragua, South Africa, Tanzania, Thailand, Uganda, Ukraine, Vietnam, and Zambia

^{xxiii} Ethiopia, India, Nicaragua, South Africa, Tanzania, Uganda, and Ukraine

- Diabetes EMTs are more available in urban centers and at higher levels of the health system, with particularly limited availability at the primary care level.
- Even facilities focusing on diabetes care have poor availability of most EMTs.
- Multipurpose technologies, such as weigh scales, blood pressure monitoring devices, and syringes, are more available than medicines and technologies specifically used to manage diabetes.
- Availability of diabetes EMTs is highly variable both across and within LMICs.
- Medicines for acute conditions are more available than diabetes EMTs, as demonstrated by the availability of amoxicillin, which was generally available at or near the GAP 80 percent target for NCD medicines.

Specific research on the availability of the full range of EMTs for diagnosing and treating diabetes is needed in order to best understand and improve the environment in low-resource settings. Given the wide variability, this research should occur across a number of countries and regions to provide the necessary detailed analysis of the global landscape. There are instances of notable outliers in the data presented, and these may offer opportunities for best practice and lessons learned. In the next section, we summarize stakeholder opinions on the availability of diabetes EMTs, to complement our findings from the literature.

Stakeholder interviews: themes on availability of diabetes essential medicines and technologies

Stakeholders interviewed for this report agreed with the major findings in the literature, further supporting the conclusion that diabetes EMTs are insufficiently available in LMICs. Several themes emerged from the stakeholder discussions and are presented below.

Availability of EMTs for diabetes, and NCDs in general, is insufficient to meet the needs of people affected by the disease(s), particularly in the public sector.

“In the public sector, essential medicines and technologies, even simple technologies, are not readily available; that makes it very difficult to manage the disease. The majority of people accessing services through the public sector are not getting the kind of care they require because of limited access to essential medicines and technologies. In general, the public sector is not equipped to handle these diseases [NCDs] in particular.” (Dr. Steven Shongwe, Regional Adviser for NCDs, World Health Organization Regional Office for Africa)

“...there are still too many places where there isn’t sufficient access or affordability for insulin...” (Dr. David Beran, Lecturer and Researcher, Geneva University Hospitals and University of Geneva)

“WHO/HAI survey data has shown that availability is a real problem, particularly in the public sector in low- and middle-income countries... and it’s clear the problem lies with chronic disease medicines.” (Ms. Margaret Ewen, Pharmacist, Health Action International)

Diabetes EMTs are more available in the private sector than the public sector.

“In the private sector, the medicines and technologies are available, but are not affordable for most people.” (Dr. Steven Shongwe)

“...we see [EMTs] are not enough available in the public sector, and some of them are too expensive...” (Ms. Cécile Macé, Technical Officer, Policy, Access and Use, Essential Medicines and Health Products Department, World Health Organization)

“[availability in the] private sector is better than the public sector in most cases.” (Dr. David Beran)

“...it doesn't matter where you are in the world, there is profound disparity [between] the public and private sectors.” (Prof. Naomi (Dinky) Levitt, Professor, University of Cape Town and Director, Chronic Disease Initiative for Africa)

Availability of essential technologies is inadequate, particularly in the public sector, at lower level facilities, and in less urban areas.

“Technologies are available, but not the right one, or they are there, but not being used, or it is broken and they don't have the ability to fix [the technology], whether that is personal knowledge or the finances to get it fixed.” (Dr. Julie Torode, Deputy CEO and Advocacy & Programmes Director, Union for International Cancer Control)

“...technologies are not regularly available...in many of the....countries in Africa; essential medicines and especially technologies...are not readily available.” (Dr. Steven Shongwe)

“The public sector, especially in the primary level, is poorly staffed and poorly stocked with technologies. Some technologies are available, but not in very remote areas...” (Prof. Jean Claude Mbanya, Director, Health of Population in Transition Research Group and Professor, Medicine and Endocrinology, University of Yaoundé 1)

One stakeholder noted that while basic, multiple use technologies such as weigh scales were generally available, more complex technologies for diabetes were less available (e.g. technologies to measure blood glucose).

“...availability issue is there for anything complex and [improving availability] requires the supply system to operate in a proper way to ensure that not only is the machine working, but also that reagents are present.” (Dr. David Beran)

Furthermore, even with the better availability of these basic technologies, there may be problems with functionality, as one stakeholder commented:

“Even...blood pressure cuffs and equipment [are] frequently nonfunctional, noncalibrated.” (Prof. Naomi (Dinky) Levitt)

Monitoring blood glucose is particularly difficult for many people in LMICs.

Stakeholders said that blood glucose monitoring was rarely accessible for the average clients, particularly those relying on primary health care facilities and residing outside of major cities. As one respondent commented,

“It's hard to imagine managing diabetes without technologies, but [ministries of health] would not regard glucose monitoring strips as essential.” (Dr. Larry Deeb, Director, Diabetes Center, Tallahassee Memorial Hospital)

In many countries, HbA1c technologies are only available at the tertiary care level, if at all. In Tanzania, for example, one stakeholder noted that the technology is not available in the public sector due to the high relative costs. Another stakeholder commented that it is available at the secondary and tertiary levels in South Africa, but is largely unavailable at the primary care level.

“If you look at Mozambique, Zambia, Mali, Nicaragua, Tanzania, and Vietnam, HbA1C is only measured at hospitals and often only at the national level....if you focus on primary care, then there is no point in including HbA1c [because it won’t be available].” (Dr. David Beran)

“...everyone should have HbA1c done, [it] is essential technology.” (Dr. Silver Bahendeka, Honorary Senior Consultant Physician, Diabetes & Endocrinology, San Raphael of St. Francis Nsambya Hospital; Lecturer, Mother Kevin Postgraduate Medical School, Uganda Martyr’s University)

Furthermore, while technologies may be available in some facilities, stakeholders commented that patients rarely have the ability to monitor blood glucose in their homes, which is essential for persons with diabetes using exogenous insulin and helpful for those on oral hypoglycemic medicines (ADA, 2015). As noted by one stakeholder,

“At the very least, all patients on insulin should be able to test their blood glucose at home to better manage their disease.” (Mr. Marcel Gmuender, Head of Diabetes Care EMEA LATAM, Roche Diagnostics International AG)

As with most of our findings thus far, this is highly country-specific; one stakeholder noted a concentrated effort in Nigeria to provide people with diabetes with glucometers and monitoring strips to improve their ability to self-monitor. He noted that about 40 percent of people with diabetes currently have glucometers, and this is expected to increase to 80 percent within two years.

In addition to the critical EMTs, it is important to consider the availability of consumables that support administration of these EMTs. As noted by one respondent,

“... [we] assumed that alcohol swabs or other instruments or consumables were present, but we find that often they are not necessarily there.” (Dr. Alan Bornbusch, Public Health Adviser, United States Agency for International Development)

For diabetes, this includes a range of consumables, from alcohol swabs to glucose monitoring strips and syringes and needles. Glucose monitoring strips come up repeatedly in the literature, and were mentioned by a number of stakeholders, as key technologies that are not readily available in LMICs.

KEY FINDINGS:

Availability of essential medicines and technologies for diabetes

The literature and stakeholder interviews agree that the availability of diabetes EMTs in LMICs is inadequate in both the public and private sectors, with slightly better availability in the private sector.^{3-7,35,40,43-44,47-55,57-59,61-64,67-69,78} The following conclusions come from these sources:

Availability of EMTs for diabetes is insufficient to meet the needs of the people affected by this disease, based on the WHO GAP target of 80 percent availability in public and private facilities.

- Even facilities offering diabetes diagnosis and/or treatment had limited availability of diabetes EMTs, according to SARA data. Aside from multipurpose technologies such as weigh scales, median availability of diabetes EMTs in these facilities ranged from 20.5 percent for insulin to 59.5 percent for urine protein test strips (across all countries and both sectors).

For medicines listed in Appendix B, availability is typically higher in the private sector than the public sector.

- In only a few instances was a diabetes medicine available at 80 percent or more of facilities in both sectors:

Amlodipine: Delhi, India⁵⁷

Glibenclamide: Nicaragua⁵³

Animal insulin: Tanzania⁶⁹

Metformin: Philippines⁴³ and Malaysia⁵⁸

- Availability of insulin was limited, especially in the public sector. While there were occasional examples of sufficient availability of insulin in select countries, usually this essential medicine was difficult to find in both sectors in LMICs. For example, the SARA findings showed that availability of insulin was minimal even in facilities focused on diabetes care, with availability in public sector diabetes facilities ranging from 3 percent to 35 percent across four countries, compared with a range of 11 percent to 46 percent in private diabetes facilities. Similarly, an analysis of six different countries found that availability of insulin was far below the 80 percent target in both sectors, across all countries and for all insulin types assessed.⁵

There is notable disparity in availability across countries and within countries.

- While there was wide variation across the countries assessed, the SARA data showed that diabetes EMTs were more available in urban areas and at higher levels of health systems. As a group, these commodities were least available at the primary care level in the countries assessed.
- In a survey of eight countries, researchers found wide variation in availability of diabetes EMTs at the primary care level, with only one country (Suriname, an upper-middle income country) demonstrating general availability of all EMTs assessed in the primary care facilities surveyed.⁷¹ Suriname was also the only country where EMTs were sufficiently available, with 80 percent median availability for all EMTs surveyed. Variation was considerable in the other countries, with both Benin and Bhutan demonstrating a median of zero percent availability of the EMTs assessed.
- Stakeholders also commented that public sector availability of EMTs is best at the tertiary care level and is extremely limited at primary health care facilities.

Essential technologies to monitor blood glucose have limited availability across both sectors, though more so in the public sector.

- The RAPIA assessments found that diagnostics and monitoring tools were rarely available in the public sector. While many facilities had glucometers, they did not stock the associated blood glucose test strips, and monitoring tools were rarely available for use in the home. As a result, many people

with diabetes were not able to carefully monitor and control their blood glucose levels, and this leads to diabetes-associated illnesses.

- According to SARA data, median availability of glucometers and associated strips (assessed together) was 13 percent across all health facilities/sectors and 35.5 percent across facilities providing diabetes diagnosis and treatment (both public and private).
- The SARA data also showed that glucose testing technologies were more available in the private sector than the public sector, both for all health facilities and those providing diabetes services. An exception was among facilities offering diabetes services in Benin, where these products were equally available in both the public and private sectors (31 percent).

Diabetes EMTs are far less available than medicines for acute disease, such as amoxicillin.

- Across the WHO/HAI surveys and SARA assessments, in almost all cases, amoxicillin was more available than medicines for diabetes in both sectors. Malaysia was a notable exception, where WHO/HAI data show that amoxicillin was generally less available than diabetes medicines. This rudimentary comparison provides further evidence that medicines for infectious disease are more available than those for diabetes.
- The secondary analysis by Cameron and colleagues demonstrated that chronic disease medicines, including those for diabetes, were significantly less available than medicines for acute diseases, with the greatest disparities appearing in the lowest-income countries, particularly in Africa.

Limitations of published literature: The current literature on availability of diabetes EMTs is limited, and most of our review focused on studies using one of three methodologies: RAPIA, WHO/HAI, or SARA. The data on availability in the RAPIA reports was not specific enough for a robust assessment, given the limited quantitative reporting. For WHO/HAI surveys, the fact that only glibenclamide and simvastatin are included on the list of core medicines could mean that some critical medicines, such as insulin, were not considered “core” at the time this methodology was developed. Another possible explanation is that these surveys primarily focused on assessing price rather than availability, and there may be issues related to the measurement of price for some diabetes medicines that excluded them from the core list. The SARA reports provide good information on availability, but at this point they assess only a handful of LMICs, making it difficult to draw conclusions about the environment across LMICs.

The sources cited in this report applied different indicators of availability, with some assessing any dosage form or strength of a medicine and some looking for specific dosage forms or strengths. While we report the general findings on availability, regardless of dose, differences in methodology mean data across sources cannot be compared directly. Finally, the list of EMTs in Appendix B includes 22 products. The current literature includes data on 15 of these products, and these data are limited for the reasons noted earlier. Overall, the scarcity and limited comparability of the data available restrict our ability to understand the breadth of issues related to availability of these products, both on a global scale and at a national level.

Despite the limitations noted above, it can be concluded from the literature and stakeholder opinion that the supply of diabetes EMTs is inadequate to meet current and future demand, and must be strengthened to improve access to these products in LMICs. The next section of the report will discuss factors that contribute to the limited availability of diabetes EMTs, which may present opportunities to modify

existing approaches in order to improve access to these EMTs. However, before shifting into a review of contributing factors, it should be reiterated that a key part of access to EMTs is their price, both to procurers and end users, and how affordable they are for people in low-resource settings.⁷³ While this report focuses primarily on availability of diabetes EMTs due to limited data on price and affordability for these products, we feel it is important to provide a high-level summary of selected literature, given the linkages between price, affordability, and availability and access to EMTs. Box C summarizes the WHO/HAI survey data on this topic.

Box C: Pricing and affordability of essential medicines and technologies for diabetes.

Together, availability, price, and affordability of EMTs are indicators of access to treatment for diabetes.⁷³ Data from WHO/HAI surveys are the primary source of information on all three measures, focusing on a small subset of the EMTs from Appendix B; as such we only review data from the WHO/HAI surveys already discussed, given the wide range of countries surveyed and articles published utilizing this methodology. As noted, these surveys did not assess technologies, therefore price and affordability data on technologies are not included here.

Price is assessed as the median price ratio (MPR), comparing the local price for a product to the international reference price (IRP) for that product, and demonstrates how much more or less a procurer or end user pays for a product compared to the IRP. As with availability, the procurement and retail prices of diabetes medicines varied widely across regions and countries. A diabetes-focused secondary analysis of 32 country surveys found that median public sector MPR for glibenclamide was 1.10 times the IRP, ranging between 0.27 in Chennai, India to 17.37 times the IRP in Nigeria.³⁵ In other words, procurement prices equaled or exceeded 1.10 MPR in half the locations surveyed, while the other half paid the IRP or lower. Median public sector procurement price for metformin was below the IRP, with a median MPR of 0.72 across 21 surveys, ranging from 0.17 in Chennai, India to 8.17 times the IRP in Shandong, China.³⁵ In a survey of 36 countries, the mean MPR for public sector procurement of glibenclamide was 2.15 times the IRP.⁶ Mean MPR was highest in the African region at 3.42 times the IRP; however, MPR within Africa ranged from 0.6 to 17.37 times the IRP. This means that, on average, governments in Africa procured glibenclamide at prices 34.2 percent higher than the IRP, though this varied widely within the region. Finally, in an analysis of affordability of cardiovascular medicines in 36 countries, mean MPR for public sector procurement of HCT was 9 times the IRP.⁴⁷

There were few data on price and affordability in the individual country surveys reviewed earlier in this report. While data on specific procurement prices were not mentioned, research in Delhi, India noted wide variations in procurement price among different public sector agencies.⁵⁷ It is challenging to draw conclusions on the efficiency of procurement for diabetes EMTs, given the limited number of diabetes medicines included in these analyses, as well as the limited number and age of the references and different methods for reporting findings (e.g. median vs. mean). There was wide variation both across and within countries and across medicines, limiting our full understanding of public procurement efficiency. Original research assessing the MPR for the full range of diabetes EMTs in Appendix B is needed to provide a basis for understanding the efficiency of public procurement of these products. The literature did not provide data on the MPR for private sector procurement of diabetes medicines.

While diabetes medicines may be provided at no cost to the patient through public sector outlets in some countries, this is not universal. Moreover, limited public sector availability of these products often requires people to purchase them at private retail outlets. Retail MPR, or cost to the end user, is generally higher in the private sector than the public sector. Mean MPR of retail prices for glibenclamide in the African region ranged from 17.65 times the IRP in the public sector to 33.87 times the IRP in the private sector.⁶ Another analysis showed that mean retail MPR for the lowest-priced generic version of HCT ranged from approximately 20 times IRP in the public sector to 70 times IRP in the private sector across 36 countries.⁴⁷

Box C: Pricing and affordability of essential medicines and technologies for diabetes. (cont.)

In the Philippines, retail prices for glibenclamide were over 5 times the IRP in the public sector and more than 25 times the IRP in the private sector.⁴³

There was very little information comparing procurement price with retail price, or providing the costs added to the product along the distribution chain. Mark-ups in price from procurement to end-user purchase point can impact affordability significantly, and, as with availability and procurement price, they varied widely across countries, reflecting variations in regulation, procurement efficiency, and market competition.⁵ In an analysis of ten LMICs, differences between the public sector procurement price of glibenclamide and the patient price ranged from a 5 percent mark-up in Peru to a 311 percent mark-up in Tanzania.³⁵ For metformin, mark-ups in the public sector ranged from 24 percent in Tanzania to 372 percent in Nigeria. For both medicines, mark-ups were highest in the African countries surveyed. Unfortunately, further insights are not available to help determine at which stage in the distribution process these mark-ups occur.

For people living with diabetes and other chronic diseases, affordability was generally measured by how many days' wages the lowest paid government worker would need to work in order to purchase a 30-day supply of treatment, with the ideal affordability being one day's wages or less.^{6,35,73,a} The evidence on affordability of diabetes medicines for end users was mixed. Three secondary analyses of WHO/HAI surveys found that essential diabetes medicines were generally unaffordable in the private sector, costing more than two days' wages in the majority of countries reviewed.^{35,73,a} Specifically:

- Combination treatment with the lowest-priced generic versions of glibenclamide and metformin cost between less than one days' wages in Fiji to eight days' wages in Ghana.^{35,a} This combination was least affordable in El Salvador, Ghana, Nigeria, and Tanzania, where the treatment cost at least six days' wages. Furthermore, metformin was less affordable than glibenclamide in the majority of countries.
- An analysis of the affordability of metformin and captopril (an angiotensin-converting-enzyme inhibitor for hypertension, not included in Appendix B), presented similar findings.⁷³ Significantly, of 25 countries, these two medicines together cost less than a days' wages in only two. Of the countries assessed, Ghana was the least affordable, with this combination costing 15 days' wages for a 30-day supply.

Conversely, in an earlier survey of six LMICs, the diabetes medicines assessed were largely affordable: across the six countries, the cost of HCT and either glibenclamide or metformin was less than one days' wage.⁵ Troublingly, however, a 30-day supply of insulin was shown to be unaffordable, costing between 2.8 days' wages in Brazil and as much as 19.6 days' wages in Malawi.⁵ It is notable that this data represents affordability of innovator brand insulin in all countries except Brazil.

These data suggest that wide variations in affordability of diabetes medicines exist across countries, within countries, and across medicines and likely incur catastrophic cost for individuals and families affected by this disease. Affordability is particularly concerning for insulin, which currently has few biosimilar equivalents.

IN SUMMARY

Data from the WHO/HAI surveys suggest that select diabetes medicines are more expensive in the private than public sector compared to the IRP and less affordable in the private sector than the public sector.

Many countries struggled to procure diabetes medicines at prices close to the IRP, with the Africa region demonstrating particularly wide-ranging MPR for glibenclamide (0.6 to 17.37 times the IRP) and paying 34.2 percent more than the IRP, on average. Furthermore, mark-ups between the procurement and retail prices in public sectors that charge for medicines can be high and there are widespread discrepancies within and between countries. Given the limited availability of diabetes EMTs in the public sector, many people must

Box C: Pricing and affordability of essential medicines and technologies for diabetes. (cont.)

purchase these products at private outlets, often at unaffordable prices that may be marked up substantially from the procurement price. This may result in severe economic consequences or in patients choosing to go without treatment, particularly for the many people in LMIC who earn less than the wage of the lowest-paid government worker. The data available references only a small subset of the diabetes medicines from Appendix B, and no technologies, so we were not able to holistically assess the global landscape for the price and affordability of diabetes EMTs. Furthermore, there is limited price and affordability data on diabetes medicines in general, even within these surveys. More evidence is needed to understand the financial environment for diabetes EMTs in LMICs. Research is particularly needed for individual countries; a wide range of diabetes medicines and technologies, such as the list presented in Appendix B; and both procurement and retail prices, as well as affordability, in both the public and private sectors.

^a UN. *Strengthening the Global Partnership for Development in a Time of Crisis: MDG Gap Task Force Report 2009*. New York: UN; 2009. Available at: http://www.un.org/en/development/desa/policy/mdg_gap/mdg_gap_archive/mdg8report2009_enw.pdf. Accessed May 19, 2015.

Factors Affecting Availability of Essential Medicines and Technologies for Diabetes

In this section we focus on factors that contribute to the insufficient availability of diabetes EMTs in LMICs, with the aim of identifying any unique challenges these products encounter on their journey to the shelves of health facilities and retail outlets. Identification of determinants of availability may shed light on solutions to improve access to these products. Contributing factors cited most often in the literature and by stakeholders include insufficient financing, inadequate health systems, overburdened regulatory structures, discordant national essential medicines lists, and weak supply chains. Evidence from the literature is presented, along with supporting comments and insights from stakeholder interviews. Where possible, we discuss factors contributing to availability in both the public and private sectors, though there is little information on the private sector.

Financing

Earlier in this report we discussed the overall funding environment for NCDs in LMICs, noting the desire of many countries to achieve UHC, despite the limited financial resources available. While it is beyond the scope of this report to provide a thorough analysis of NCD financing, particularly disaggregating financing for diabetes, it is important to acknowledge the challenges countries face in allocating their limited funding among competing programs in order to best address local burden of disease, donor priorities, and achievement of national goals such as UHC, the MDGs, and/or the GAP targets. This clearly has an impact on availability of EMTs for diabetes and other chronic diseases.

The funding environment

The amount budgeted for supplying diabetes EMTs and the allocation of those budgeted funds are key factors affecting availability of diabetes EMTs, as noted in published reports and stakeholder interviews. Traditionally, financing for public sector NCD EMTs, including those for diabetes, comes primarily from government budgets, which may be supplemented by taxes, health insurance, and user payments.^{32,74} A recent essay argued that the public sector financing structure for NCDs must be adjusted in order to improve the supply chain for NCD EMTs and achieve a secure supply of these products in public facilities.³² Specifically, the authors called for foreign assistance for the poorest countries, and reprioritizing the budgets and health systems of middle-income countries to increase spending on EMTs for diabetes and other NCDs. They suggested a financing model that highlights international assistance and government budgets, as well as health insurance programs for NCDs, and out-of-pocket user payments, with eventual phasing out of international assistance over time. As discussed previously, international assistance for NCD programming, including ensuring availability of EMTs, is minimal; the addition of foreign aid may support initial implementation of national NCD strategies in some countries and foster improved availability of EMTs.

The pharmaceutical sector, through shared value initiatives and programs to aid the world's poorest people, is also an important source of financing for diabetes EMTs in LMIC. For example, some of the branded insulin manufacturers offer differential pricing options to procurers in least-developed countries.^{75,76} But while these opportunities exist for procurers to purchase insulin at lower prices than paid in high-income countries, we found low availability of these products in both the public and private sectors in a number of LMICs. Furthermore, lower procurement prices would ideally result in lower prices to the end user, but as discussed in Box C, there are often markups along the supply chain that make these products unaffordable to many in LMICs. Evidence on this practice notes that differential pricing does not ensure the products are affordable, but rather that they are sold at a different price to different markets.⁷⁷ More information is needed on why these differential prices do not always translate into better availability and affordability at service delivery and/or retail points.

Funding and availability of diabetes EMTs

Much of the literature discussed the need for increased or more efficient funding as a pathway to improving availability of diabetes EMTs, but these reports were typically not quantitative.^{3,5-6,39,43-44,47,55,57-59,66,69,71} Authors used phrases such as “inadequate funding,” “cash flow constraints,” “unsustainable financing,” and “under-budgeting” to describe the funding challenges.^{3,5,6,47,55,57,66} In the Philippines, health professionals felt the availability of diabetes medicines was dependent on the local government's budget, and that budget allocations were influenced by “politics,” presumably meaning that agendas are self-serving and not based on needs of the population.⁴³ However, there was generally no discussion in the literature on underlying funding issues, such as budget allocations for diabetes, and their impact on the availability of diabetes EMTs. Furthermore, while the literature recommended improving financing for NCDs as one way to improve availability of EMTs, there was little detail on financing adjustments that would have the most impact on availability.

Stakeholders cited limited funding as the primary factor contributing to insufficient availability of EMTs for diabetes and other NCDs. One element noted by several stakeholders was the competition diabetes and other NCDs face for limited financial resources in the public sector, particularly when that competition is infectious disease programs. A few stakeholders noted the influence of political motives on

funding allocations and the need for political champions to support strong national programs to address diabetes and other NCDs. Another troublesome element of funding reported by stakeholders was the tendency to group all NCDs together in one budgetary pool, which typically limits the amount that goes to EMTs for individual chronic diseases. Some key statements included the following:

“...even if you plan [for procurement] properly, the budget often is not sufficient and not enough [medicines are] bought...you have this vicious cycle of not enough resources, therefore not enough medicines in the system, not enough data on what should be bought and it goes around and around. In some cases you may have enough budget, but it’s not used wisely or in other cases it’s just not enough to cover the needs of a given country.” (Dr. David Beran)

“[EMTs for NCDs] are typically at the bottom of the priority [list] because they are competing with malaria, tuberculosis, [and other infectious diseases].” (Dr. Kibachio Joseph, Head, Noncommunicable Disease Unit, Ministry of Health, Republic of Kenya)

“...in the end, funding is the major issue [regarding availability of diabetes EMTs].” (Dr. Steven Shongwe)

“When countries are thinking of procurement and budget financing, the way those decisions are made are basically considering NCDs as one big bucket. Other program areas are segmented, but NCDs do not receive this consideration and allocations tend to be much smaller [as a result].” (Dr. Prashant Yadav, Director, Healthcare, William Davidson Institute, University of Michigan)

While much of the literature and many stakeholder opinions on funding were not specific to diabetes EMTs, it is apparent that funding is a critical factor affecting the availability of EMTs, including those for diabetes, particularly in the public sector.

Health Systems

The limitations of current health systems in LMICs were noted as influencing factors on availability of EMTs for NCDs, including diabetes.

Limited capacity to address NCDs

The limited capacity of health systems in general in LMICs contributes to the failure to recognize, prioritize, and plan for adequate supplies of the affordable, quality-assured EMTs for diabetes and other NCDs. Many health systems in LMICs were built to address acute, infectious disease and have been slow to adapt to the changing nature of the disease burden in LMICs.^{3,10,78} As noted by one stakeholder,

“Chronic disease management is not integral in the health care systems of most LMICs. The health care systems are based on [acute] infectious diseases. [There is a need to] integrate these two systems in such a way that you make sure that there is access to [EMTs].” (Prof. Jean Claude Mbanya)

Several authors reported that governments in LMICs were not focused on improving access to treatment for NCDs in the public sector and commented on the need for more government stewardship to improve access to EMTs for NCDs,^{3,5,6} suggesting that strengthening the overall health system is the best approach.¹²

Lack of care for NCDs at the primary care level

In general, health systems in LMICs are best able to diagnose and treat diabetes and other NCDs at the tertiary care level, with capacity decreasing at the secondary level and extremely limited at primary care facilities.^{12,71} The data presented earlier showed that diabetes EMTs were least available at the primary care level, even though this is where many people first seek health care.^{61–65,71} Additional systemic gaps at the primary care level included rudimentary health information systems, limited skilled personnel in the facilities, and poor financing.⁷¹ Unfortunately, these gaps mean that many people with diabetes and other NCDs must travel long distances to access care at secondary and tertiary facilities, spending time and money, and often waiting until complications are serious before they seek treatment.

Need for a comprehensive approach to treating NCDs

Selected literature argues that access to diabetes medicines is also about access to general health services, and that a broader view must be taken, going beyond ensuring supplies are available and focusing instead on improving overall access to treatment for diabetes and other chronic diseases.^{12,78,79} It was noted that health systems must ensure that:

- Diagnostic tools as well as medicines are available.
- Health care providers are sufficiently trained to diagnose and treat NCDs.
- Infrastructure that supports supply and treatment should be strengthened.
- A positive policy environment that engages communities and diabetes associations is fostered.

Several stakeholders acknowledged the need to do things differently and strengthen health systems holistically. One stakeholder echoed the need to build provider capacity, also calling for the utilization of health management information systems (HMIS) that incorporate NCD indicators. Another stated that:

“We need to be sure that [health] systems in LMICs are ready to take care of and have the proper follow up with [NCD] patients....we need to support countries to adapt their systems...in new ways.”
(Ms. Cécile Macé)

These ideas are supported by additional research, which recognized the vertical nature of current efforts to strengthen the availability of medicines and developed a framework that takes a holistic health systems approach to improve access to medicines.⁸⁰ While as yet untested, the holistic nature of this framework lends itself well to considering how health systems can be updated to better address chronic disease. As stated by one stakeholder, diabetes and other NCDs are missing from the health systems frameworks in many countries and more research is needed into how NCDs can be integrated into existing health service delivery platforms.

Both the published literature and stakeholders felt that governments must take a leadership role in facilitating a more holistic approach to access to diabetes EMTs, focusing on overall improvements to the health system that will simultaneously foster improvements in the availability of EMTs for diabetes and as well as other chronic, and infectious, diseases. As noted by Mendis et al, “...health system strengthening, particularly at the [primary care] level, is a prerequisite for scaling up prevention and control of NCDs in resource-constrained settings”.^{71(p.6)}

Regulatory Procedures

In order for pharmaceutical products and technologies to be available for procurement, sale, and distribution in a country, they typically must be registered with a national drug authority or regulatory body. These bodies are responsible for ensuring the quality, safety, and efficacy of health commodities, including both drugs and devices.^{32,81,82} As the prevalence of NCDs increases in LMICs, more essential medicines and technologies are required to respond to the population's health needs, placing a heavy burden on regulatory systems that are already overwhelmed. Regulatory standards are generally country-specific—and thus, different everywhere—and meeting them can be time-consuming, expensive, and repetitive for manufacturers, which may discourage drug makers from pursuing country registrations, thus limiting options and selection of EMTs in a country.⁸¹ The selection and acceptance of generic medicines and the assurance of quality were regulatory themes emerging from both the literature and the stakeholder interviews, reflecting their importance in determining availability of diabetes EMTs.

Regulation of generic medicines

The overall regulation of generic medicines was highlighted by several authors and stakeholders as a barrier to supply, with many calling for more efficient regulatory practices regarding these medicines to ensure that generic and/or biosimilar diabetes EMTs are effective and safe and are eligible for procurement. Surveys in the Philippines revealed perceived distrust of generic medicines for diabetes and doubts about the quality of both generic medicines and the capacity of the national regulatory authority to properly monitor quality of EMTs.⁴³ In China, researchers found that provider and patient distrust of the quality of generic medicines may contribute to low demand—and thus, stockouts—of some generic medicines.⁵⁵ In both countries, researchers called for efforts to improve the reputation of generic medicines, both among providers and patients.^{43,55} Other authors and some stakeholders also noted the need to ensure generic formulations were included in the national essential medicines list (NEML), which may facilitate procurement of these medicines (NEMLs are discussed in the next section of this report).^{7,47,69,83} Relevant comments from key stakeholders included the following:

“A lot of [diabetes] medicines are generic, but governments are not necessarily choosing these options...the fact that [diabetes EMTs] are generic already, but there are still issues around availability and affordability, is concerning.” (Ms. Katie Dain, Executive Director, NCD Alliance)

Quality Assurance Practices

Quality assurance for medicines and technologies is a challenge in LMICs,^{11,81,84} where limited resources contribute to ineffectual regulatory authorities.⁸⁵ A WHO assessment of 26 sub-Saharan African countries found that while all countries had national regulatory bodies, there were complex legal frameworks supporting those bodies, along with insufficient funding, staffing, and operational resources that led to inefficient practices.⁸⁵ Seven of the 26 countries did not have operational quality assurance mechanisms/authorities in place at the time of this assessment. In Kyrgyzstan, the RAPIA report suggested that the quality of syringes and needles purchased through the central government was poor, hinting that the regulatory agency is not conducting proper quality assurance procedures to approve appropriate technologies for procurement.³⁹

While not all stakeholders mentioned quality as a contributing factor to poor availability of diabetes EMTs, those that did were particularly concerned about quality assurance processes. One stakeholder

noted that the environment is conducive to the development of counterfeit medicines for NCDs, considering the demand for use and the limited resources for inspections in LMICs. Another stakeholder called for secondary quality checks by a neutral international body, such as WHO, to confirm the quality of diabetes medicines such as insulin. This was echoed by another interviewee, who suggested expanding the scope of the WHO Prequalification Programme to include EMTs for diabetes and other NCDs. A different stakeholder discussed the lack of understanding and data on the extent of low-quality EMTs for diabetes and other NCDs on the market in LMICs:

“In regards to the extent of substandard and counterfeit medicines and quality of NCD medicines, to be frank, the situation is not very clear. We know there is a huge problem in LMICs, and that countries have limited capacity to control their market. This is a general problem [for all medicines], and it’s probably the same for NCD medicines. However, we lack a proper documentation confirming this.” (Ms. Cécile Macé)

Finally, there is a need for national regulatory authorities to cooperate across regions and with stringent regulatory authorities^{xxiv}.³² Improving access to EMTs for NCDs, including diabetes, will necessitate multi-country cooperation, with national regulatory bodies leveraging each other’s strengths and knowledge to better manage regulation of medicines and technologies at a regional level.

National Essential Medicines Lists

Along with regulatory approval, a NEML is a key factor in determining the procurement—and thus supply and availability—of EMTs at the country level. A NEML is preferably modeled after the WHO Model List of Essential Medicines^{xxv}, which includes medicines that satisfy the priority health care needs of the population.⁸⁶ Medicines included in the WHO Model List “...are selected with due regard to disease prevalence, evidence on efficacy and safety, and comparative cost-effectiveness”.⁸⁶ Using the WHO Model List as a guide for development of NEMLs allows countries to determine which products are most important for their burdens of disease.^{7,83,87} Ideally, multidisciplinary committees define the products that may be included on the NEML, and as a result, these are the essential medicines the country’s public sector is most likely to purchase. Finally, in some countries there are additional EMLs at the subnational level, necessitating more extensive monitoring for cohesion within the country and alignment with the WHO Model List.

A number of papers reviewed and stakeholders interviewed for this report noted that NEMLs should be based on the most recent WHO Model List;^{7,11,69,83,87} however, a 2010 study of antihypertensive medicines in 13 sub-Saharan African countries found that only 38 percent of NEMLs had been updated in the previous five years and therefore were not harmonized with the latest WHO Model List.^{11,88} The application of a NEML, along with correlated standard treatment guidelines, fosters consistent procurement practices of cost-effective products.⁸³

^{xxiv} Stringent regulatory authorities are national regulatory bodies that apply standards for quality, safety and efficacy, that compare to WHO’s own standards. Qualifying countries must be members or observers of the International Conference on Harmonisation of Technical Requirements for Registration of Pharmaceuticals for Human Use. More information can be found here: http://www.ghtcoalition.org/files/WHO_Schematic_medicines_v01_rev01.pdf

^{xxv} The 19th WHO Model List includes all of the medicines from Appendix B. It does not include diabetes technologies such as glucometers, though it does note the need for specialized diagnostic or monitoring equipment.

Some of the individual country assessments referred to in the availability section of this report noted the relationship between a national or subnational EML and limited availability of essential medicines:

- In Tanzania, the diabetes medicines available in the public sector prior to 2013 were only those contained within the NEML. While this would generally be recommended, at the time of the survey Tanzania's NEML did not include the range of medicines required for diabetes, limiting the treatment options for public sector patients.⁶⁹
- In Delhi, India, different EMLs across multiple public sector providers and facility levels created inefficiencies, contributing to low availability of the medicines investigated.⁵⁷ The authors also cited the purchase of medicines not included in the NEML as a potential factor contributing to low availability of essential medicines.
- Researchers in China noted that the lack of specificity in the development of the provincial medicines lists contributed to limited procurement and possible stockouts.⁵⁵
- In Kyrgyzstan, it was reported that exclusion of syringes from the list of essential technologies contributed to poor availability.³⁹

Rational selection

One assessment noted the need to focus limited finances on a small group of EMTs, preferably generic and/or biosimilar versions, rather than trying to supply a wide range of both generic and branded products.⁴⁷ Similarly, stakeholders focused on the rational selection of medicines for the NEML. They felt that governments often did not purchase the most appropriate, cost-effective EMTs for their local environment and/or disease burden. One interviewee said that many countries think that the “newer technology is the better technology,” and thus procure more expensive products that may not be most suitable for their environment or budget. Another stated,

“Some countries do not comply with WHO’s essential medicines list, and then go and buy medicines that are not on their [own national] essential medicines list...breaking their own guidelines. [There is] a complex process of what should be bought, what is bought, and what is used.” (Dr. David Beran)

Inclusion of essential technologies

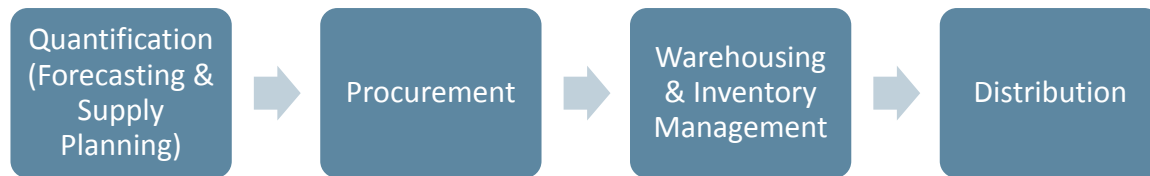
While also essential, monitoring technologies such as glucometers and urine test strips are not included on the WHO Model List of Essential Medicines and are thus excluded from most NEMLs. There may be a relationship between the lack of a formal policy acknowledging the essential nature of these products and their limited availability. With the increasing burden of diabetes in low-resource settings and the need for technologies to appropriately manage the disease, it may be time to include the technologies listed in Appendix B in national and global lists of essential medical products. Such an administrative endorsement could facilitate improved availability of these products.

Supply Chains

The most commonly noted downstream obstructions to the adequate supply of essential diabetes medicines and technologies were components of in-country public health supply chains, depicted in

Figure 4 and discussed below. Published reports and stakeholders cited problems with the central components of the in-country supply chain—quantification, procurement, warehousing/inventory management, and distribution—as drivers of insufficient supply of diabetes EMTs in LMICs in the public sector. While some of this may also apply to the private sector, there is little evidence specific to diabetes EMTs.

Figure 4: Components of the in-country supply chain.



Source: Supply and Awareness Technical Reference Team, UN Commission on Life-Saving Commodities for Women and Children. *Challenges and Barriers Along the In-Country Supply Chain*. Arlington: Management Sciences for Health; 2013. Available at: <http://siapsprogram.org/wp-content/uploads/2014/07/14-076-Barriers-Supply-Chain-Format.pdf>. Accessed September 8, 2014.

While individual supply chain components are in need of improvement, a number of stakeholders commented on the need for overall strengthening of in-country supply chains. This would help ensure the availability of diabetes EMTs as well as commodities for other health concerns, and would aid implementation of UHC measures and general health system strengthening by moving away from vertical approaches and embracing a holistic approach to the supply of health commodities.

“Working in silos has contributed to the problems NCD programs are facing [regarding availability of EMTs].” (Dr. Eric Mallard, Senior Health Specialist, The World Bank)

Below we present findings from the literature and stakeholder interviews regarding individual components of the in-country supply chain and the effects of dysfunction on availability of diabetes EMTs.

Quantification

Quantification—comprising both forecasting and supply planning—is the complex process of determining the amount of any medicine or technology to procure in a set timeframe; planning future supply needs for the short-, medium-, and long-term; and reconciling those intentions with the funding available.⁸⁹ Forecasting is the process of estimating how much of a given product will be required for a set procurement period, and typically requires the collection of historical consumption data, current and anticipated burden of disease, and existing stock information.⁸⁹ Supply planning, on the other hand, involves the prediction of future needs in order to assure balance in the supply, demand, and funding for commodities. Information needed for supply planning includes expiration dates of current stock on hand, supplier details (prices, lead times, etc.), funding information (source, disbursement schedule, etc.), and procurement and distribution details.⁸⁹

Quantification is generally difficult for diabetes EMTs in low-resource settings because of the lack of reliable, consistent data on the burden of disease, consumption of EMTs, and unknown, but anticipated, growth in demand as diagnosis and prevalence rates increase. The RAPIA reports found that a lack of information on the diabetes burden, and thus on the demand for diabetes-related EMTs, contributed to

inadequate forecasting and supply planning in the short term, and sub-optimal availability of EMTs in the longer-term.³⁹⁻⁴³ Authors of a WHO/HAI report on six countries suggested that poor consumption data contributed to inaccurate quantification and subsequent stockouts of medicines for chronic disease.⁵ Furthermore, latent demand for diabetes EMTs is often high in LMICs, given the limited screening and diagnosis of the disease;^{12,32} according to the International Diabetes Federation, approximately 46.3 percent of people with diabetes are undiagnosed.⁸ In many LMICs, the unknown burden of diabetes and nonexistent or inaccurate data contribute to inaccurate forecasting and supply planning for these EMTs.

The majority of the literature that assessed availability of EMTs did not comment specifically on quantification, though a few authors did comment on the need to improve forecasting processes.^{3,5-7,39,43,55,57} However, little detail was provided as to exactly how poor quantification contributed to availability of diabetes EMTs specifically.

While the literature on availability did not emphasize quantification as a significant contributor to insufficient availability of diabetes EMTs, a recent essay stressed the necessity of improving demand forecasting in order to improve availability of and access to EMTs for diabetes and other NCDs.³² The authors argued for better-quality surveillance data to support forecasting, supply planning, and procurement, including collection of the following information:

- Burden of disease, including prevalence and diagnosis rates.
- Past consumption of EMTs.
- Market research on patient/caregiver patterns of use and treatment-seeking for NCD EMTs, across health sectors.
- Market research on provider preferences for EMTs.
- Relevant standard treatment guidelines.

The authors argued that collecting this information on a routine basis and feeding it into the procurement process can prevent bottlenecks and inconsistencies within a country's supply chain for NCD EMTs. This call for improved surveillance and collection of demand-side data is supported by WHO, which recommends improved surveillance as an option for monitoring trends and progress towards the GAP targets, including the target for availability.⁴ However, much remains to be done to build the capacity of the health systems in LMICs to a point where they are able to collect this data for diabetes and other NCDs.

The majority of stakeholders interviewed felt very strongly about the need for improved quantification, and noted that the lack of data to support proper forecasting was one of the main factors contributing to insufficient availability of diabetes EMTs:

"...a lack of understanding of the actual burden at a facility level, which translates into not understanding the burden at a national level, which doesn't allow for proper budgeting and planning for the disease in terms of [procurement of] medicines...it's about knowing what you need when you need it and having the data to back it up and the systems to collect and monitor the data." (Dr. David Beran)

"There can be a lack of supplies not because...the supply chain isn't working, but because of the lack of knowledge of what is needed...if [countries] do not have data they cannot support acquisition of [diabetes] EMTs." (Prof. Jean Claude Mbanya)

“...you can’t forecast properly if there isn’t data to support the need to have the supplies. The lack of information in the health care system doesn’t allow [communities] to purchase drugs if they can’t properly account for the need and justify it to the ministry of health.” (Dr. Julie Torode)

“The forecasting is usually not accurate as there is lack of input data.” (Dr. Kaushik Ramaiya, CEO & Consultant Physician, Shree Hindu Mandal Hospital, Dar es Salaam, Tanzania)

“...there must be a very good linkage between supply and demand...identifying the numbers of people and the number of [EMTs] required...would enable a much better distribution process.” (Prof. Naomi (Dinky) Levitt)

Supply planning is a key component of quantification but was rarely mentioned in the literature or stakeholder interviews. Yet the information needed for supply planning—expiration dates of current stock, supplier details, funding information, and procurement and distribution details—tends to be more readily available than inputs for forecasting. One stakeholder commented that forecasting can often be challenging and incorrect, but supply planning can help compensate when the system is flexible. Unfortunately, as he noted, that is rarely the case. Technical assistance to improve supply planning processes may be feasible in current supply chain system strengthening environments and could have a positive effect on the availability of diabetes EMTs.

There is a clear need, as voiced by key stakeholders in this field as well as some research publications, to improve the quantification processes for diabetes EMTs, with particular attention to the collection of surveillance data. Interviewees felt that improved data collection on diabetes burden and the demand for diabetes EMTs would contribute to increased availability of these supplies in LMICs. That said, assistance with supply planning processes may be easier and more efficient in the short term.

Procurement

The following definition from PATH’s *Procurement Capacity Toolkit* aligns with the in-country supply chain model presented in Figure 4: procurement is the “...technical process of soliciting offers and placing contracts [for the purchase of commodities]...”.^{90(p.I-4)} Procurement in this narrow sense still encompasses many components, including the following:^{90,91}

- Collaboration with entities responsible for regulatory procedures, quantification, warehousing, and distribution.
- Implementation of management processes to increase efficiencies.
- Coordination with national policies and strategies, such as standard treatment guidelines and NEMLS.
- Price setting and negotiations with manufacturers, importers, wholesalers and distributors.
- Issuing tenders, reviewing offers, selecting a supplier and managing contracts.

Given the many components involved, it is not surprising that procurement was mentioned repeatedly in the literature as a contributing factor to insufficient availability of EMTs, particularly in the public sector.^{3,11,35,37,39,43-44,47,55,57,66,79} Evidence provided in this section focuses primarily on the public sector, as few data are provided on the private sector’s procurement processes. Despite repeatedly listing procurement as a key issue, the research on availability of diabetes EMTs provided little insight into specific procurement bottlenecks. For example, one report implied that issues with tendering, price negotiation, and the pre-procurement process of quantification affected availability of diabetes EMTs in

Mozambique in 2003.³⁷ These processes were said to have improved when reassessed in 2009, but the authors did not comment on the specific changes that resulted in the improvements. Another report was more specific, identifying some procurement bottlenecks in Kyrgyzstan that contributed to low availability of some diabetes EMTs:^{39,44}

- Most of the insulin budget—57 percent— was spent on a small amount of the insulin supply, which did not meet WHO criteria (largely analog and penfill insulin devices). These constituted only 29 percent of the insulin purchased, limiting funds available to purchase insulin meeting WHO criteria. A review of these findings noted that if all patients had been on generic insulin, the government could have treated twice the number for the same amount of money.¹¹
- Kyrgyzstan’s standard treatment guidelines for diabetes at the time of the assessment stated that metformin is the first line of treatment, and as such, it was the most prescribed diabetes medicine, yet it was rarely available in the public sector. In 2009, the amount procured covered approximately 1 percent of the need.
- The government purchased medicines not listed on the WHO Model List or its own NEML.
- Purchase prices for glibenclamide and metformin were significantly higher than the respective IRPs at the time of the assessment (5.4 and 10.3 times higher than the IRP, respectively).

Of note, in published research on availability of EMTs, only the RAPIA reports and Volman’s report focused solely on diabetes EMTs and thus were the only documents to highlight the impact of procurement problems specifically on diabetes EMTs. That said, it is clear from the literature that strong procurement practices are an important contributor to availability and can help countries achieve the 80 percent GAP target for availability of EMTs for diabetes and other NCDs.

Stakeholders also highlighted procurement concerns, though with less emphasis than the literature. One interviewee said that procurement was the most concerning element of the supply chain for diabetes EMTs. He stated that the flow of money within a country is often the root cause of insufficient procurement practices: complicated, lengthy processes to transfer funding to the procurement agency inhibit efficient supply chain management and thus availability of EMTs. Several stakeholders commented on the need for countries to negotiate better procurement prices and transfer lower prices to the end users.

“...the person at the end of the [supply] chain gets benefits from the [country’s] negotiating with the manufacturer.” (Dr. Julie Torode)

Another stakeholder said that countries need more support to remain independent of influence from industry or product manufacturers when considering which commodities to purchase, commenting that:

“...industry has a role to play, but in national public health decisions, countries should be free to make their own decisions on which medicines to select and purchase for NCDs, and the development of guidelines and NEML should be based on scientific evidence without industry influence, this is not always the case in countries.” (Ms. Cécile Macé)

This stakeholder felt that countries could benefit from assistance in negotiating the best prices and in using their resources wisely. As discussed in Box C, public procurement for some diabetes medicines is close to the IRP; however, data on many of the EMTs from Appendix B is limited, limiting our understanding of the efficiency of procurement for diabetes EMTs.

Pooled Procurement. A method of procurement that elicited a number of comments from stakeholders as well as published literature is the concept of pooled procurement, which is defined as follows:

“An approach to ensure a consistent and sustainable supply of essential medicines. It involves purchasing done by one procurement office on behalf of a group of facilities, health systems, or countries. In return, members agree to purchase certain drugs exclusively through this mechanism. Successful pooled procurement schemes can lead to reductions in unit prices for medicines, and improvements in procurement and quality assurance systems and capacity levels in individual countries.”⁹²

The four common models of pooled procurement are listed in Table 16 and describe different levels of collaboration among participating purchasers. Examples of successful pooled procurement mechanisms include the Global Drug Facility (GDF) for tuberculosis (TB) and the Revolving Fund of the Pan American Health Organization (PAHO), which are discussed in the next section of this report as well as in Appendix C.

Table 16. Pooled procurement models.

Pooled Procurement Model	Description
Informed buying	Purchasers or countries share information on prices and suppliers Procurement is conducted separately
Coordinated informed buying	Purchasers or countries conduct joint market research and share information on prices and supplier performance Procurement is conducted separately
Group contracting	Purchasers or countries negotiate prices collectively Purchasers or countries agree to purchase from selected suppliers Purchasing is conducted separately
Central contracting and procurement	A central buying unit, established by the purchasers or countries, acts as the procurement agent in the tendering and award of contracts Central buying unit manages the purchase on behalf of the purchasers or countries

Source: WHO. *Multi-country Regional Pooled Procurement of Medicines*; Meeting Report. Geneva: World Health Organization; 2007. Available at: <http://apps.who.int/medicinedocs/documents/s14862e/s14862e.pdf>. Accessed March 19, 2015.

Additional advantages of pooled procurement include improved quality through restricted tendering and other preventive measures, rational selection of products, reduced corruption, and improved functioning of the supply chain.⁹³ However one stakeholder felt that the formal processes required to successfully administer a pooled procurement mechanism may hinder the agility of the supply system in an individual country, negatively affecting availability.

Pooled procurement works best when large volumes can be procured on a regular basis; therefore, regional multi-country mechanisms may benefit countries of small population size or with limited need for EMTs for diabetes and other NCDs.³² In some pooled procurement mechanisms, such as PAHO’s revolving fund, a reserve is available to offset funding distribution gaps within countries and ensure suppliers are paid on time and countries receive products as intended. Timely payments to suppliers, an important success factor of this model,⁹³ may be a challenge to LMICs given the current funding mechanisms for supply of diabetes and other NCDs.

Several authors of research reports thought that pooled procurement initiatives could positively influence the availability of EMTs for diabetes and other NCDs.^{5-6,47} When asked whether or not they felt pooled procurement mechanisms could work to improve availability of EMTs for diabetes and other NCDs, stakeholders had a range of responses, including the following:

“[Pooled procurement] could be difficult [for NCDs] unless you can create a strong donor and government commitment.” (Dr. Alan Bornbusch)

“The odds are that it could be very helpful...[for]...a select few NCDs, those where you could leverage commonalities. Don’t know whether that would be a sustainable model, but it could be a transitional model.” (Dr. Brian White-Guay, Professor, University of Montreal)

“In theory, yes, because you would have centralized procurement and large quantities purchased...in practice, no, if countries purchased [EMTs] properly and looked for the best price on the market they would not need a centralized procurement agency.” (Dr. David Beran)

“...trying a pilot [project] in South Africa [or another country] where dual epidemics occur would be a great way forward.” (Ms. Paurvi Bhatt, Sr. Director, Global Access, Medtronic Philanthropy)

“[Pooled procurement] would work if there is enough demand... [it could] provide a huge push if the global community is willing to provide funds. In reality though, it probably is not feasible.” (Dr. Veronika Wirtz, Associate Professor, Global Health, Boston University)

“Yes, I think so...I think something like this at the global level would be a great idea.” (Dr. Steven Shongwe)

Overall, stakeholders expressed the opinion that general strengthening of national public sector supply chain systems would have more impact than pooled procurement alone.

Strengthening the procurement capacity of LMICs could help ensure the availability of diabetes EMTs. Specific elements that need improvement include tendering practices and funding flows, which are related to the financing concerns discussed earlier. Furthermore, while we know some diabetes medicines are procured at fairly efficient prices (see Box C), the data are limited and more research is needed to determine how effective countries are in negotiating purchase prices for diabetes EMTs. While pooled procurement was mentioned as an option to improve availability of these products, many stakeholders felt more impact would be seen from overall strengthening of the supply chain management systems in LMICs. Unfortunately, there is little published information on the influence of private sector procurement on availability of diabetes EMTs; additional research in this area would help improve access to these medicines and technologies.

Warehousing and Inventory Management

Warehousing and inventory management involve the appropriate storage of EMTs, including maintaining a cold chain and proper storage temperatures when required; monitoring stock levels and their entrance and departure from the warehouse; and ensuring that products are traceable.⁹¹ Few authors identified problems with this step in the supply chain for the availability of EMTs for diabetes. RAPIA assessments noted that the cold chain for insulin did not seem to be a barrier to availability in Mozambique, Nicaragua and Vietnam.⁴⁰⁻⁴² Furthermore, the RAPIA found that most patients were able to store insulin properly at

home in Mozambique and Nicaragua.^{40,41} Few stakeholders commented on this element of the supply chain. One noted that storage is less concerning than in the past:

“Storage in the cold chain is not as good as [the Ministry of Health] wants it to be, but they are working on making it better. A study was done and they are not as worried about storage as they used to be” (Dr. Kibachio Joseph, speaking about Kenya)

However, one stakeholder did feel the cold chain was among the biggest contributors to limited availability of diabetes EMTs, specifically insulin.

One element of warehousing and inventory management is ensuring that products clear customs and all duty fees are paid. Several articles commented on the onerous customs duties and value added tax (VAT) imposed on EMTs in some countries.^{6,35,42,56,59} For diabetes EMTs specifically, fees ranged from 5 percent VAT and import duty in Vietnam to 12 percent VAT on medicines in the Philippines.^{42,59} Not only do these fees increase the end price of the products, to both national procurers and end users, but they may also discourage importation of particular medicines or technologies. In a policy review, WHO and HAI found that of 23 countries charging taxes on medicines, tax rates ranged from 2.9 percent to 34 percent.⁹⁴ Furthermore, these national taxes were the third largest influence on the final price of medicines after manufacturer sales price and distribution markups. Some authors recommended reduction or elimination of these fees as one way to improve availability of EMTs for diabetes and other NCDs.^{6,35,42,59} Only one stakeholder commented on the issue of taxes, noting that

“...there can be too much tax assessed on [essential technologies] and by the time that it gets to the end user it may be too expensive.” (Prof. Jean Claude Mbanya)

Distribution

At the country level, distribution consists of transporting health commodities among elements of the supply chain, including the arrival port, customs, central warehouse, regional or district warehouses, and the final destination. This can often be the most challenging stage of the supply chain, as local infrastructure is not always conducive to efficient transportation and the cold chain must be maintained throughout all steps for EMTs such as insulin.⁹⁵

Distribution challenges were commonly cited factors contributing to lack of availability of EMTs for diabetes in the public sector and likely account for some of the in-country variation in availability.^{3,6,39,40,55,57,66} In Kenya, 63 percent of respondents (number surveyed was not given) blamed stockouts on poor distribution practices.⁶⁶ In China’s Shaanxi province, financing for distribution was likely inadequate because many facilities were a significant distance from central warehouses.⁵⁵ As noted by the RAPIA in Mozambique, a significant amount of the insulin supply remained in the capital city, where less than ten percent of the population lived at the time of the assessment.

Distribution challenges were cited as the primary factor driving poor national availability of insulin in Kyrgyzstan.³⁹ Overall, insulin supplies were sufficient to meet demand in the country, but distribution processes were ineffective and inefficient. Distributors provided whatever insulin was available to facilities, regardless of whether or not it was the type ordered.⁴⁴ This forced patients to switch their insulin regimens and, in some cases, use incorrect syringes for the type of insulin at hand. Furthermore, distribution only took place every three months, so facilities often limited their distribution of supplies to avoid stockouts.

A number of stakeholders commented on issues with distribution contributing to limited availability of diabetes EMTs. One commented on the overall challenges of distributing diabetes products in resource-constrained settings:

“The stories of the difficult trips people have to take to get insulin show that distributing [EMTs to] where people are is the biggest issue in the supply chain.” (Dr. Larry Deeb)

A key concern for stakeholders was leakage, or theft, of EMTs during the distribution process, also cited by a multi-country WHO/HAI report as a particular concern for EMTs meant for the public sector.⁶

“The driver would appropriate a certain amount of supplies, the people who unloaded the truck and pharmacists would do the same. This means that the supplies are being diverted and are being sold over the counter in other areas...” (Prof. Edwin Gale, Emeritus Professor, University of Bristol)

“...in lots of places the medication seems to get into the country but there is a great deal of leakage along the way.” (Prof. Naomi (Dinky) Levitt)

Some stakeholders felt distribution systems were working well overall. As noted by one respondent, these issues are extremely country-specific and it is difficult to make general statements about factors contributing to limited supply of diabetes EMTs.

KEY FINDINGS:

Factors affecting availability of essential medicines and technologies for diabetes

Discussions in the literature, as well as stakeholder opinions, identified insufficient funding, inadequate health systems, regulatory problems, underutilized NEMs, and weak supply chains as primary drivers of poor availability of diabetes EMTs. However, our review of the literature found no quantitative research investigating factors specifically affecting availability of diabetes EMTs; therefore, it is difficult to determine whether these differ from problems that confront availability of any health product. Furthermore, given the country-specific nature of the drivers that contribute to availability of health commodities, including those for diabetes, it is problematic to attempt to draw global conclusions from the current evidence. Despite these challenges, based on discussions in the literature, as well as the opinions of technical experts, we can highlight the following as likely reasons for poor availability of diabetes EMTs:

- Limited or unreliable funding for supply of diabetes EMTs.
- Health systems that are unprepared to address diabetes and other NCDs.
- Inaccurate quantification related to insufficient or poor-quality surveillance data.
- Generally weak procurement practices.

While these factors were most often noted in the literature, they are not specific to diabetes, nor were they finely dissected or explored. More research is needed to understand the enablers of supply chain effectiveness and the drivers of poor availability for EMTs for diabetes specifically, and for NCDs more broadly. There was little discussion of differences between the public and private sector, and of why the private sector has better availability of these EMTs. While not specific to diabetes EMTs, one explanation

may be that limited availability in the public sector forces people to purchase them in private facilities, which drives up demand, and thus supply, in the private sector, all at high cost to the end user.⁷ However, this does not explain why the private sector appears to function better when it comes to estimating and responding to demand. In addition to research on the private sector, country-specific evidence is essential in order to identify the relative contributions of different causes of insufficient availability of diabetes EMTs. Finally, research is needed to determine how best to adapt health systems so they are better able to manage chronic diseases and integrate diabetes and other NCDs into existing health systems.

The next section discusses projects and partnerships that aim to ensure availability of EMTs for other health sectors, such as HIV/AIDS, vaccines, malaria, and reproductive health, and the potential for applying these approaches to improve the availability of EMTs for diabetes.

Experience across Other Health Sectors

As noted throughout this review, ensuring availability of EMTs is a concern for many health issues affecting LMICs and is an important step on the path toward UHC. A number of projects, programs, and partnerships implement approaches to safeguard availability of EMTs—a concept sometimes referred to as commodity or supply security—and these can inform activities to improve the supply of EMTs for diabetes as well as for other NCDs. A review of strategies undertaken by other health sectors to address commodity security identified some common approaches that contributed to improved availability of EMTs, including donor-funded procurement, pooled procurement, and partnerships. Examples of these strategies are highlighted below. Appendix C includes detailed information on the projects, programs, and partnerships reviewed, specifically information on the particular health sectors, funders, implementing organizations and supplies relevant to each activity.

Donor-funded procurement

Some authors and stakeholders attributed the insufficient availability of diabetes EMTs, in part, to limited donor funding for this disease and these specific products. Donor funding to support the procurement of commodities as well as systems strengthening activities for other health sectors, such as HIV/AIDS and malaria, has improved the availability of related EMTs. Here we describe selected examples of bilateral and multilateral donor-funded procurement assistance for health sectors other than NCDs; additional examples are presented in Appendix C.

The *USAID | DELIVER PROJECT*, funded by USAID, is responsible for procuring essential commodities for family planning and malaria and strengthening national supply chains in eligible countries.⁹⁶ In addition to procuring and distributing EMTs, some of the project's largest achievements concern the establishment of routine data collection mechanisms to track availability of these supplies. An example of this is the Procurement Planning and Monitoring Report, which includes data on present and historic contraceptive stock levels for over 30 countries.⁹⁷ These data contribute to improved quantification at the national level and provide valuable information for global supply planning and understanding of contraceptive supply flows.

The *Supply Chain Management System (SCMS)* project, supported by the US President's Emergency Plan for AIDS Relief (PEPFAR), focuses on managing and strengthening global and national supply

chains, procurement services, and commodity security for the treatment of HIV/AIDS.⁹⁸ The SCMS project is managed by the Partnership for Supply Chain Management, an NGO consisting of 13 international institutions representing nonprofit groups, commercial private sector corporations, academic institutions and faith-based organizations.^{99,100} Each of these partners leverages unique skills to improve the overall procurement process for EMTs for HIV/AIDS. This project reduced the price of antiretroviral medicines and streamlined distribution processes through large-volume procurements and the establishment of regional distribution centers.

While the previous two examples are supported through bilateral funding, the *Global Fund to Fight AIDS, Tuberculosis, and Malaria* (Global Fund) is a multilateral donor that provides direct assistance to in-country principal recipients—in most cases ministries of health—whose implementation activities are overseen by Country Coordinating Mechanisms. Global Fund assistance includes financial support and technical assistance for the procurement of medicines and technologies for the three diseases; over 40 percent of the Global Fund's US \$19.9 billion budget is intended for procurement and management of EMTs, making this an exceptionally large donor-funded procurement program.¹⁰¹ Recipient governments are required to co-fund efforts to address the three diseases, including procurement, facilitating sustainability, and strengthening local capacity.

In most cases, donor-funded procurement aligns with the individual donors' designated strategies and priorities for foreign assistance and is therefore generally disease- or sector-specific (i.e. vertical funding). With overall development assistance for diabetes and other NCDs so low compared with that in other health sectors, donor-funded procurement for diabetes EMTs is likely to be minimal and, if available, probably linked to other vertical support, such as HIV/AIDS.

Pooled procurement mechanisms

As discussed earlier in this document, a number of researchers and some stakeholders felt that pooled procurement approaches could help improve the availability of diabetes EMTs in low-resource settings. This supply mechanism has proven successful for other health sectors, with a number of partnerships and projects purchasing baskets of EMTs for specific diseases. Examples include those operated by the Global Fund and the SCMS project; the Global Alliance for Vaccines and Immunization (GAVI); the Revolving Fund of PAHO, which is focused on vaccines; the GDF, which is focused on TB; and the Asthma Drug Facility (ADF), which is no longer operating. Specific details on these pooled procurement mechanisms are available in Appendix C, and some examples are highlighted below.

GAVI is a collaborative partnership to fund increased access to vaccines for children in over 70 countries, and uses a pooled procurement structure. *GAVI* does not procure vaccines itself, but instead is supported by members United Nation's Children's Fund (UNICEF) and PAHO, who manage the supply system on behalf of *GAVI*.¹⁰² *GAVI* provides a country's quantified supply request and the funding to these procurement partners, who then implement the procurement of supplies on its behalf. *GAVI* concentrates on framing the marketplace for vaccines, including modeling future demand, strengthening forecasting data on behalf of its partner countries, and collaborating with members and partners to shape the vaccine market to achieve ideal prices.

The *GDF* is a pooled procurement mechanism implemented by the Stop TB Partnership—a global network of approximately 1100 partners—to ensure access to effective diagnosis, treatment, and cure for TB. The *GDF* is a direct procurement platform, offering countries the opportunity to use its pooled

procurement mechanism and technical assistance to purchase TB-related EMTs, leveraging the GDF's ability to negotiate lower prices and contract with efficient procurement partners.¹⁰³ The GDF is also a grant-based mechanism providing WHO quality-assured TB drugs to countries and NGOs that are approved for this financial assistance.¹⁰⁴ The GDF is the world's largest supplier of quality-assured TB drugs, and current data show that it has delivered more than 24 million treatment courses to over 133 countries since 2001.¹⁰³ Some approaches the GDF undertakes include standardizing packaging, to ease administration of treatment courses; increasing transparency through web-based order submissions and tracking; and providing in-country technical support. The mechanism is also building a global stockpile of TB-related EMTs, establishing a flexible, revolving procurement fund, and shaping the market for TB commodities through competitive tendering and early engagement with suppliers.

The *ADF* was an example of a pooled procurement mechanism for NCDs, which focused on pooling procurement of quality-assured asthma inhalers for LMICs.¹⁰⁵ Unfortunately, the Facility is now closed after only a few years of operation. There has not been a review of the *ADF* to provide lessons learned or rationale for the closure, though stakeholders familiar with the *ADF* felt that it shut down due to low demand from countries, which limited the Facility's financial viability. According to communications on the closing of the *ADF*, problems included the need for short-term donor support, awareness raising, and demand generation activities to stimulate country interest (Ms. Cécile Macé, personal communication, May 29, 2015). Additional details on this mechanism are provided in Appendix C.

As noted earlier in this document, stakeholders had mixed feelings about the utility and feasibility of a pooled procurement approach for EMTs for diabetes and other NCDs. The successful examples highlighted here are at least partially financed by donors and supported by multisectoral partnerships. They also function at a global level, pooling the purchase of significant volumes of a set group of commodities for a wide range of country partners. These foundational elements may need to be in place before a pooled procurement mechanism for diabetes EMTs could be feasible and sustainable; the lack of some of these elements may be a reason why the *ADF* did not continue. Box D describes two UN-operated alternatives that provide partners with access to quality-assured, price-negotiated products via web-based ordering systems.

Box D. Online product catalogs.

Both the United Nations Population Fund (UNFPA) and UNICEF operate web-based product catalogs that provide eligible partners with easy access to quality-assured, lower-priced EMTs, as well as some benefits of pooled procurement, combined with technical assistance and capacity building opportunities. Both the public and private not-for-profit sectors are eligible to procure EMTs via the catalogs.

UNFPA operates AccessRH, a procurement and information service available to both LMIC governments and NGOs seeking to procure contraceptive supplies, census supplies, and supplies for humanitarian relief.^a UNFPA manages the tendering and quality-assurance process, establishing long-term agreements with suppliers and ensuring competitive prices and cost-savings through high volumes. Some critical commodities are held in stock at UNFPA warehouses, reducing lag times in delivery and ensuring their availability to participating partners as needed. AccessRH allows partners to compare prices, estimate costs and lead times, and research order history for 140 countries.^b Government partners are also eligible to receive technical assistance from UNFPA to help improve supply chain performance.

The UNICEF Supply Catalog is a similar tool that partners can use for procuring over 2,000 commodities related to the needs of children and families.^c Products range from pharmaceuticals to lab equipment, bednets, and education supplies. As with AccessRH, standard products are kept on hand in a UNICEF warehouse to reduce delivery times and ensure availability. Eligible partners can receive procurement assistance through UNICEF's Procurement Services branch. Eligible partners include governments, NGOs, other UN agencies, international financial institutions, universities, and philanthropic organizations.^d

Some EMTs from the list in Appendix B are included in the UNICEF supply catalog: HCT and urine test strips for glucose and protein (i.e. microalbuminuria). The addition of a full range of diabetes EMTs to the UNICEF catalog might improve availability of more of these products.

^a United Nations Population Fund (UNFPA). *AccessRH: Access to reproductive health and census supplies starts here*. Copenhagen: UNFPA; 2014. Available at: <https://www.myaccessrh.org/documents/10157/199489/1.+AccessRH+Overview+factsheet+062014.pdf/9e327f0a-7d37-42e5-a9b0-763531a92588>. Accessed June 24, 2015.

^b UNFPA. *AccessRH: Better planning, the AccessRH web portal is a consolidated source of RH information*. Copenhagen: UNFPA; 2014. Available at: <https://www.myaccessrh.org/documents/10157/214159/2.+AccessRH+Better+Planning+factsheet+English+032014.pdf/e0d10eba-7dbf-416b-ba2a-a0ba0d3b477b>. Accessed June 24, 2015.

^c Welcome to UNICEF Supply Catalogue page. UNICEF website. 2015. Available at: https://supply.unicef.org/unicef_b2c/app/displayApp/%28layout=7.0-12_1_66_67_115&carearea=%24ROOT%29/.do?rf=y. Accessed June 24, 2015.

^d Supplies and logistics: questions and answers page. UNICEF website. Available at: http://www.unicef.org/supply/index_faq.html#3_What_services_are_offered_via_the_Procurement_Services_mechanism. Accessed June 24, 2015.

Global partnerships and networks

Global level partnerships and networks enable like-minded institutions to come together to achieve a common goal, raise the profile of issues they address, and leverage the range of skills and experience of their members to improve access to health commodities and related services. A number of partnerships and networks include commodity security in their overall strategies, and some are entirely focused on this task. An example of each of these approaches is discussed below.

The *Stop TB Partnership*, noted in the previous section for its pooled procurement activities through the GDF, aims to ensure access to effective diagnosis, treatment, and cure for TB.¹⁰⁶ The 1100 Partnership members come from a multitude of institutions, including governments, NGOs, research and funding

agencies, foundations, technical organizations, the private sector, and civil society. The Partnership works through its diverse membership and working groups to improve diagnosis of TB, ensure access to EMTs for TB treatment, and identify new treatments for the disease. Ensuring the availability of TB-related medicines and technologies is one element of the Partnership’s overall aim of eliminating tuberculosis.¹⁰⁷ The GDF, as described earlier and in Appendix C, is the Partnership’s primary activity related to commodity security.

An example of a global partnership focused solely on commodity security is the *Reproductive Health Supplies Coalition* (RHSC). The RHSC is a global partnership of more than 300 members—including donors, manufacturers, technical partners, and advocates—dedicated to ensuring the availability of contraceptive—and, more recently, maternal health—supplies in LMICs.¹⁰⁸ Notable achievements of the RHSC include projects to address stockouts, pool contraceptive procurement, reduce product prices, publish data on contraceptive shipments, and advocate for contraceptive security.¹⁰⁹ The RHSC is a rare global network in that it is focused solely on essential supplies and their availability in LMICs. Key leverage points allowing the RHSC to achieve successes in commodity security include its global scope, the variety of its membership, the strong collaborative spirit among its members, the provision of neutral territory to facilitate discussions among members, and data to support a call for action.¹¹⁰ Strong support from international donors and private foundations also assisted the RHSC in gaining traction within the global health community and among key external stakeholders.

These two examples offer a glimpse at what can be achieved through the power of partnership. For TB and reproductive health, these partnerships bring diverse institutions together to achieve a common goal: access to the required EMTs when needed, where needed. These partnerships were both established in the early 2000’s and supported by significant donor funding. A similar partnership or network could bring together the right mix of institutions to influence and improve the availability of EMTs for diabetes and other NCDs.

KEY FINDINGS:

Experience across other health sectors

The themes presented here do not necessarily function independently, in many cases there are overlapping and supporting structures. For example, the online product catalogs described in Box D incorporate elements of pooled procurement and multilateral donor-support. It may be that some element of each of these themes is necessary for successful achievement of commodity security in low-resource settings. As noted by one stakeholder,

“A lot of the [commodity security] successes have been program based, where donors and governments work hand in hand within the scope of a very specific procurement effort to provide intervention for a given condition.” (Dr. Brian White-Guay)

The most visible efforts to address commodity security across various health sectors focus on changes to procurement and other elements of the supply chain, with activities occurring at global, regional, and national levels, in both the public and private sectors. While the supply chain is a main focus, the examples highlighted here and in Appendix C incorporate activities to address financing, shape markets, strengthen systems, change policy, and raise awareness to improve availability of EMTs. All of these

factors influence availability, directly or indirectly, and will be important to include in future efforts to improve availability of diabetes EMTs.

The diabetes community may be able to build on the experiences of other health sectors to address the availability of EMTs. Moreover, there may be opportunities to leverage existing projects, programs and partnerships to address supply security issues for diabetes and other NCDs and integrate EMTs for diabetes and other NCDs into these activities. Challenges include sensitivity to funding priorities, protracted country engagement, and complicated national supply chains that result from existing vertical funding and procurement structures. The differences between diabetes (and other NCDs) and infectious diseases, such as the need for lifelong treatment combined with the minimal amount of foreign assistance provided and low national budgets for diabetes programs, may hinder the adaptation of existing commodity security approaches.

Discussion

The evidence presented in this report allows for a general understanding of the current landscape for availability of EMTs for diabetes in LMICs, including affordability of these products, and the factors that contribute to their presence at the point of care or purchase. Unfortunately, one of the important findings of this review is the paucity of data on availability and affordability of the full range of diabetes EMTs, particularly regarding the underlying causes that influence availability. At this time, data on disease burden, consumption of EMTs, and supportive systems are rarely collected or tracked for diabetes in LMICs, making it challenging to assess the true supply landscape and draw accurate conclusions. That said, the literature and stakeholder interviews analyzed for this report do provide useful insights on the availability of affordable diabetes EMTs and the factors that drive availability, as discussed below.

Evidence on availability of essential diabetes medicines and technologies

The data and opinions presented in this report provide insights into the current state of availability and affordability of EMTs for diabetes on a global scale. In the majority of LMICs where data was available, current availability of diabetes EMTs was far below the 80 percent GAP target and was insufficient to meet the diagnostic, monitoring, and treatment needs of people living with diabetes and accessing care in either the public or private sectors. There were differences within and across countries and sectors, and across medicines and technologies. In general, both medicines and technologies for diabetes were most available in the private sector, in urban areas, and at higher levels of the health care system, particularly hospitals. That said, availability of these commodities was insufficient across *all* settings. National-level, representative data are needed to best understand the circumstances surrounding availability of diabetes EMTs in individual LMICs. The lack of consistency in availability of the package of EMTs for diabetes, as demonstrated by the wide range of availability of individual EMTs within countries, suggests there are fragmented systems that can provide some of the EMTs some of the time but are unable to comprehensively meet the daily and lifelong requirements of people with diabetes.

It is difficult to compare availability of individual EMTs due to the variety of research methods used, but the literature showed that some products were far less available than others. For example, simvastatin was rarely available, with proportions usually in the single digits. Glucometers and blood glucose testing

supplies and insulin were also infrequently available according to the cited research. Conversely, multiple indication technologies such as weigh scales were almost always available. With such wide-ranging rates of availability across the individual products that comprise the package of diabetes EMTs, tailored solutions will be required to achieve and exceed the 80 percent GAP target. For products with availability at the lowest end of the spectrum, there may be opportunities to derive lessons learned from the systems surrounding supply of the diabetes EMTs that are generally more available.

While the evidence is limited, clearly the price and affordability of diabetes EMTs are problematic. As discussed in Box C, the public sector procurement price of selected diabetes EMTs in the countries assessed was highly variable by product and country. The data did, however, provide examples of significant markups occurring once products enter a country, particularly in African countries. These markups made the products unaffordable for many people living with diabetes. Again, there was wide variation in affordability across countries, but the literature suggested insulin was among the least affordable diabetes medicines and that diabetes EMTs were least affordable in Ghana (among the countries and products studied). Evidence on price and affordability was limited to a few products and primarily the public sector, which makes it difficult to generalize about procurement efficiency and affordability for the full range of diabetes EMTs. It is obvious, however, that diabetes EMTs are unaffordable for many people in LMICs, resulting in catastrophic economic impacts on individuals and families affected by this disease. Further research is needed, specific to diabetes and the range of medicines and technologies included in Appendix B, to investigate where and why mark-ups occur at the country level and assess current procurement practices to determine if opportunities exist to reduce costs to the end user. In the meantime, urgent action is needed to increase access to affordable EMTs for diabetes in both the public and private sectors.

Barriers to availability of essential diabetes medicines and technologies

The poor availability of diabetes EMTs is the result of many contributing factors, with elements of the in-country supply chain, inadequate financing, and unprepared health systems emphasized in the literature and by stakeholders interviewed. Elements that cut across these overarching systems include the collection of data, primarily through HMIS and logistics management information systems (LMIS), and government stewardship. All of these factors are interdependent on one another, ideally working together to result in sufficient availability of affordable EMTs. What the literature did not discuss well is how these overarching and cross-cutting factors influenced availability of diabetes EMTs in LMICs, specifically, and what solutions might have the most impact on increasing availability of affordable EMTs for diabetes and other NCDs.

Regarding the supply chain for diabetes EMTs, the elements cited most often as the primary contributors to limited availability were quantification and procurement practices. Stakeholders were particularly concerned with the absence of data related to diabetes at all levels of the system, from individual patient data to population level surveillance systems (e.g., HMIS and LMIS). This lack of data makes it difficult to properly forecast and plan for the procurement of diabetes EMTs. Strengthening the supply chain for diabetes EMTs will require improvements in data collection from both the public and private sectors. This also requires supportive financing and systems, recalling the interdependency of the factors that drive availability of diabetes EMTs.

More broadly, public sector supply chains would benefit from overall capacity building and systems strengthening to allow them to better manage the supply of diabetes EMTs. Supply chain strengthening

for other health sectors such as HIV/AIDS and family planning is supported through foreign aid and vertical programs; however, this is not feasible for diabetes and NCDs given the limited development assistance for these diseases. A number of stakeholders felt that efforts to strengthen the supply chain for diabetes EMTs should be incorporated into broader activities to build the capacity of LMIC health supply chains. Given the importance of sustainable interventions, combined with the constrained funding environment for diabetes and other NCDs, this approach may be more feasible and effective than developing yet another vertical supply chain program. An interim step could be the integration of EMTs for diabetes and NCDs into existing vertical supply chain activities, such as those for HIV/AIDS.

Limited development assistance for diabetes and other NCDs has left the systems to support diagnosis and treatment of these diseases underdeveloped compared with vertical programs such as those for malaria and HIV/AIDS; combined with limited national budgets to fund the supply of EMTs for diabetes and other NCDs, it is clear that the lack of financing is a barrier to availability of diabetes EMTs. As discussed earlier, only 1.2 percent of global development assistance goes to NCD-related interventions^{xxvi}, which implies that foreign aid to support capacity building, systems strengthening and procurement specific to diabetes EMTs is miniscule considering the growing global burden of the disease. That said, while development assistance may help to initially build national capacity to procure affordable diabetes EMTs and ensure their availability, it is not a sustainable solution. Given that current funds for procurement of diabetes EMTs generally come from national budgets, a more useful approach to ensure supply of these products would be to advocate with governments to prioritize them in the annual budgeting process. Mechanisms such as including specific budget line items for diabetes EMTs, integrating diabetes EMTs into UHC packages of care, and integrating consumption data into the national HMIS and LMIS could help ensure these supplies are funded and procured at appropriate levels.

The capacity of health systems was also a major factor affecting the availability of diabetes EMTs. Due to the historic disease burden of these countries, most health systems in LMICs are configured to address infectious and acute illnesses. As the types of illnesses affecting populations in low-resource settings shift from infectious to chronic, noncommunicable disease, health systems must adjust to provide prevention, care, treatment and follow up services for chronic diseases at all levels of care, particularly the primary care level. Ensuring the availability of EMTs for diabetes and other chronic diseases must be part of these adjustments, and will ideally result from holistic strengthening of existing health systems, which may be occurring under efforts to achieve UHC. Specific health system strengthening activities that should be undertaken at all levels of care and may impact availability of diabetes EMTs include:

- Integrating diabetes and NCDs into service delivery policies and standards.
- Integrating diabetes- and NCD-specific indicators into the HMIS and LMIS.
- Training and mentoring health workers.

Governments must take the lead to improve access to diabetes EMTs, in both the public and private sectors. Integrating diabetes and NCDs into ongoing efforts to strengthen health systems is an effective, sustainable approach to improve access to these products. As with supply chains, shifting away from vertical program standards may have the most positive effect on improving availability of affordable diabetes EMTs in LMIC health systems. However, leveraging opportunities to integrate diabetes and other NCDs into existing vertical programs, such as those operated under PEPFAR, may facilitate improved availability and access to these products and services in the short-term. This will require

^{xxvi} As of 2011.

governments to advocate for integration with their health donors, ensuring national health services address the current burden of disease and meet the health needs of the population. Furthermore, it will be essential for governments to commit financing to support integration of NCDs into these systems strengthening activities, and build partnerships with the private sector to do the same. Advocacy targeted at the national and subnational government levels is needed to increase policy makers' understanding of the burden of disease and the adjustments needed in the health system to ensure that the supply of EMTs meets the demand. Building the capacity of civil society and people living with diabetes and other NCDs to advocate with government on behalf of this issue is a critical foundation for securing government awareness and commitment to improve access to diabetes EMTs.

The available evidence provides a general understanding of the barriers to the availability of diabetes EMTs in LMICs—we know that insufficient availability is rooted in the challenging financing environment, outdated health systems, and underdeveloped in-country supply chains. What is not well discussed in the literature are the origins of these contributing factors, and what factors, if any, are specific to diabetes. For example, additional evidence from country-specific assessments is needed to answer the following questions:

- What steps need to be taken to include diabetes and other NCD indicators in national HMIS and LMIS?
- What factors influence NEMs? What steps are needed to align NEMs with the WHO Model List and ensure they address current and projected burdens of disease?
- How does the private sector provide better availability of these products than the public sector, and what lessons can be learned from that experience?
- What changes are needed to support dispensing of diabetes EMTs at lower levels of care—such as policy changes, health worker training and mentoring?
- What factors contribute to the significant price markups in some countries, and how can this be mitigated?
- How can private sector prices be reduced to make diabetes EMTs more affordable in the locations where they are currently most available?

Once the availability of affordable EMTs for diabetes is better understood, country-specific strategies can be developed to improve availability and affordability, and innovative solutions can be tested locally in the short-term.

Transferable approaches from other health sectors

Experience across other health sectors shows that there are many approaches to address the availability of EMTs, and that in all cases it is an ongoing process that requires focused effort. Donor-funded procurement, pooled procurement, and global partnerships emerged as the key themes in existing supply security efforts. As discussed previously, however, donor financing of procurement and supply chain capacity building for diabetes and other NCDs is an unlikely option. Encouraging LMIC governments to prioritize the prevention, care, and treatment of diabetes and other NCDs in their national health and supply systems and budgets, including prioritizing the availability and affordability of EMTs for these diseases, is a more workable approach and one that allows for alignment with attainment of broader goals such as the GAP, UHC and the SDGs.

Pooled procurement mechanisms could be useful for diabetes and other NCDs, since international donors have not historically procured these medicines. Typically, EMTs for these diseases are purchased individually by governments at volumes that are too low to secure cost savings; regional procurement mechanisms would increase volumes and might be especially helpful to countries with decentralized health systems. Coordinating pooled procurement for this class of EMTs would not be without difficulties, particularly given the lack of data on disease burden and true demand, but increased negotiation power may benefit countries with small procurement requests, and it would force improvements in supply planning. However, the stakeholders interviewed for this report had mixed feelings about the utility of a pooled procurement mechanism for diabetes EMTs, or NCD EMTs more broadly. Many said that if efforts were undertaken to improve the national supply chain in general, pooled procurement would not be necessary. If a pooled procurement mechanism were developed, stakeholders thought a regional effort would be more successful than a global scheme such as the Global Fund. Pooled procurement is not a cure-all for achieving supply security: as noted earlier, the ADF closed after only a few years of operation. It may be simpler to integrate diabetes EMTs into a supply catalog and procurement system such as that offered by UNICEF, as many LMICs are using this resource for other commodities and the integration may help realize overall supply efficiencies for these products and foster integration of diabetes in other areas of the health and supply systems.

Global partnerships can achieve engagement on the issue of availability of EMTs across a wide range of institutions. There is a great deal of power in partnership, as demonstrated by successful networks such as the RHSC. The RHSC, with its sole focus on commodity security for reproductive health supplies, has seen great success in increasing funding for these EMTs, increasing national government commitment to ensure availability of these products, decreasing manufacturer prices, and ensuring reproductive health commodity security is understood as a critical need within the global health community. A similar partnership could provide comparable successes for diabetes EMTs, focusing on advocating with governments and the private sector, improving data collection and monitoring, and building country capacity to supply these products. Initial in-kind or financial commitment will be necessary to establish such a network and provide the time and resources to demonstrate the added value of its role.

The experiences across other sectors offer possible options for addressing availability of diabetes EMTs. What is common across the identified themes is the focus on procurement. While important, it may be more impactful for diabetes and other NCDs to first raise awareness about the critical nature of EMTs for these diseases and advocate for increased security of these supplies. An additional commonality across other health sectors is the presence of dedicated funding, generally through development assistance. Without such funding in place, adapting the approaches taken by other sectors may prove challenging for the diabetes community. That said, there may be opportunities to leverage the existing diabetes programs funded by the private manufacturing sector, and determine new ways of addressing supply security for diabetes EMTs in LMICs. Furthermore, there is potential to integrate diabetes and NCDs into existing service and supply systems, such as those for HIV/AIDS. Leveraging existing systems may facilitate rapid advancement towards improving the availability of EMTs for diabetes and other NCDs. A next step is to determine whether the response is to seek additional funding, or identify more sustainable and fast-acting approaches, such as awareness raising and integration, that can be undertaken in the current diabetes funding environment.

With the increasing prevalence of diabetes—and, hopefully, improved diagnosis—in the future, the growing demand for diabetes EMTs is likely to continue outpacing availability. The potential for a growing gap between demand and available supply of diabetes EMTs is significant, and systemic and

structural changes are needed to improve country capacity to respond to the current and pending demand for these commodities. It is time to put chronic diseases on the same level as infectious diseases and approach health care, including supply of EMTs, from a holistic perspective. This is a complex issue requiring a multisectoral, multipronged approach. Commitment, stewardship and prioritization of this issue from governments, as well as the foreign aid and global health communities and the private sector, are essential to ensuring that the supply of diabetes EMTs is sufficient to meet the need.

Limitations of this report

While the literature reviewed and stakeholders interviewed helped achieve the objectives of this report, there are some constraints to drawing conclusions. First, the literature on availability of diabetes EMTs was limited, particularly on availability of the full range of diabetes EMTs listed in Appendix B. Next, the bulk of the research cited in this report assessed availability at one point in time, potentially misstating the true availability status of some products. Furthermore, few reports focused exclusively on diabetes. Discussion of barriers to and drivers of availability was incomplete and again not focused on diabetes. Our analysis of the price and affordability of diabetes EMTs also was limited, both because of the paucity of data and the intended scope of this report. Finally, because the literature and most of the stakeholders interviewed focused on the in-country supply chain as a key contributing factor to availability, we did not discuss the influences of manufacturers on availability of these EMTs. Despite these impediments, the evidence assessed shows that availability of diabetes EMTs in LMICs is far below the 80 percent GAP target; that known barriers limit their availability; and that approaches used in other sectors may improve availability.

Recommendations

The following recommendations are drawn from the literature and stakeholder opinions, and are intended to facilitate improved availability and affordability of EMTs for diabetes in low-resource settings. They are intended for a range of audiences who will facilitate improved access to these critical health products. There is natural overlap across audiences, which presents opportunities where these actors can work together to achieve the GAP target of 80 percent availability of the affordable basic technologies and essential medicines, including generics, required to treat major NCDs in both public and private facilities. Priority recommendations are noted with bold text.

Policy-makers in Low- and Middle-Income Countries

These recommendations are intended for governments, including the national and subnational decision makers who are primarily responsible for ensuring the health and well-being of their populations. Specific target groups include Ministers of Health and Finance, district level leadership, and management within national supply and distribution operations.

- **Priority:** Integrate diabetes and other NCDs into activities to strengthen the health and supply systems in the public and private sectors, including strategies to achieve UHC. Specifically:
 - Integrate diabetes and NCDs into existing surveillance and monitoring systems that provide data for the continuous supply of health commodities.

- Integrate EMTs for diabetes and other NCDs into national HMIS and LMIS, including committees focused on supply security for other sectors—consider refreshing their focus to encompass all EMTs to address the country’s particular disease burden.
 - Build the capacity of supply chain managers to better understand the dynamics of diabetes EMTs and the need for ensured availability of these health products on a consistent, long-term basis.
 - Ensure clinical providers and health technologists are properly trained and equipped to diagnose and treat diabetes.
 - Collect evidence necessary to prioritize access to diabetes EMTs and related quality health services at the primary care level, specifically providing screening, diagnosis and treatment for these health conditions.
- Ensure adequate and sustainable financing for the supply of diabetes EMTs, including consideration of a separate budget line item for diabetes EMTs and development of a national health insurance scheme for people living with diabetes.
 - Strengthen regulatory authorities to ensure that diabetes EMTs are safe and quality-assured.
 - Adopt the list of EMTs from Appendix B and incorporate into the NEML.
 - Integrate and prioritize diabetes and other NCDs into health partnership programs, including those with the private sector and bilateral and multilateral donors.
 - Engage with civil society to ensure diabetes and NCD programs are meeting the needs of communities.

Multilateral Institutions and Technical Partners

This set of recommendations are intended for a wide audience, namely those groups who implement projects and/or programs to improve access to health services in LMICs. This can include multilateral organizations such as WHO, private sector programs, and technical partners such as NGOs and faith-based organizations, research institutions, professional organizations representing clinical providers, and other agencies who carry out projects at country level that aim to increase access to health services, including EMTs.

- **Priority:** Build the evidence base to support policy and systems change. Specifically:
 - Conduct country-specific assessments on the availability, price and affordability of EMTs for diabetes and investigate the driving forces behind the findings.
 - Assess private sector supply chains for diabetes EMTs, including factors affecting availability and price.
 - Pilot the integration of diabetes and other NCDs into existing health systems and service delivery platforms, including supply mechanisms.
 - Pilot successful approaches from other health sectors to assess their feasibility for diabetes and their impact on availability and affordability of diabetes EMTs.
- Integrate and prioritize diabetes and other chronic diseases within programs focused on improving access to medicines in LMICs.
- Convene global, regional and national forums to raise the profile of this issue, present and discuss evidence, and formulate strategies to minimize obstructions.

Financial Contributors

These recommendations are intended for those institutions that provide financial support for global health and development activities in LMICs. This includes, but is not limited to, bilateral and multilateral donors, private foundations and individuals, international financing institutions, and private sector entities.

- **Priority:** Include and prioritize diabetes and other NCDs within programs that support strengthening of health systems, regulatory authorities, and supply chains.
- Support research to build the evidence base on availability and affordability of EMTs for diabetes and other NCDs.
- Explore public private partnerships—identify where there is shared value and pilot collaborative projects to address access to EMTs and services for diabetes.

Advocates

These recommendations are intended for global and local advocates who can raise the profile of this issue starting at a grassroots level and increasingly engaging subnational and national leaders and policy makers, as well as global stakeholders. Target groups for these recommendations cut across the subsequent audiences, and include individuals, such as people living with diabetes; civil society organizations; key stakeholders, implementing partners, and donors who champion the issue; and global advocacy organizations such as the NCD Alliance.

- **Priority:** Engage civil society and empower people living with diabetes to advocate for themselves with their community leaders, policy makers and governments.
- Utilize existing and future evidence as an advocacy tool to engage policy makers and drive changes in policies, systems, and financing to support improved access to affordable diabetes EMTs.
- Raise awareness of poor and inconsistent availability of affordable diabetes EMTs, at both the global and national levels.
- Identify country champions and build their capacity to advocate for improved availability and affordability of diabetes EMTs.
- Connect the availability and affordability of diabetes EMTs to national and global development goals, such as UHC, the SDGs, and WHO global diabetes programs, and target global networks where it may be appropriate to integrate NCDs into their mission

Box E: We are all advocates.

Stakeholders across all sectors can be powerful advocates within their own agencies, encouraging greater access to EMTs for diabetes, as well as other NCDs. Policy makers, multilateral and technical partners, and financial contributors all have a role to play in raising awareness of this issue with other relevant stakeholders, building and translating the evidence base into effective policies and programming, and championing the integration of diabetes and other NCDs into existing health and supply systems and programs.

Conclusion

As the burden of diabetes and other NCDs escalates in LMICs, ensured access to the EMTs required to reduce related morbidity and mortality becomes increasingly difficult. It can be concluded from this review of the literature and stakeholder opinion that the package of EMTs required to properly diagnose and treat diabetes—one of the four leading NCDs—are currently insufficiently available in LMICs. Improving availability of diabetes EMTs in these countries will require overcoming barriers related to financing, health systems, and the supply chain. The WHO target of achieving 80 percent availability of the affordable basic technologies and essential medicines, including generics, required to treat major NCDs in both public and private facilities by 2025 will be challenging to achieve, as evidenced by the current availability environment for diabetes EMTs in LMICs. Global engagement, government stewardship, and innovative solutions are needed to ensure the supply of EMTs for diabetes and all NCDs in low-resource settings.

Given the limitations of the literature, along with the wide variation in availability and affordability of diabetes EMTs within and between countries, country-specific research is needed to best understand the current landscape for these products in LMICs. Through the *No Empty Shelves* project, PATH will start to fill some of the gaps identified in this report. In Kenya and Senegal, PATH will collect data on the supply system, investigating the root causes of barriers to availability. We will also research the price and affordability of diabetes EMTs in each of these countries. The evidence generated through this research will result in recommended solutions for each country, and contribute to the evidence base on availability and affordability of EMTs for diabetes. PATH aims to build on this research and stimulate global action to ensure availability of affordable EMTs for diabetes and other NCDs in low-resource settings.

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Appendix A: Key stakeholders interviewed for this report

PATH wishes to acknowledge the following individuals who participated in the stakeholder interviews. The individuals named here contributed valuable time to provide key content for this report, and we are grateful for their thoughtful comments and willingness to be a part of this document. The individuals listed below consented to have their names included here. Our thanks go out to the following:

Dr. Alan Bornbusch, Public Health Adviser, United States Agency for International Development

Dr. Brian White-Guay, Professor, University of Montreal

Ms. Cécile Macé, World Health Organization

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Dr. David Cavan, Director of Policy and Programs, International Diabetes Federation

Dr. Delna Ghandhi, Senior Health Adviser, Department for International Development

Prof. Edwin Gale, Emeritus Professor, University of Bristol

Dr. Eric Mallard, Senior Health Specialist, The World Bank

Sir George Alleyne, Director Emeritus, Pan American World Health Organization; Chancellor and Emeritus Professor, University of the West Indies

Mr. James Droop, Senior Policy Adviser, Human Development Department, Department for International Development

Prof. Jean Claude Mbanya, Director, Health of Population in Transition Research Group and Professor, Medicine and Endocrinology, University of Yaoundé 1

Dr. Julie Torode, Deputy CEO and Advocacy & Programmes Director, Union for International Cancer Control

Ms. Katie Dain, Executive Director, NCD Alliance

Dr. Kaushik Ramaiya, CEO & Consultant Physician, Shree Hindu Mandal Hospital, Dar es Salaam, Tanzania

Dr. Kibachio Joseph, Head, Noncommunicable Disease Unit, Ministry of Health, Republic of Kenya

Dr. Larry Deeb, Director, Diabetes Center, Tallahassee Memorial Hospital

Mr. Marcel Gmuender, Head of Diabetes Care EMEA LATAM, Roche Diagnostics International AG

Ms. Margaret Ewen, Pharmacist, Health Action International

Prof. Naomi (Dinky) Levitt, Professor, University of Cape Town and Director, Chronic Disease Initiative for Africa

Mr. Newton Siele, Country Manager, East and Southern Africa, Novo Nordisk

Mr. Oluwaseun Ishola, Country Manager, English West Africa, Novo Nordisk

Ms. Paurvi Bhatt, Sr. Director, Global Access, Medtronic Philanthropy

Dr. Prashant Yadav, Director, Healthcare, William Davidson Institute, University of Michigan

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Dr. Steven Shongwe, Regional Adviser for NCDs, World Health Organization Regional Office for Africa

Prof. Sunny Chinenye, Professor, Department of Internal Medicine, Division of Endocrinology/Diabetes, College of Health Sciences, University of PortHarcourt; President, Diabetes Association of Nigeria

Dr. Veronika Wirtz, Associate Professor, Global Health, Boston University

Appendix B: Comprehensive list of essential medicines and technologies for diabetes

The World Health Organization (WHO) defines essential medicines as “those that satisfy the priority health care needs of the population.”ⁱ Globally and nationally, the selection of essential medicines and technologies is based on prevalence of particular diseases, evidence of safety and efficacy, and comparative cost-effectiveness. WHO maintains a model list of essential medicines across multiple health sectors, which is meant to provide guidance for the development of national and institutional essential medicines lists (EMLs). Many countries have their own EMLs that reflect the priority health needs of their populations. Ideally, public sector procurement of health commodities is based on inclusion in the national EML. For example, if a medicine or technology is not on the EML, then it is often not procured for the public sector in that country.

There is no set list of essential medicines and technologies (EMTs) for treating diabetes in low- and middle-income countries (LMICs). In fact, there are multiple lists of EMTs that include treatments for diabetes and cardiovascular disease, as follows:

- WHO Package of Essential Noncommunicable (PEN) Disease Interventions for Primary Health Care in Low-Resource Settingsⁱⁱ
- WHO Model List of Essential Medicines for Adultsⁱⁱⁱ
- WHO Model List of Essential Medicines for Children^{iv}
- WHO/Health Action International core and regional lists of medicines for the price, availability and affordability of medicines surveys^v

The PEN contains the most comprehensive set of EMTs for diabetes and NCDs. There is some overlap between the other lists, but they generally leave out essential technologies. Clearly, consensus is needed on a comprehensive list of both essential medicines and essential technologies for diabetes and other NCDs. This will facilitate inclusion of appropriate EMTs for diabetes and other NCDs in country-level EMLs.

Drawing from all of these documents, as well as clinical practice guidelines from the International Diabetes Federation and American Diabetes Association,^{vi,vii} and input from the *No Empty Shelves*

ⁱ Page on Essential Medicines. World Health Organization (WHO) website. Available at: http://www.who.int/medicines/services/essmedicines_def/en. Accessed August 8, 2014.

ⁱⁱ WHO. *Package of Essential Noncommunicable Disease Interventions for Primary Care in Low Resource Settings*. Geneva: WHO; 2010. Available at: http://whqlibdoc.who.int/publications/2010/9789241598996_eng.pdf?ua=1 Accessed August 8, 2014.

ⁱⁱⁱ WHO. *WHO Model List of Essential Medicines: 19th List*. Geneva: WHO; April 2015. Available at: http://www.who.int/medicines/publications/essentialmedicines/EML2015_8-May-15.pdf Accessed May 18, 2015.

^{iv} WHO. *WHO Model List of Essential Medicines for Children: 5th List*. Geneva: WHO; 2015. Available at: http://www.who.int/medicines/publications/essentialmedicines/EMLc2015_8-May-15.pdf Accessed May 18, 2015.

^v WHO and Health Action International (HAI). *Global and Regional Core list of Medicines*. Geneva: WHO and HAI; 2008. Available at: <http://www.haiweb.org/medicineprices/manual/documents.html>. Accessed August 8, 2014.

^{vi} International Diabetes Federation. *Global Guideline for Type 2 Diabetes*. 2012. Brussels: International Diabetes Foundation; 2012. Available at: <http://www.idf.org/sites/default/files/IDF-Guideline-for-Type-2-Diabetes.pdf>. Accessed September 22, 2014.

^{vii} American Diabetes Association. Clinical practice recommendations 2014. *Diabetes Care*. 2014;37(Supplement 1).

project's Technical Advisory Committee, PATH developed a list of EMTs for the purposes of this project and literature review, as noted in Table B1. This list includes the critical EMTs for addressing diabetes care and treatment for both Type 1 and Type 2 diabetes, including EMTs for hypertension and hyperlipidemia, and screening technologies for complications.

Medicine/Technology	Purpose	Class
MEDICINES		
Simvastatin	Lipid lowering agent	Statin
Amlodipine	Anti-hypertensive	Calcium channel blocker
Bisoprolol	Anti-hypertensive	Beta blocker
Enalapril	Anti-hypertensive	Angiotensin-converting-enzyme inhibitor
Hydrochlorothiazide	Anti-hypertensive	Diuretic
Insulin: short- and intermediate-acting and mixed	Glucose lowering hormone	Hormone
Gliclazide or Glibenclamide ^{viii}	Oral hypoglycemic	Sulfonylurea
Metformin	Oral hypoglycemic	Biguanide
Glucagon injection	Treat severe hypoglycemia	Glucose elevating hormone
Tropicamide eye drops	Dilate pupils for fundal exam	Mydriatic-cycloplegic
TECHNOLOGIES		
Blood glucose test strips	Monitor blood glucose levels	Diagnostic
Glucometer	Blood glucose monitor	Monitoring and diagnosis
Urine glucose test strips	Monitor urine glucose as proxy for blood glucose	Monitoring/screening
Urine ketone test strips	Monitor ketones	Monitoring/screening
Hemoglobin A1c analyzer	Monitor glucose control	Diagnostic/monitoring
Hemoglobin A1c testing consumables	Monitor glucose control	Diagnostic/monitoring
Blood pressure measurement device, with digital reader	Screen for hypertension	Diagnostic
Insulin syringes with adult and pediatric needles	Inject insulin	Technology
Urine protein test strips	Screen for nephropathy (semi-qualitative)	Monitoring/screening
Monofilament	Screen for peripheral neuropathy	Diagnostic
Funduscope	Screen for retinopathy	Monitoring/screening
Weigh Scale	Monitor weight	Monitoring/screening

^{viii} According to the 19th WHO Model List of Essential Medicines, glibenclamide is not recommended for people over the age of 60 years; therefore gliclazide is the preferred sulfonylurea. Data on the availability and affordability of gliclazide is limited, thus we include both medicines to indicate availability of oral hypoglycemic drugs in low- and middle-income countries.

Appendix C: Selected commodity security projects, programs and partnerships

Name	Basic Information	Notes
Asthma Drug Facility (ADF), International Union Against Tuberculosis and Lung Disease	<p>Health sector(s): Asthma</p> <p>Purpose: The mission of the ADF was to provide affordable, quality-assured essential asthma drugs to LMICs.</p> <p>The ADF aimed to be an efficient, transparent, sustainable mechanism that:</p> <ul style="list-style-type: none"> • Pooled requests from qualifying programs to obtain affordable prices for quality-assured essential asthma medicines. • Used competitive processes to keep prices low. • Supplied only quality-assured products. • Provided technical assistance. <p>Included commodities: Asthma inhalers produced by three quality-assured manufacturers.</p> <p>Funding source: Not available</p> <p>Implementing organization(s): International Union Against Tuberculosis and Lung Disease</p>	<ul style="list-style-type: none"> • As of October 2013, the ADF is no longer in operation and, according to the website, efforts are under way to transfer its functions to other international agencies.

ⁱPage on What is the ADF?. Asthma Drug Facility website. Available at: http://www.globaladf.org/index.php?option=com_content&view=article&id=2&Itemid=2&lang=en
 Accessed August 12, 2014.

Name	Basic Information	Notes
Gavi, the Vaccine Alliance ⁱⁱ Pooled Procurement Mechanism	<p>Health sector(s): Vaccines</p> <p>Purpose: Gavi brings together the public and private sectors to create equal access to new and underused vaccines for children living in the world's poorest countries. Gavi helps make vaccines more affordable, more available, and their provision more sustainable.</p> <p>Gavi does not procure vaccines itself, but rather quantifies the amount of vaccines needed for its beneficiary countries, and then provides these numbers and related funding to its procurement partners who manage the procurement and distribution of Gavi-funded vaccines.</p> <p>Included commodities: 11 vaccines for children and youth.</p> <p>Funding source: Gavi is funded through two streams: direct contributions from governments, private foundations, and individuals and innovative financing from the International Finance Facility for Immunization and an Advance Market Commitment.</p> <p>Implementing organization(s): The Gavi Secretariat oversees the day-to-day operations, while the Board is responsible for giving strategic direction and policymaking.</p>	<ul style="list-style-type: none"> • Since 2000, 440 million children have been immunized through Gavi support.ⁱⁱⁱ • In 2013, more than 60 countries were co-financing new and underused vaccines supplied by Gavi. Their contributions totaled US\$70 million. • 76 percent of children in Gavi-supported countries receive vaccines. • Over a decade, Gavi facilitated a 43 percent price reduction for pentavalent vaccine.

ⁱⁱPage on About Gavi, the Vaccine Alliance. Gavi, the Vaccine Alliance website. Available at: <http://www.gavi.org/about>. Accessed August 12, 2014.

ⁱⁱⁱPage on GAVI Facts and Figures. Gavi, the Vaccine Alliance website. Available at: <http://www.gavi.org/advocacy-statistics>. Accessed August 12, 2014.

Name	Basic Information	Notes
Global Drug Facility (GDF) ^{iv} , Stop TB Partnership	<p>Health sector(s): Tuberculosis (TB)</p> <p>Purpose: The GDF is a grant program of the Stop TB Partnership. The Partnership is a global network of more than 1,000 members from international and technical organizations, government programs, research and funding agencies, foundations, nongovernmental organizations (NGOs), civil society and community groups, and the private sector.</p> <p>The goal of the GDF is to ensure every TB patient has access to effective diagnosis, treatment, and cure. The GDF operates a pooled procurement mechanism to procure and distribute essential medicines and technologies for TB to more than 100 potential countries.</p> <p>Included commodities:</p> <ul style="list-style-type: none"> • Diagnostic and laboratory technologies • Medical devices • Pharmaceuticals <p>Funding source: The Partnership is funded by bilateral and multilateral agencies, as well as private foundations and in-kind contributions from members.</p> <p>Implementing organization(s): The Secretariat is managed by WHO. Seven working groups help define and implement activities.</p>	<ul style="list-style-type: none"> • Delivered more than 24 million treatment courses to more than 133 countries since 2001.^{4v} • As of 2012, the GDF was the largest supplier of quality-assured TB products. • A new strategy was implemented in 2012, including two new mechanisms focused on commodity security: building a global strategic stockpile and establishing a flexible procurement fund.

^{iv}Page on What is the GDF?. Stop TB Partnership website. Available at: <http://www.stoptb.org/gdf/whatis/default.asp>. Accessed August 12, 2014.

^vStop TB Partnership. Annual Report 2012. Geneva: World Health Organization; 2012. Available at: http://www.stoptb.org/assets/documents/publications/annualreports/Annual_Report_2012_v4_single_pages_for_web.pdf. Accessed August 12, 2014.

Name	Basic Information	Notes
<p>The Global Fund to Fight HIV/AIDS, Tuberculosis, and Malaria Pooled Procurement Mechanism (PPM)^{vi} (formerly Voluntary Pooled Procurement)</p>	<p>Health sector(s): HIV/AIDS, TB, malaria</p> <p>Purpose: Procurement of core health commodities for HIV, TB, and malaria. The PPM helps Global Fund grant recipients:</p> <ul style="list-style-type: none"> • Increase the speed and delivery of health products to country. • Ensure supply availability and reliability of products. • Ensure procurement of quality-assured products. • Secure attractive prices for the products purchased. • Strengthen local procurement and supply management capacity. <p>Included commodities:</p> <p>Core health products:</p> <ul style="list-style-type: none"> • Antiretroviral medicines (ARVs) • Rapid diagnostic kits for HIV • Artemisinin-based combination therapies • Long-lasting insecticide treated nets • Rapid diagnostic tests malaria <p>Non-core products:</p> <ul style="list-style-type: none"> • Medicines to treat opportunistic infections or sexually transmitted infections • Other diagnostic and laboratory supplies • Post-exposure prophylaxis kits • Condoms <p>Funding source: The Global Fund to Fight AIDS, Tuberculosis, and Malaria</p> <p>Implementing organization(s): Partnership for Supply Chain Management—a team of 13 private-sector, nongovernmental, and faith-based organizations</p>	<ul style="list-style-type: none"> • As of 2011, the mechanism provided 307 million daily doses of antiretroviral medicines and reduced lead times to six to eight months.^{vii}

^{vi}Page on Procurement Support Services. The Global Fund to Fight HIV/AIDS, Tuberculosis and Malaria website. Available at: <http://www.theglobalfund.org/en/procurement/vpp>. Accessed August 12, 2014.

^{vii}The Global Fund to Fight HIV/AIDS, Tuberculosis and Malaria. *VPP Key Results (2009–2011)*. March 28, 2012. Geneva: The Global Fund to Fight HIV/AIDS, Tuberculosis and Malaria. Available at: <http://www.theglobalfund.org/en/procurement/vpp>. Accessed August 12, 2014.

Name	Basic Information	Notes
<p>Global Programme to Enhance Reproductive Health Commodity Security (GPRHCS),^{viii} United Nations Population Fund (UNFPA)</p>	<p>Health sector(s): Reproductive health, primarily family planning</p> <p>Purpose: GPRHCS's goal is universal access to reproductive health commodities and family planning services and information. Its work aims to achieve five strategic results:</p> <ul style="list-style-type: none"> • Improved enabling environments. • Increased demand for reproductive health commodities. • Improved efficiency for procurement. • Improved access to reproductive health and family planning. • Strengthened national capacity and systems. <p>GPRHCS leverages UNFPA's comparative advantage in procurement as a high-volume buyer and pooler of significant donor resources, maximizing buying power and ensuring value for money. GPRHCS is structured as a thematic trust fund—a performance-based and flexible mechanism that provides donors with the opportunity to target their commitment to a particular thematic priority, allows for pooled multiyear funding, and ensures more timely and flexible use of resources to address specific country needs.</p> <p>Included commodities:</p> <ul style="list-style-type: none"> • Contraceptives • Condoms • Medicine and equipment for family planning, HIV, and sexually transmitted infection prevention • Maternal health medicines • Emergency reproductive health kits <p>Funding source: Donors supporting UNFPA</p> <p>Implementing organization(s): UNFPA Procurement Services Branch along with a dedicated Steering Committee</p>	<ul style="list-style-type: none"> • Only United Nations (UN) program specifically addressing reproductive health commodity security. • Among development agencies, GPRHCS is the leading supplier of contraceptives. • Supported the procurement of 33 percent of all donated reproductive commodities. • Much of the program's success can be attributed to strategic partnerships with UN agencies, donor and partner governments, NGOs, community-based organizations, civil society groups, faith-based organizations, and the private sector. • 32 countries have functional coordinating mechanisms for reproductive health commodity security, led by the government. • In 2013, 25 countries had budget line allocations for either contraceptives, maternal health medicines, or both.

^{viii}Page on Strategic Approaches. United Nations Population Fund website. Available at: <http://www.unfpa.org/public/supplies/pid/3591>. Accessed August 12, 2014.

Basic Information		Notes
Name	Organization of Eastern Caribbean States/Pharmaceutical Procurement Services (OECS/PPS) ^{ix}	
Health sector(s): All	<p>Purpose: Established in 1986, the OECS/PPS serves nine Eastern Caribbean Countries: Anguilla, Antigua and Barbuda, British Virgin Islands, Dominica, Grenada, Montserrat, St. Kitts and Nevis, St. Lucia and St. Vincent and the Grenadines. The OECS/PPS was initially established under a project funded by USAID, and was self-sufficient by 1989^x. The mechanism pools procurement of pharmaceuticals and medical supplies for the nine country members. Tenders are centralized and suppliers are prequalified. OECS/PPS awards annual contracts, place orders directly with suppliers, and monitors delivery and supplier performance.</p> <p>Included commodities: The mechanism procures 840 products including:</p> <ul style="list-style-type: none"> • Pharmaceuticals • Contraceptives • Medical supplies • Radiological products <p>Funding source: The mechanism is self-financed and covers operating costs through an 11 percent surcharge. Countries deposited one-third of their annual pharmaceutical budget to individual country drug accounts at the Eastern Caribbean Central Bank (ECCB) in order to assure prompt payment to suppliers and to maintain a revolving drug fund^{xi}. The bank acts as a guarantor, ensuring prompt payment to suppliers. As of 2004, the total value of annual purchases is USD \$10 million.</p> <p>Implementing organization(s): An OECS/PPS Policy Board oversee operations. Members of the Board include Ministers of Health, the OECS Director General, the ECCB representative and the OECS/PPS Managing Director. Two sub-committees report to the Policy Board: the Technical Advisory Committee (TAC) and Tenders Sub-Committees. The Board and subcommittees meet annually, with the chair rotating by country.</p>	<ul style="list-style-type: none"> • Annual cost savings are estimated to be 20 percent • The mechanism was originally established through a USD \$3.5 million grant from USAID, with an additional USD \$0.7 million contributed by counterparts^{xii}. • Key success factors include: <ul style="list-style-type: none"> – Formal structure, including permanent secretariat; reliable management systems; and formal purchasing/contracting agreements – Commonalities across countries, such as the OECS Treaty; stable political systems and political will; common aviation system; shared culture, language; central bank – Good governance – Ownership through country-based committees

^{ix}Formerly the Eastern Caribbean Drug Service

^xAbout PPS: Establishment of OECS/PPS. Organization of Eastern Caribbean States website. Available at: <http://www.oecs.org/about-pps?showall=&start=2> Accessed June 24, 2015.

^{xi}About PPS: Political Will and Financial Commitment. Organization of Eastern Caribbean States website. Available at: <http://www.oecs.org/about-pps?showall=&start=1> Accessed June 24, 2015.

^{xii}WHO. Report: regional workshop on strengthening quantification and procurement of essential medicines. New Delhi: India. June 10-12, 2014. October 2014. Available at: http://www.searo.who.int/entity/medicines/documents/sea_drugs_165/en/ Accessed June 24, 2015.

Name	Basic Information	Notes
People that Deliver (PtD) ^{xiii}	<p>Health sector(s): Applies to all health sectors</p> <p>Purpose: PtD is a network of more than 80 organizations working to build the capacity of supply chain management professionals around the world.</p> <p>Included commodities: Applies to all health commodities</p> <p>Funding source: Significant investments in the Initiative have come from a variety of partners, including the UK Department for International Development (DFID), USAID, the Reproductive Health Supplies Coalition (through a grants program supported by the Bill & Melinda Gates Foundation), the World Health Organization, Project Optimize (a WHO-PATH partnership), RTT Group, the Clinton Health Access Initiative, UNITAID, and the US President's Emergency Program for AIDS Relief (PEPFAR).</p> <p>Implementing organization(s): A Board is the primary governing body, and consists of between 13 and 24 members.</p>	<ul style="list-style-type: none"> The initiative began as a work stream of the Reproductive Health Supplies Coalition (see below).

^{xiii}Page on About. People that Deliver website. Available at: <http://www.peopletthatdeliver.org/?q=content/about>. Accessed August 12, 2014.

Name	Basic Information	Notes
Reproductive Health Supplies Coalition (RHSC) ^{xiv}	<p>Health sector(s): Reproductive health, with a primary focus on family planning and a secondary focus on maternal health</p> <p>Purpose: The RHSC is a global partnership of public, private, and NGOs dedicated to ensuring that all people in low- and middle-income countries can access and use affordable, quality-assured supplies to ensure their better reproductive health. The Coalition brings together almost 300 diverse agencies and groups with critical roles in providing contraceptives and other reproductive health supplies. These include multilateral and bilateral organizations, private foundations, governments, civil society, and private-sector representatives.</p> <p>Through three working groups, two regional forums, and two caucuses, members work together to advocate for change, generate new knowledge, build consensus, and identify technical solutions.</p>	<ul style="list-style-type: none"> • Close to 300 members. • Important leverage points: <ul style="list-style-type: none"> – Significant inclusion of country representatives in the earliest meetings. – Strong evidence base. – Skilled advocates and champions. – Initial meetings were not affiliated with any one organization, thereby creating an open space for communication.^{xv}
	<p>Included commodities:</p> <ul style="list-style-type: none"> • Contraceptive medicines and technologies • Supplies for maternal health: <ul style="list-style-type: none"> – Magnesium sulfate – Misoprostol – Oxytocin 	
	<p>Funding source: A donor consortium that includes the Bill & Melinda Gates Foundation, USAID, UNFPA, DFID, and other private donors.</p>	
	<p>Implementing organization(s): Secretariat is managed by PATH. The working groups, forums, and caucuses help define and implement activities carried out by members.</p>	

^{xiv}Page on About Us. Reproductive Health Supplies Coalition website. Available at: <http://www.rhsupplies.org/about-us.html>. Accessed August 12, 2014.

^{xv}Solo, J. *Reproductive Health Commodity Security: Leading from Behind to Forge a Global Movement*. Brussels: Reproductive Health Supplies Coalition; 2011. Available at: http://www.rhsupplies.org/fileadmin/user_upload/Access/JulieSolo.pdf. Accessed August 11, 2014.

Name	Basic Information	Notes
Revolving Fund, Pan American Health Organization (PAHO) ^{xvi}	<p>Health sector(s): Vaccines</p> <p>Purpose: The Revolving Fund allows the 41 PAHO member states to pool procurement of quality-assured vaccines, syringes, and related products. The Fund:</p> <ul style="list-style-type: none"> • Helps countries to estimate their requirements for vaccines and related supplies. • Consolidates orders so that vaccines can be procured in bulk at the lowest prices. • Coordinates and monitors shipments. <p>Member states provide their forecasting requirements to PAHO, which acts as the procurement agent for the selected commodities.</p> <p>Included commodities:</p> <ul style="list-style-type: none"> • 46 vaccines • 29 syringes and cold chain products <p>Funding source: The Fund is supported by member states through a 3.5 percent surcharge on orders as well as direct contributions.</p> <p>Implementing organization(s): PAHO Procurement Services Area</p>	<ul style="list-style-type: none"> • 15 million people received vaccinations through the Revolving Fund in 2013. • Countries cover over 95 percent of vaccine costs with national funds. • Operational since 1977.

^{xvi}Page on PAHO Revolving Fund. Pan American Health Organization website. Available at: http://www.paho.org/hq/index.php?option=com_content&view=article&id=1864&Itemid=40713&lang=en. Accessed September 10, 2014.

Name	Basic Information	Notes
Southern Africa Regional Programme on Access to Medicines and Diagnostics (SARPAM) ^{xvii}	<p>Health sector(s): Applies to all health sectors</p> <p>Purpose: To improve access to medicines within the Southern African Development Community (SADC).^{xviii} SARPAM aims to improve efficiency and competition in the market for EMTs in the SADC. The program addresses gaps including poor supply chain management and inefficient pricing of pharmaceuticals in the region. Strengthening regulatory bodies, harmonizing regulation, and operating a pooled procurement mechanism are among the program’s key activities.</p> <p>The pooled procurement Partnerships for Action, or PACTs, coordinates collaboration among SADC countries for the procurement of EMTs and the collection of data on price, quality, and source of medicines. Data are then made available on an online knowledge hub, to strengthen the capacity of member countries as they work to improve access to quality-assured EMTs. Finances are pooled across the region to improve negotiating power with manufacturers.</p> <p>Included commodities: Essential medicines and other health commodities</p> <p>Funding source: DFID</p> <p>Implementing organization(s): Re-Action!</p>	<ul style="list-style-type: none"> • SARPAM facilitated SADC adoption of the <i>Common Regional Technical Document</i> as a standard for registering medicines in 2013, which will improve harmonization of medicines registration and reduce time to register medicines. • Established the InfoHub, which collates public data on pharmaceutical procurement volumes and prices, product registration status, and information about medicines registrations, suppliers, and manufacturers.

^{xvii}Southern African regional Programme on Access to Medicines and Diagnostics website. Available at: <http://www.sarpam.net>. Accessed September 9, 2014.

^{xviii}Angola, Botswana, Democratic Republic of Congo, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, United Republic of Tanzania, Zambia, and Zimbabwe.

Name	Basic Information	Notes
Supply Chain Management System (SCMS) ^{xix}	<p>Health sector(s): HIV/AIDS</p> <p>Purpose: Supply chain management and strengthening, as well as procurement services.</p> <p>Included commodities: Essential medicines and technologies for the prevention and treatment of HIV/AIDS.</p> <p>Funding source: USAID, PEPFAR.</p>	<ul style="list-style-type: none"> • Procures 67 percent of the antiretroviral medicines funded by PEPFAR.^{xx} • Delivered more than US\$1.8 billion in essential commodities, including ARVs, test kits, and essential medicines.
	<p>Implementing organization(s): Partnership for Supply Chain Management—a team of 13 private-sector, nongovernmental, and faith-based organizations.</p>	

^{xix}Page on About Us. Supply Chain Management Systems website. Available at: <http://www.scms.pfscm.org/scms/about>. Accessed August 12, 2014.

^{xx}Page on By the Numbers. Supply Chain Management Systems website. Available at: <http://www.scms.pfscm.org/scms/about/btn>. Accessed August 12, 2014.

Name	Basic Information	Notes
<p>Systems for Improved Access to Pharmaceuticals and Services (SIAPS) Program^{xxi}</p>	<p>Health sector(s): Family planning and reproductive health, HIV/AIDS, malaria, maternal and child health, TB</p> <p>Purpose: Health systems strengthening focused on medical products and pharmaceutical systems. Focus on the following:</p> <ul style="list-style-type: none"> • Health governance • Human resources (building pharmaceutical management and services capacity) • Information for decision-making • Pharmaceutical financing • Pharmaceutical service delivery <p>SIAPS works with national regulatory authorities and other key stakeholders to streamline registration processes, strengthen quality assurance systems, align national essential medicines lists with standard treatment guidelines, and establish transparent pharmaceutical management systems.^{xxii}</p>	<ul style="list-style-type: none"> • Working to revise the Democratic Republic of the Congo's EML and providing technical assistance to revamp the country's National Drug Authority.^{xxiii} • Established a Forecasting Working Group in Bangladesh for reproductive health supplies. • Providing technical assistance to revise the National Medicine Policy in Haiti. • Developed an action plan to improve access to maternal health supplies in Rwanda.
<p>Included commodities:</p> <ul style="list-style-type: none"> • Contraceptives. • ARVs, HIV test kits, other HIV-related essential medicines and supplies. • Malaria, tuberculosis, and maternal and child health medicines. 		
<p>Funding source: USAID</p>		
	<p>Implementing organization(s): Management Sciences for Health</p>	

^{xxi}Page on How We Work. System for Improved Access to Pharmaceuticals and Services website. Available at: <http://siapsprogram.org/approach>. Accessed August 12, 2014.

^{xxii}Page on SIAPS Maternal and Child Health [brochure]. System for Improved Access to Pharmaceuticals and Services website. Available at: <http://siapsprogram.org/wp-content/uploads/2013/01/MCHbrochure1-11-13.pdf>. Accessed August 12, 2014.

^{xxiii}Systems for Improved Access to Pharmaceuticals and Services. *Strengthening Pharmaceutical Systems Program Annual Report: Program Year 2, October 2011–September 2012*. Arlington, VA: Management Sciences for Health; 2013. Available at: <http://siapsprogram.org/publication/siaps-annual-report-program-year-2>. Accessed August 12, 2014.

Name	Basic Information	Notes
USAID DELIVER ^{xxiv} PROJECT	<p>Health sector(s): Family planning and malaria (primary), emerging pandemic threats, essential medicines, HIV/AIDS, laboratories, and TB (secondary)</p> <p>Purpose: Provides technical assistance for supply chain strengthening in more than 30 countries. Focuses on supply chain management, commodity security, and procurement services. This project manages the procurement of all family planning and malaria commodities donated by the US government.</p> <p>Included commodities:</p> <ul style="list-style-type: none"> • Drugs, diagnostics, and supplies for family planning and malaria. • Contraceptives and condoms. • Malaria treatment medicines, insecticide-treated bed nets, and rapid diagnostic tests. • Essential medicines. • Select commodities for HIV/AIDS, maternal and child health, infectious diseases, avian influenza, and other emerging pandemic threats. <p>Funding source: USAID Washington and US missions abroad.</p> <p>Implementing organization(s): John Snow, Inc.</p>	<ul style="list-style-type: none"> • Operational for over 20 years, working with governments in more than 60 countries. • Between 2009 and 2012, the project shipped enough contraceptives to provide more than 75 million couple years of protection, potentially preventing more than 22 million unwanted or unplanned pregnancies and more than 39,000 maternal deaths.^{xxv}

^{xxiv}Page on About Us. USAID | DELIVER website. Available at: <http://deliver.isi.com/dhome/about>. Accessed August 12, 2014.

^{xxv}USAID | DELIVER PROJECT. Task Order 4 Annual Report: October 2011–September 2012. Arlington, VA: USAID | DELIVER PROJECT; 2013. Available at: http://deliver.isi.com/dlvr_content/resources/allpubs/toandigc/TO4_AnnuRepo_FY2012.pdf. Accessed August 12, 2014.

Name	Basic Information	Notes
UN Commission on Life-saving Commodities for Women and Children (Commission) ^{xxvi}	<p>Health sector(s): Maternal, reproductive, newborn, and child health</p> <p>Purpose: The Commission was formed in 2012 to increase access and use of essential medicines, medical services, and health supplies that effectively address causes of death during pregnancy, childbirth, and into childhood. The Commission identified a set of 13 essential commodities and made ten recommendations for getting the commodities to those who need them most. The Commission aims to achieve the following for each of the 13 commodities:</p> <ul style="list-style-type: none"> • Improved markets for life-saving commodities. • Improved national delivery of life-saving commodities. • Improved integration of private sector and consumer needs. <p>Technical Reference Teams (TRTs) carry the Commission's recommendations forward at the global and national levels. The nine TRTs are: reproductive health; maternal health; newborn health; child health; demand and performance; global markets, quality, and regulations; local supply chains and markets; mobile health and information and communications technology; and advocacy.</p> <p>Included commodities:</p> <ul style="list-style-type: none"> • Emergency contraception • Female condom • Contraceptive implants • Oxytocin • Magnesium sulfate • Misoprostol • Injectable antibiotics • Antenatal corticosteroids • Chlorhexidine • Resuscitation equipment • Child health • Amoxicillin • Oral rehydration salts • Zinc <p>Funding source: Norwegian Agency for Development Cooperation</p> <p>Implementing organization(s): UN through the Every Woman Every Child movement; TRTs and their members; national governments.</p>	<ul style="list-style-type: none"> • The Commission was created and chaired by the UN Secretary General as part of the Every Woman Every Child movement, with Nigeria's president and Norway's prime minister as co-chairs. • Main barriers identified by the Commission: <ul style="list-style-type: none"> – Ineffective regulation, with insufficient resources leading to delays, poor quality oversight and general inefficiencies. – Limited supplies of quality-assured products because manufacturers have no incentive to sell their products in particular countries or fail to produce sufficient quantities. – User supply and demand challenges such as low demand by end users, local delivery and distribution breakdowns and incorrect prescription and use.^{xxvii}

^{xxvi}Page on UN Commission on Life-saving Commodities. Every Woman Every Child website. Available at: <http://www.everywomaneverychild.org/networks/life-saving-commodities>. Accessed September 24, 2014.

^{xxvii}Every Woman, Every Child. *UN Commission Recommends Innovative Actions to Save Lives*. Every Woman, Every Child website. Available at: <http://everywomaneverychild.org/images/ReportSummary2Paper.pdf>. Accessed August 12, 2014.

