Non-Communicable Disease Medicine Gap Study in Ghana

Submitted to:

Ghana Heart Initiative

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Executive Summary

Background

Non-communicable diseases (NCDs) have been defined as diseases or conditions that occur in or are known to affect individuals over an extensive period and for which there are no known causative agents that are transmitted from one affected individual to another. They are also known as lifestyle diseases or chronic diseases. The WHO defines the scope of NCDs to include cardiovascular diseases, mainly heart disease and stroke; cancers; chronic respiratory diseases; diabetes; others, such as mental disorders, vision and hearing impairment, oral diseases, bone and joint disorders, and genetic disorders. Some NCDs progress slowly or cause chronic symptoms requiring long term care and control while others progress rapidly. They affect adult men and women but children are vulnerable as well. People may appear healthy but still suffer from these conditions. The global burden of NCDs is high and accounts for 71% of the 57 million deaths worldwide in 2016. The burden in Ghana is equally high and is projected to increase due to ageing, rapid urbanization, and unhealthy lifestyles.

Medicines are essential in both primary and secondary prevention of NCDs. They are an essential component for the treatment of various diseases including cardiovascular, diabetes, chronic respiratory diseases (i.e., chronic obstructive pulmonary disease, asthma), many cancers (including palliative care), mental and neurological disorders and in the management of their complications. It is estimated that the appropriate use of medicine alone can reduce up to 80% of the burden of NCDs in many countries. Those with NCDs often depend on a continuous supply of medication and/or treatments which may be interrupted or stopped because of disasters. With NCDs, you cannot stop taking medicines once you feel better, you must keep taking them to keep illness away, often for a lifetime. Unfortunately, quality assured and safe NCD medicines are always not available in adequate quantities, and at a price that both individuals and the community can afford. This study was therefore carried out to identify the facilitators and enablers in accessing NCD medicines and to make appropriate recommendations.

Methods

The study was conducted across six regions in Ghana. The regions included Greater Accra, Ashanti, Central, Bono East, Eastern and Northeast regions. We selected these regions based on

their proportion of the total number of registered pharmacies and over-the-counter medicine sellers (OTCMS) in Ghana. Data on the location of all the registered pharmacies and over-the-counter medicine shops were obtained from the pharmacy council. This was a mixed-method cross-sectional study involving two components i.e., qualitative, and quantitative. Both primary and secondary data were collected simultaneously and subsequently triangulated to facilitate an appropriate interpretation of the overall results. Secondary data were collected from grey and published literature on the availability and accessibility of NCD medicines in Ghana. Primary data was collected through key informant interviews (KII) of purposively selected respondents whose roles were in the areas of regulation, service delivery, manufacturing, and policy/administration; and through survey of respondents in community and health facility pharmacies and OTCMs. Content and thematic analysis using NVivo V.14 was done for qualitative data after verbatim transcription and coding. Survey data was collected using Kobo Collect App version 2022.1.2 and later exported to Stata V.16.1 for data cleaning, processing, and analysis.

Findings

The key findings from the study are:

1. There was a total of 591 respondents from the six (6) study regions. Majority of the respondents were from community (OTCMS) pharmacies (504, 85.2%) while the rest were from pharmacy shops located within public (71, 12.0%), private self-financing hospitals (8, 1.4%) and Christian Health Association of Ghana (CHAG) (8, 1.4%).

2. With the exception of cancer drugs (medicines) which availability was less than 10% (6.4%), all the other medical conditions had drugs availability from 68% for asthma to 97.2% for sickle cell disease.

3. Availability of drugs (medicines) to manage hypertension varied from 5.2% for alpha blockers to 83.6% for calcium channel blockers.

4. Availability of drugs to manage diabetes for instance varied from 0.5% for GLP-1 agonists to 75.3% for biguanides. Further, Biguanides and Sulfonylureas are available across all the levels of facilities; and less than 40% availability in OTCMS compared to other levels of care.

5. The availability of NCD drugs (medicines) varies depending on the level of health facility, OTCM or community pharmacy.

6. The availability of drugs (medicines) for the management of acute complications of chronic conditions varied from as low as 1.4% for Glucagon to 99.2% for NSAIDS across all the levels of facilities.

7. The median prices of NCD drugs (medicines) varied from a high of GHS196.48 (165.00-234.25) for Combination inhaled and Long-Acting Beta-Agonist to as low as 0.2 (0.15-4.00) for paracetamol analgesics oral.

8. The cost of drugs (medicines) has generally been described as “too expensive” in Ghana.

9. NCD drugs (medicines) were more and readily available in private (community pharmacies and OTCMS) and CHAG health facilities than in government/public facilities.

10. Some public facilities are resorting to co-payment especially for NCD medicines as a way of breaking even.

11. Availability of NCD drugs (medicines) was influenced more by price and location of the facility.

12. There is smuggling of medicines that is occurring especially at the land borders which compromises the quality of NCD drugs (medicines) in the market.

13. The strength of regulation especially of the FDA was highly commended but still more room for improvement, especially in the area of post-market surveillance and adverse events reporting.

14. Government has created various incentive measures such as framework contracting, reduced regulatory fees, tax exemptions, and restricted tendering to encourage local manufacturers and improve availability.

Conclusions

The following conclusions are made based on the findings of the study:

1. There is more than 90% of the required NCD medicines available and stoked in various health facilities and community facilities across Ghana.
2. Though the medicines are available, there are significant challenges with access, the main challenge being high cost. Ironically, more than 80% of the community pharmacies (OTCMS) do not accept National Health Insurance (NHI) and these further limits access.
3. The cost of medicines in Ghana is influenced by several factors including import duty, geographical location of the receiving facility, whether generic or branded product.
4. Smuggling of medicines across the country's borders is a major challenge that affects the quality and safety of medicines on the market.
5. Some frontline healthcare providers, especially prescribers, have concerns about the quality and safety of medicines on the market because of their individual experiences of how less efficacious some medicines were when prescribed.
6. There is a preference of prescribers to branded medication than generic medicines because of their belief that the branded products are more efficacious.
7. The government, through the MoH, has put in place various mechanisms that serve as incentives to encourage local manufacture of essential medicines. Some of these include guaranteed market, framework contracting, and regulatory incentives (such as reduced registration fees and support from the Food and Drugs Authority (FDA) around good manufacturing practices).
8. Healthcare facilities are limited by the type of medication they can prescribe as a result of the level at which they have been credentialled under the National Health Insurance Scheme (NHIS) or per the Standard Treatment Guideline. In view of this, the type of

medicine a prescriber can prescribe is limited and this affects access especially at the primary healthcare level.

9. Copayment for medicines was identified in many National Health Insurance Authority (NHIA) credentialled facilities. Providers justified this by indicating that the cost of the medicines was too expensive and there was the need for a top-up to be able to break even or make profit.

Recommendations for Policy Action

The following recommendations are made based on the findings of the study:

Government/Ministry of Health (MoH)

1. Collaborate with the NHIA to align the benefits package to the essential health service package to ensure congruence and alignment. The EHSP also has to be reviewed.
2. Government to remove the capping on the NHIA to ensure that more liquidity is available to them to reimburse facilities on time.
3. Encourage and incentivize local pharmaceutical manufacturing companies to improve their capacity to increase local production.
4. Review as a matter of urgency the policy on the prescription level (the current policy restricts type of medicine that can be prescribed at one level of the health care system based on type of provider) to facilitate access to quality and safe NCD medicines, especially at the primary healthcare level.
5. The health sector should focus more attention and resources on primary prevention. Further, it should put in place mechanisms to strengthen secondary prevention as a way of ensuring that those who are diagnosed are maintained on treatment.
6. Increase funding and resources to the FDA, Ghana Health Service (GHS), and other agencies of the MoH to ensure that they continuously improve on the availability of the quality of medicines in the market and the facilities.
7. The MoH and its agencies should strengthen the existing partnership and collaboration with civil society organizations (CSOs) so they can educate and empower their communities to

be responsible and interested in their health and to also support the health system for improved outcomes.

8. Government/MoH should prioritize the enhancement of its pharmaceutical supply chain system and address the inherent financial challenges.
9. The Government for that matter the MoH should explore various funding options and grants to support the procurement of NCD medicines. By actively seeking financial resources through different avenues, the country can secure the necessary funds to ensure the availability of NCD medicines for those who need them most. Addressing these critical aspects will enable Ghana to enhance its pharmaceutical supply chain system, overcome financial bottlenecks, and ultimately improve the accessibility and availability of NCD medicines.

National Health Insurance Authority (NHIA)

1. Consider credentialling specific services within health facilities other than the entire facilities. This will ensure that specialist services that are provided are adequately paid for.
2. Conduct further actuarial studies to ensure that the prices of medications truly reflect the market prices so this can serve as incentive to health facilities that have been credentialled (including even those that are yet) to avoid copayment and improve upon their availability.
3. Streamline the NHIS reimbursement process and explore further funding options and grants will provide healthcare facilities with the necessary resources to procure and supply NCD medicines in a timely manner, ensuring their availability for individuals in need.

Ghana Health Service /CHAG/Teaching Hospital

1. Agencies of the MoH should scale up the implementation of the Network of Practice across the country to make it possible for patients to get their drug (medicine) refills and prescriptions at the PHC level (including health centers.

2. Strengthen collaboration and partnerships with non-governmental organisations (NGOs) in health and CSOs, empower and educate them to understand and appreciate their role especially in the communities.

3. Strengthen and leverage on existing reproductive health service delivery protocols and service delivery models/regimen for noncommunicable diseases. For instance, the same midwife seeing pregnant women ANC can be sufficiently equipped, empowered, and given the opportunity to do visual inspection of the cervix for cervical cancers.

Regulatory Authorities

1. The MoH should facilitate a discussion between the various regulatory bodies that have a role in ensuring availability and access to quality medicines i.e., FDA, Pharmacy Council, and the Customs division of the Ghana Revenue Authority (GRA) to strengthen collaboration.

2. FDA should increase awareness and training of providers, patients, and relatives on where and how to report all medication safety-related events both in their facilities and homes.

3. The FDA should strengthen the regulatory and control mechanisms that ensure that manufacturing companies where generics are produced are routinely monitored and checked to ensure they are complying to Good Manufacturing Practices (GMP)

4. The Pharmacy Council should strengthen its regulation of community pharmacies, especially OTCMs, and ensure that they are stocking and selling medicines that they are required to sell per regulatory approval.

5. The Customs division of the GRA should increase the awareness and education of importers of pharmaceutical products.

6. The Customs division of the GRA should strengthen existing regulatory and control mechanisms to improve upon their presence, especially at the land borders, to reduce the prevalence of smuggling activities and the influx of substandard medicines onto the market.

Health Providers (Frontline healthcare workers)

1. Measures should be put in place to enhance and encourage providers to report all medicine-related adverse events.

List of Abbreviations

1. CHAG : Christian Health Association of Ghana
2. DALYs : Disability-Adjusted Life Years
3. FBOs : Faith-Based Organizations
4. GDP : Gross Domestic Product
5. HENNIS : Health, Equity, and New Network for Innovations in Health Systems and Health Workforce Research
6. HIC : High-Income Countries
7. LMICs : Low- and Middle-Income Countries
8. LMICs : Low-Middle-Income Countries
9. MDGs : Millennium Development Goals
10. MoH : Ministry of Health
11. NCD-RisC: Non-Communicable Disease Risk Factor Collaboration
12. NHIS : National Health Insurance Scheme
13. NHS : National Health Service
14. NCDs : Non-Communicable Diseases
15. NHIS : National Health Insurance Scheme
16. SDG : Sustainable Development Goals
17. UMIC : Upper-Middle-Income Countries
18. UN : United Nations
19. VAT : Value Added Tax
20. WHO : World Health Organization

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Access to affordable essential medicines and health products plays a crucial role in ensuring universal healthcare (WHO, 2010). The provision of essential medicines that meet quality standards should be ensured consistently, with sufficient supply and affordability for individuals and communities (WHO, 2013). Numerous studies have consistently found that crucial medicines for non-communicable diseases (NCDs) are often scarce, expensive, and unaffordable in many low-middle-income countries (LMICs), regardless of whether they are obtained from public or private sources (Cameron et al., 2011; Mendis et al., 2007; van Mourik et al., 2010). NCDs pose a substantial global public health challenge, impacting individuals of various age groups and socioeconomic strata, with a significant prevalence among adults. This category of diseases, encompassing cardiovascular diseases, cancer, chronic respiratory diseases, and diabetes, contributes significantly to the burden of illness and mortality on a worldwide scale. As, per data from the World Health Organization (WHO), NCDs contribute to about 71% of all worldwide fatalities, with LMICs carrying the heaviest load (World Health Organization, 2018a). These countries account for 78% of all NCD deaths and 85% of premature adult NCD deaths worldwide (GBDCoD, 2017). Ghana, a country located in West Africa is no exception to this growing epidemic of NCDs. The burden of these diseases (NCDs) has been on the rise (NCD-RisC), 2017).

The global development agenda acknowledges the profound influence of NCDs, reaching far beyond the scope of promoting health and well-being (SDG 3). NCDs also exert substantial implications for other goals such as reducing poverty, combating hunger, improving education, achieving gender equality, and fostering economic growth (Nugent et al., 2018). Specifically, SDG target 3.4 sets a clear objective to reduce premature NCD mortality by one-third. To effectively combat NCDs, it is crucial to focus on health-related lifestyle and address social inequalities that contribute to the emergence of NCD risk factors. Additionally, ensuring access to effective NCD treatments is essential for those already affected by NCDs. This comprehensive approach involves promoting healthy lifestyles, addressing social determinants of health, and providing accessible and affordable healthcare services. By taking these measures, we can effectively tackle the burden of NCDs and promote sustainable development (Dussault and Buchan, 2018; Magnusson and Patterson, 2014; Tobias et al., 2009). The importance of access to safe, effective, quality, and affordable medicines is reflected in SDG

3.8 and is underpinned by the Universal Health Coverage (UHC) and financial risk protection for patients and their families. In 2011, a resolution was passed by the United Nations General Assembly to address the prevention and management of NCDs (United Nations, 2011). This commitment was reaffirmed in 2015 when the Sustainable Development Goals (SDGs) were adopted, specifically targeting 3.4, which aims to decrease premature mortality from NCDs by one-third by 2030 through preventive measures, treatment, and the promotion of mental health and well-being (United Nations, 2022).

In recent years, Ghana has witnessed a rapid epidemiological transition, with NCDs overtaking communicable diseases as the leading cause of death in the country (Ministry of Health, 2022). The prevalence of NCDs in Ghana has been steadily rising due to various factors, including urbanization, changing lifestyles, unhealthy diets, physical inactivity, and an aging population (Boakye et al., 2023). The burden of NCDs poses not only a significant health challenge but also exerts a considerable economic burden on individuals, families, and the healthcare system in Ghana. Access to effective medicines is a crucial component in the management and control of NCDs. Availability and affordability of quality medicines are fundamental for individuals to receive appropriate treatment, prevent complications, and improve health outcomes. However, despite the increasing prevalence of NCDs in Ghana, there are concerns regarding the availability of effective medicines for the management of these diseases. Limited access to essential NCD medicines can be attributed to several factors, including inadequate healthcare infrastructure, weak pharmaceutical supply chains, lack of financial resources, and regulatory challenges (Atinga et al., 2018). Moreover, the high cost of NCD medicines, particularly those for chronic conditions, can be a significant barrier for many Ghanaians, especially those from lower socioeconomic backgrounds.

1.2 The Problem

NCDs have emerged as a significant public health challenge in Ghana, with a rising prevalence and associated morbidity and mortality. Effective medicines play a crucial role in managing and controlling NCDs, yet there are concerns regarding the availability of these medicines in the country. Limited access to essential NCD medicines can have detrimental effects on the health outcomes of individuals and contribute to the growing burden of NCDs. Therefore, it is essential to assess the status of availability of effective NCD medicines in Ghana and identify the underlying challenges hindering their accessibility.

Ghana, like many other LMICs is experiencing an epidemiological transition characterized by a shift from communicable diseases to non-communicable diseases (Ministry of Health, 2022).

NCDs including cardiovascular diseases, cancer, chronic respiratory diseases, and diabetes, have become the leading causes of morbidity and mortality in the country. The WHO estimates that NCDs account for approximately 71% of all deaths in Ghana (World Health Organization, 2018a).

Ensuring the availability of affordable and effective medications plays a vital role in effectively managing and controlling NCDs. Medicines have the potential to alleviate symptoms, slow down the progression of diseases, prevent complications, and enhance overall health outcomes. Regrettably, Ghana encounters multiple barriers that impede the availability of vital NCD medications. Among these hurdles, insufficient healthcare infrastructure and fragile pharmaceutical supply chains emerge as noteworthy contributors. Many healthcare facilities in Ghana, particularly those in rural areas, face resource constraints, including limited storage capacity, inadequate transportation systems, and a lack of trained healthcare professionals (Atinga et al., 2018). These limitations affect the procurement, storage, and distribution of medicines, leading to stockouts or irregular availability of NCD medicines. The limited availability of NCD medicines in Ghana is influenced by a range of factors. Financial constraints significantly contribute to this issue, aggravated by the delayed reimbursement from the National Health Insurance Scheme (NHIS) to healthcare facilities. These financial challenges further compound the existing difficulties faced by healthcare providers. Moreover, the management of many NCDs requires long-term treatment involving multiple medications. Unfortunately, the high cost of these medicines poses a significant burden, especially for individuals with low incomes or without health insurance coverage. Consequently, accessing NCD medicines becomes a formidable task, resulting in individuals resorting to inadequate treatment or even discontinuing medication entirely.

Additionally, the restricted prescription of certain effective medicines to some levels of care is another contributing factor to the limited availability of NCD medications in Ghana. This practice hampers the supply of these medicines at the community level of care, intensifying the challenges faced by individuals in obtaining the necessary treatments for their NCDs.

The above not only undermines the availability of effective NCD medicines but also erodes public trust in the healthcare system. The accessibility of effective NCD medicines in Ghana is a pressing concern that requires immediate attention. Hence this work aims at developing comprehensive strategies and engaging a wide array of stakeholders. Through these efforts, we aim to contribute to the growing knowledge that can assist Ghana in proactively reducing the impact of NCDs and improving the health outcomes of its citizens.

1.3 Main Objective

The primary objective of this study was to assess the availability of effective NCD medicines in Ghana and identify the underlying challenges that hinder their accessibility.

1.3.1 Specific Objectives

1. Evaluate the factors and limitations that affect the availability of effective NCD medicines.
2. Identify the key factors that contribute to the availability of effective NCD medicines.
3. Collaborate with relevant stakeholders to formulate all-encompassing policies, tactics, and a structured plan for ensuring the enduring accessibility of effective NCD medications.

1.4 Study Significance

NCDs pose a significant public health burden in Ghana, contributing to increased morbidity and mortality rates. Understanding the availability of effective NCD medicines is crucial for addressing this burden and improving health outcomes. By identifying the gaps and challenges in accessing these medicines, appropriate interventions can be developed to ensure their availability and affordability. Access to essential medicines is a fundamental aspect of a well-functioning healthcare system. Examining the availability of NCD medicines in Ghana will shed light on the strengths and weaknesses of the pharmaceutical supply chain, healthcare infrastructure, financing, and regulatory frameworks. This information will guide policy and system-level changes to enhance the overall efficiency and effectiveness of healthcare delivery. Research findings on the availability of NCD medicines will provide evidence for policy formulation and interventions. Policymakers can then use this information to prioritize resource allocation, develop guidelines for procurement and distribution, and implement measures to ensure quality assurance and regulation of NCD medicines. Evidence-based policies and interventions have a higher likelihood of success in addressing the challenges related to NCD medicines. Also, this research will contribute to existing knowledge and will unearth other areas for further studies.

CHAPTER TWO

2.0 Literature Review

2.1 Overview

NCDs have been defined as diseases or conditions that occur in or are known to affect individuals over an extensive period of time and for which there are no known causative agents that are transmitted from one affected individual to another. They are also known as lifestyle diseases or chronic diseases (Islands, 2021). The WHO defines the scope of NCDs to include cardiovascular diseases, mainly heart disease and stroke, cancers, chronic respiratory diseases, diabetes, others such as mental disorders, vision and hearing impairment, oral diseases, bone and joint disorders, and genetic disorders (MoH Ghana, 2012). Some NCDs progress slowly or cause chronic symptoms requiring long-term care and control while others progress rapidly. They affect adult men and women but children are vulnerable as well (Balsarkar, 2022). People may appear healthy but still suffer from these conditions.

Many NCDs can result from behavioral risk factors like smoking, alcohol, lack of exercise and poor diet and are therefore, preventable (Islands, 2021; World Health Organisation., 2011). Two other important factors that can cause NCDs are poverty and malnutrition (Zahangir et al., 2017). The four major NCDs (cardiovascular disease, cancer, chronic respiratory disease, and diabetes) are causally linked with four leading behavioral risk factors: tobacco use, harmful use of alcohol, physical inactivity, and unhealthy diet (World Health Organization, 2018b). In turn, these behaviors lead to four key metabolic/physiological changes: raised blood pressure, overweight/obesity, raised blood glucose, and raised blood lipids. Environmental air pollution is also a key risk factor (World Health Organization, 2018b).

NCDs contribute to two-thirds of the world's deaths (Ndubuisi, 2021). Nearly 80% of NCD deaths, close to 30 million per year, occur in low- and middle-income countries where most of the world's population lives (Haileamlak, 2019). People in these countries tend to develop disease at younger ages, suffer longer, and die sooner than those in high-income countries. Each year, 17 million people die from an NCD before age 70. Tobacco accounts for over 8 million deaths every year (including from the effects of exposure to second-hand smoke).1.8 million deaths annually have been attributed to excess salt/sodium intake. More than half of the 3 million annual deaths

attributable to alcohol use are from NCDs, including cancer. 830,000 deaths annually can be attributed to insufficient physical activity. Cardiovascular diseases account for most NCD deaths, (17.9 million people) annually, followed by cancers (9.3 million), chronic respiratory diseases (4.1 million), and diabetes (2.0 million including kidney disease deaths caused by diabetes).

In 2016, NCDs were the leading cause of death globally, responsible for 71% of the 57 million deaths worldwide (Gbadamosi and Tlou, 2020). The four leading NCDs: cardiovascular diseases (CVDs), type 2 diabetes mellitus (T2DM), chronic respiratory diseases, and cancer, jointly contributed to 78.8% of all NCD deaths worldwide (Gbadamosi and Tlou, 2020). Disturbingly, in 2016, 78% of all NCD deaths occurred in low- and middle-income countries (LMICs). WHO estimates that NCDs account for an estimated 34% of deaths and 31% of disease burden in Ghana. NCDs kill an estimated 86,200 persons in Ghana each year with 55.5% of them aged less than 70 years and 58% of males being affected. The age-standardized NCD death rate is 81.7 per 100,000 for males and 595 per 100,000 for females. They cause 2.32 million DALYs representing 10,500 DALYs lost per 100,000 population. The burden of NCDs in Ghana is projected to increase due to ageing, rapid urbanization, and unhealthy lifestyles (Ministry of Health, 2022).

Medicines are essential in primary and secondary prevention of NCDs. NCD medicines are an essential component of the treatment of cardiovascular diseases, diabetes, chronic respiratory diseases (i.e. chronic obstructive pulmonary disease, asthma), many cancers (including for palliative care), mental and neurological disorders (Abegunde, 2011) and in the management of their complications. It is estimated that the appropriate use of medicines alone can reduce up to 80% of the burden of NCDs in many countries (Beran et al., 2019b). Those with NCDs often depend on a continuous supply of medication and/or treatments which may be interrupted or stopped as a result of disasters (Mokdad et al., 2005; World Health Organisation., 2011). With NCDs, you cannot stop taking medicines once you feel better, you have to keep taking them to keep illness away, often for a lifetime (Ng et al., 2021). But many people stop taking medicines once they feel better or when they run out of money. These illnesses also require close monitoring and regular follow-up by a health service provider.

Quality-assured essential medicines should always be available in adequate quantities, and at a price that both individuals and the community can afford. The facilitators of this availability are

the rational selection and use of the NCD medication in alignment with the essential medicines list of the country, implementation and use of standard treatment guidelines and adherence to good prescription practices, eliminating markup and taxes on essential medicines to promote affordability, sufficient funding for NCD programmes, reliable health and supply systems through the use of risk pooling and sharing mechanisms and strong surveillance and information management systems and also ensuring quality of the medicines (HENNIS, 2017).

The WHO as part of the voluntary global targets for its Global Action Plan for the Prevention and Control of Non-Communicable Diseases 2013-2020 set a goal of 80% availability of basic technologies and essential medicines, including generics, needed to treat major NCDs in all health facilities. However, essential medicines availability for the management of NCDs remains poor, especially in many LMICS. Failure to meet these targets has been the result of many factors.

2.2 Impact of Non-Communicable Diseases

Preventing and controlling NCDs demands a substantial allocation of investment and resources, primarily due to the extended duration of these ailments. The consequences, often posing a risk to life, lead to the depletion of human, financial, and material resources. Consequently, unmanaged NCDs have widespread repercussions affecting individuals, families, societies, and healthcare systems.

Individuals with NCDs present intricate healthcare needs that may necessitate a higher utilization of health services compared to those without such conditions. In cases where individuals suffer from multiple NCDs, the healthcare costs incurred by families can be financially devastating. NCDs drive more people into poverty because, especially in many Low- and LMICs, these expenses are typically shouldered directly by households as out-of-pocket expenditure (Xu et al., 2007). As a result, studies have revealed a cyclic connection between NCDs and poverty. NCDs can precipitate poverty, and in turn, poverty perpetuates NCDs. This occurs because individuals afflicted by these conditions may encounter limitations in their ability to engage in gainful employment, thereby remaining trapped in a cycle of poverty (Peters et al., 2008).

Moreover, NCDs can lead to a cycle of excessive borrowing, a well-documented phenomenon among families grappling with NCDs in LMICs (Kruk et al., 2009). Furthermore, the physical pain and distress experienced by individuals can be incapacitating. This issue becomes even more

severe in complex NCD scenarios, such as strokes and lower limb amputations, which inevitably diminish the quality of life for affected individuals (Azevedo and Alla, 2008).

In addition to the physical challenges, the financial burdens associated with NCD treatment exacerbate the psychosocial hardships, particularly in LMICs. In these settings, families who deplete their financial resources to care for individuals with NCDs often end up forsaking them. Consequently, NCDs have been observed to result in social isolation. (Aikins et al., 2010; Aikins, 2007). Studies conducted in several LMICs have uncovered the presence of social stigma surrounding specific NCDs like cancer and diabetes. For instance, in Ghana, research shows that women dealing with cancer and diabetes may confront the possibility of abandonment by their partners. In rural areas, women struggling with unmanaged diabetes, marked by severe weight loss, often experience a stigma comparable to that faced by individuals living with HIV/AIDS (Aikins, 2007).

The impact of NCDs extends well beyond individual households and affects entire societies. In the United States, for instance, 35% of healthcare spending is allocated to the 8.7% of the population dealing with five or more NCDs, and in 2010, a staggering 86% of health expenditure was directed toward individuals with one or more NCDs (Gerteis et al., 2014).
Similarly, in Europe, the annual loss of 550,000 active and working individuals due to NCDs incurs a cost of EUR 115 billion or 0.8% of GDP for the European Union, excluding additional losses related to reduced employment and productivity among those affected by NCDs (OECD/EU, 2016). Research in India has shown that without the burden of NCDs, the GDP could have been 4-10% higher in 2004 (Mahal et al., 2010). Moreover, NCDs have been found to reduce wages, increase absenteeism, impact labor supply, lower retirement ages, and potentially contribute to unemployment and economic inactivity (KRAUT et al., 2001; Suhrcke et al., 2007).

The far-reaching consequences of NCDs may encompass diminished returns on investments in human capital, a slower economic growth trajectory due to reduced domestic consumption, decreased tax revenues, and an increase in general healthcare and social welfare expenditures (Wang et al., 2011). Therefore, in resource-constrained settings like many African countries, uncontrolled NCDs could exacerbate underdevelopment, as limited resources may need to be diverted toward the treatment of individuals suffering from one or more NCDs.

There is compelling evidence suggesting that effective control of NCDs can result in improved health systems (Lopez et al., 2006). Analyzing shifts in disease patterns can have significant implications for the efficiency of the healthcare system. In the context of LMICs, where healthcare resources are limited, optimizing the allocation of resources is crucial for health planners and policymakers. To make the most of available resources, health systems must prioritize diseases or risks with the highest disease burden. This approach implies that preserving resources for health systems would be more feasible if NCDs and their risk factors were minimized and addressed according to the priorities set for disease control (Lopez et al., 2006).

Furthermore, controlling NCDs would reduce or delay the utilization of medical resources, freeing up financial opportunities for other purposes (Hou et al., 2016). The financial burden associated with the cost of caring for NCDs can have a crippling impact on the health system. For instance, a study found that in Vanuatu, a patient dependent on insulin requires drug resources equivalent to those needed for over 76 other citizens on average, placing a significant strain on a healthcare system that can only provide insulin treatment to 1.31% of the entire population (Anderson, 2013).

These challenges, combined with the complex policy and healthcare system considerations associated with effective NCD control, underscore the need for a coordinated effort from all stakeholders to manage the demand for NCD treatment effectively.

In light of the impacts on households, economies, and health systems, the consequences of unaddressed NCDs in Africa could be devastating. This is particularly concerning given the increasing burden of these diseases in the region.

2.3 Availability of Essential NCD Medications

Enhancing the accessibility of vital, quality-assured, safe, efficient, and affordable medical products is a paramount global initiative for the World Health Organization (WHO) in 2019. Medications play a crucial role in both primary and secondary prevention of Non-Communicable Diseases (NCDs). NCD medicines constitute a fundamental element in the treatment of various conditions, including cardiovascular diseases, diabetes, chronic respiratory ailments (e.g., chronic obstructive pulmonary disease and asthma), numerous cancer types (including palliative care), and

mental and neurological disorders (Abegunde, 2011) along with the management of their complications. It is estimated that the appropriate use of medicines alone can reduce up to 80% of the burden of non-communicable diseases in many countries (Beran et al., 2019). Quality-assured essential medicines should always be available in adequate quantities, and at a price that both individuals and the community can afford. The facilitators of this availability are the rational selection and use of the NCD medication in alignment with essential medicines lists of the country, implementation and use of standard treatment guides and adherence to good prescription practices, eliminating markup and taxes on essential medicines to promote affordability, sufficient funding for NCD programmes, reliable health and supply systems through the use of risk pooling and sharing mechanisms and strong surveillance and information management systems and also ensuring quality of the medicines (HENNIS, 2017).

Studies have repeatedly documented the low availability of key essential medicines for NCDs in many LMICs both in the public and private sectors (Ashigbie et al., 2020; Cameron et al., 2011). Reviews of facility surveys conducted in LMICs have shown that the availability of generic medicines to treat NCDs is lower than for communicable diseases in both the public (36.0% vs. 53.5%) and private sectors (54.7% vs. 66.2%) (Robertson et al., 2015). Mean availability of essential medicines in 36 low-income and middle-income countries was about 36% for NCDs versus 54% for acute diseases in the public sector, and 55% versus 66% (but at a much higher price) in the private sector (Gupta et al., 2020). The probability of patients receiving at least one medicine for secondary prevention of cardiovascular disease was 19·8% , 30·7% in LMICs, and 54·9% for upper-middle-income countries (Chow et al., 2020).

Cameron et al. investigated the availability of 15 generic medicines used for a range of conditions in 36 developing countries and found it to be 38% and 64% in the public and private sectors, respectively (Cameron et al., 2009). (Chow et al., 2018) also found the availability of essential diabetes medicines to be poor in low-income and middle-income countries. Kenya and Uganda have also reported higher availability of beta-blockers (98% and 92%, respectively) and furosemide (98% and 94%, respectively) (Gupta et al., 2020). In 2007 Mendis et al. assessed the availability and affordability of medicines to treat four NCDs in six LMICs using an adaptation of the WHO/ HAI methodology (Mendis et al., 2007). They found generic availability did not exceed 7.5% in the public sector in Bangladesh, Malawi, Nepal and Pakistan. In Lebanon, the availability

of generics was low in primary healthcare centres (43.3%) where medicines are dispensed free of charge, but higher in private pharmacies (77.9%) (Niëns et al., 2010). Availability and access to inhaled steroids for treating severe cases of asthma remain poor in many countries (Stolbrink et al., 2022). According to (Ewen et al., 2017) CVD medicines in LMICs (11.9%), and CNS medicines in lower-middle (10.2%) and upper-middle-income countries (33.3%), are the least available in the public sector.

Of the essential NCD medicines recommended in the Rwanda national essential medicines list, 71.4% were available in the health centers while 78.0% were available in the district level hospitals which is comparatively higher than the availability level of other LMICs (Mukundiyukuri et al., 2020). Insulins were, however, not available and this non-availability of insulins at health centers was linked to the lack of training for the nurses in insulin administration (Mukundiyukuri et al., 2020). Availability of insulin remains poor in many regions of the world due to high prices, exposing patients to the risk of serious complications and disease, such as blindness, amputation and death (Bagonza et al., 2015). The Kenya Service Delivery and Readiness Assessment Report, reported a lower mean availability of NCD medicines at primary care facilities and hospitals: 25% and 32%, respectively (NCD Countdown 2030 collaborators, 2018). This non-availability of medicines in health facilities was also linked with supplier retailer supply chain weaknesses and public financing of medicines among other factors (NCD Countdown 2030 collaborators, 2018). (Ashigbie et al., 2020) found that low availability of some of these NCD medicines may indicate low demand, or the preference of prescribers and patients for other therapeutic options within the same classes of medicine.

Low public sector availability of essential medicines is often caused by a lack of public resources due to underfunding or under-budgeting, inaccurate demand forecasting, and inefficient public sector procurement and distribution of medicines. In many countries with weak healthcare delivery systems, the default medicines supplies and distribution systems are highly fragmented by the activities of plethora of donors with resultant overlaps and duplication of distributions functions by the main players (Gupta et al., 2020). In many cases the public sector (government) role in supplies and distribution of medicines is rarely visible. Currently, there is lack of evidence on the adequacy of financing the procurement of NCD medicines in LMICs (Abegunde, 2011). A critical

constraint to planning and forecasting quantities of NCD medicines need in countries is the lack of data and information necessary for any level of planning, forecasting and even budgeting for medicine needs (Abegunde, 2011).

There is also variability in the availability and affordability of NCD medications between and within NCD conditions. Availability of insulin remains poor in many regions of the world due to high prices, exposing patients to the risk of serious complications and disease, such as blindness, amputation and death (Bagonza et al., 2015). Priority setting amid limited financial resources means that medications for some conditions are better covered by UHC systems than others. Consequently, medications for some conditions such as cancer are more expensive and less readily available than those for diseases such as hypertension. In South Africa for example, Tomlinson et al showed that for 24 cancer medications they studied, only 21 were available in the private sector whilst only 7 were available in the public sector. They also found that while oncology specialty medications made up only 13% of specialty medications by volume, they accounted for 31% of expenditure on specialty medications (Tomlinson et al., 2017).

In Ghana, Ocran at al showed that the availability of cancer medications was very low with the availability of the lowest priced generics in public hospitals, private hospitals and private pharmacies being 46%, 22% and 74% respectively. The median price for these drugs ranged between 0.35 and 227.98 US dollars putting them out of the reach of most Ghanaian patients (Ocran Mattila et al., 2023). The NHIS of Ghana while covering "over 90% of all disease conditions that are presented in health facilities in Ghana" (NHIS, 2017) only included coverage of the four commonest childhood cancers in 2021 (Naatogmah, 2023).

A similar situation was found pertaining to essential medicines for mental healthcare in Mozambique with essential psychotropic medications routinely unavailable in public health facilities (Wagenaar et al., 2015).

This variability in affordability and availability of medications is also dependent on the setting, whether rural or urban and the type of facility from where the medication was purchased. An assessment by the Ministry of Health, Ghana found that medicines were more available in urban areas than rural ones. In the urban areas, medicine availability was highest in private pharmacies while in rural areas medicine availability was highest for faith-based health facilities. There was a

variation in pricing for the lowest-priced generic in all sectors with prices sometimes showing very wide variations between facilities (Ministry of Health et al., 2009). Another assessment of selected NCD medication availability in Ghana found that availability was poorest at the health centre level with less than 80% availability of all the tracer drugs, but this improved at the regional hospitals with 100% availability of tracer drugs except for Metformin. Availability of medications was also better at faith-based organization facilities than at private hospitals (PATH, 2020).

In Kenya, Ashigbie et al found that NCD medication availability was highest in private for-profit drug outlets with availability increasing with the increasing level of care of the facilities surveyed (Ashigbie et al., 2020b). In Uganda, Armstrong-Hough et al found that availability of essential medicines for NCDs varied markedly over time, especially among public facilities with weekly price variations for the same medicines among private for-profit facilities (Armstrong-Hough et al., 2020).

The availability of effective NCD medications is also affected by supply chain and distribution processes with problems such as stockouts of medications, poor transportation and storage conditions, and counterfeit medications, affecting the quality of drugs available to patients.
An assessment of the NCD commodity supply chain in Ghana in 2020 found that the availability of medicines at the regional medical stores directly impacted function of the health system supply chain. The management of the supply chain was beset with challenges with human resource capacity as well as poor or no use of the standardized processes and ordering methodology. These along with price markups along the supply chain result in medication stockouts as well as persons with NCDs having to buy drugs from other sources at a higher price than available on the NHS. Another key constraint in the supply chain was the issue of accumulated debt and delays in paying suppliers for medicines which could pose a financial risk to manufacturers that supply the public sector (PATH, 2020). Prices are therefore seen to vary markedly between different medication outlets (Armstrong-Hough et al., 2020; Ministry of Health et al., 2009; PATH, 2020).

Additionally, the supply chain in many countries in Africa is fragmented, with multiple middlemen who profit from every transactional link in the chain (Seiter et al., 2021). The COVID-19 pandemic also highlighted the dependence of many LMIC countries, especially those in Africa, on the importation of medicines (Mikkelsen, 2023; Pourraz, 2022). Pre-existing global market access and supply issues were exacerbated by the pandemic with export restrictions, transport and freight

disruptions and staff shortages as a result of sickness curfews and quarantines, resulting in low supplies and stockouts of some essential NCD medications. During the pandemic in 2020, 26% of LMIC reported medicine stockouts in contrast to 10% of UMIC and 4% of HIC (Mikkelsen, 2023).

In a study of seven routinely used cardiovascular medicines from both licensed and unlicensed drug vendors in 10 African countries, Antignac et al found that 16% of the medications sampled were of poor quality with this proportion reaching 50% when the drugs were manufactured in Asia and sold by street vendors (Antignac et al., 2017). In Rwanda, it was found that aside from certain drugs being substandard from the time of purchase, these drugs were subject to further deterioration after six months of exposure to testing conditions simulating the tropical climate (Twagirumukiza et al., 2009). The quality of medications such as insulin which require adequate cold storage capacity also remains a challenge (PATH, 2020). Further, the number of recorded cases of falsified (counterfeit) medicines for chronic diseases is also increasing, for example through unregulated internet sales used by patients on chronic treatment (Abegunde, 2011).
The regulatory body in Ghana, the Food & Drugs Authority, although relatively strong still faces challenges in post-market surveillance of drug quality, especially outside the major urban centres (Hamill et al., 2019). Users of medication still have to contend with uncertain quality of medications even when bought from licensed outlets with issues with expired or "deteriorated medicines" due to medicines being on shop shelves for prolonged periods or poor storage conditions, especially in rural areas (Hamill et al., 2019).

Insufficient pharmaceutical workforce (in numbers and skill mix) especially in the developing countries remain a significant barrier to access to NCD medicines. Shortages in the pharmaceutical workforce already constrains the safe, effective, efficient and timely distribution of medicines (Beran et al., 2019). Studies conducted in a few Sub-Saharan countries indicate that on the average, for every 10,000 Tanzanians, there are only 0.16 pharmacists and 0.11 pharmacy technicians. Similar estimates of 0.93, 1.01, and 0.78 pharmacists per 10,000 population were recorded for Nigeria, Sudan and Ghana respectively. This poor state of pharmaceutical workforce further compounds the low-level availability of medicines in the public sector of these countries (Abegunde, 2011).

Medicine quality is also a problem, especially in low- and middle-income countries where limited local production compels cross-border importation for the majority of local medicine needs. For example, a recent survey in Rwanda showed that 20% of hypertensive medicines purchased in the market were of substandard content and 70% were of insufficient stability (Twagirumukiza et al., 2009). The number of recorded cases of falsified (counterfeit) medicines for chronic diseases is also increasing, for example through unregulated internet sales used by patients on chronic treatment (Abegunde, 2011).

The accessibility and cost-effectiveness of medications play a pivotal role in healthcare provision within any community. In instances where medicines are not accessible within the public healthcare system, individuals are compelled to seek alternative sources for their medical needs, frequently resorting to the private sector. While the private sector typically offers better availability of medicines, it also comes with higher costs, which can indeed be prohibitive for certain individuals (Robertson et al., 2015). In Ghana, some studies show that the current (2023) cost of guideline-directed medical therapy for CVDs, especially heart failure, exceeds more than half of the annual income of a patient on the daily minimum wage of GHC 14.88(~US$ 1) (Akumiah et al., 2023).

Out-of-pocket expenditure for chronic NCD medications and hospitalizations often result in catastrophic health expenditure for families and push them further into poverty (Adeniji and Obembe, 2023). This unfortunately is further exacerbated by the increasing burden of NCDs in LMICS which is as a result of ageing populations and an increase in exposure to common risk factors in health systems that are already underfunded and overburdened by infectious diseases. Even in countries where systems to provide UHC exist, under such conditions, the systems become overwhelmed and unable to adequately cover the costs of NCD medications increasing the exposure of patients and their families to catastrophic health expenditure (Beran et al., 2019a). In a population-based study in Nicaragua, it was noted that while the cost of managing type 2 diabetics identified by the health system was 5% of the total budget of the country's Ministry of Health, to manage all the estimated 186,708 people with Type 2 diabetes identified by the study, the country would require 5 times the resources (Beran et al., 2007).

As the disease profile in LMICs transitions from communicable diseases to NCDs, the issue of ensuring the availability and affordability of essential NCD medications becomes increasingly

critical. NCDs signify a fundamental shift in the way healthcare systems are structured and how treatments are administered. Patients must recognize that treatment does not conclude once their symptoms improve, as lifelong therapy is often necessary for conditions such as hypertension and hyperlipidemia, which can sometimes be asymptomatic (Robertson et al., 2015).

The absence of medicines or disruptions in the supply of medications in public healthcare facilities, challenges in obtaining medications from alternative sources, and excessive costs associated with the private sector can all jeopardize patient adherence to treatment, which is essential for achieving the desired clinical outcomes. A study done in Tanzania indicates significant challenges related to availability of NCD medicines especially in public healthcare facilities and rural regions (Robertson et al., 2015). These challenges result in a limited supply of NCD medications, even when they are relatively inexpensive. For example, medications such as metformin, Glibenclamide, and ACE inhibitors have long since lost their patent protection, and there are multiple manufacturers producing these medicines. Furthermore, the availability and affordability of insulin remain widely recognized issues in low and middle-income countries. Additionally, the additional costs associated with essential diabetes supplies like syringes and other diabetes-related commodities further contribute to the overall treatment burden for individuals with diabetes (Beran and Yudkin, 2010).

The WHO's global action plan for the prevention and control of NCDs has established a voluntary target for LMICs. The objective is to ensure that essential NCD medications are accessible and affordable to 80% of the population by the year 2025, encompassing both the public and private sectors (World Health Organization, 2013). In Nepal, it was observed that availability of NCD medicines was less than optimal in the public health sector with a rate of 60%. In contrast, the private sector exhibited better availability with a rate of 78%. The decreased availability in public outlets could be attributed to several factors, including insufficient government funding, challenges in accurately forecasting medicine requirements, and inefficiencies within the procurement and supply chain management systems (Cameron et al., 2009; Kotwani, 2013; Levison and Laing, 2003; Mendis et al., 2007). The limited availability of NCD medications within the public healthcare sector is a widespread issue in many LMICs. This challenge can be attributed to a shortage of the technical and economic resources necessary for the healthcare system to effectively

address the dual burden of both communicable and non-communicable diseases (Bygbjerg, 2012; Cameron et al., 2009).

2.4. Strategies to Improve the Availability of NCD Medicines

The concern with the high morbidity and mortality associated with cardiovascular disease, cancer, chronic respiratory diseases, and diabetes is reflected in the United Nations (UN) Political Declaration on NCDs which states that improving health systems and access to affordable medicines, particularly at the primary care level, is critical for their prevention and control. As part of the global response, the WHO has developed a Global Action Plan and monitoring framework to enable tracking of progress in preventing and controlling these major NCDs. The framework includes a voluntary medicines target of 'an 80% availability of the affordable basic technologies and essential medicines, including generics, required to treat major non-communicable diseases in both public and private facilities'(Robertson et al., 2015). The WHO Model List of Essential Medicines provides a global framework, which is adapted by individual countries into their own essential medicines lists (World Health Organization, 2017).

In Ghana, strengthening the NHIS such that essential medications for NCD management are always available as well as covering the cost of evidence-based novel therapeutics is one such way of addressing the affordability challenge of medications for NCDs. The seemingly high cost of these medications will be offset by the savings from the reduction in the costs of hospitalizations and management of complications of these diseases (Akumiah et al., 2023). Moreover, streamlining the reimbursement process of the NHIS to health facilities is necessary to guarantee prompt and timely payments (Noordman et al., 2010) By simplifying and expediting this process, healthcare facilities can receive the necessary funds without unnecessary delays.

Many policy options exist to address these inaccessibility problems and to achieve, for NCDs, the same three main objectives that are valid for any general essential medicines programme: equitable access (rational selection, affordable prices, sustainable financing and reliable systems); assured quality and safety; and cost-effective prescription and use of medicines (Beran et al., 2019). However, countries vary in their health systems and in the levels of development of their pharmaceutical markets and systems. The options for scaling-up strategies must be specific to each country's needs and best suit the local situation.

Rational selection of a limited range of essential medicines and independently developed evidence-based clinical guidelines are essential for prevention and treatment of NCDs: These form the basis of the national programme of supply, reimbursement, quality assurance and quality use of NCD medicines (Beran et al., 2019). A core set of medicines that will be required for essential NCD interventions particularly in primary care as a minimum requirement, provides a basis for improving availability to NCD medicines in countries. Budget constraints exist in all settings meaning that choices need to be made, thus priority-setting is inevitable and requires evidence-based, transparent processes based on national values and priorities, reflecting the concerns of the public and community at large (Kelly et al., 2012).

To enhance the availability of essential NCD medicines, countries must undertake health systems reforms that encompass various aspects. This includes the development of robust strategies for financing and budgeting for medicines; improving and sustaining adequate pharmaceutical work force; harmonizing the supplies and distribution systems; as well as strengthening and regulatory frameworks (HENNIS, 2017). These measures are essential for scaling-up access to NCD medicines and improving health outcomes for the affected population. It is recognized that to improve access to appropriate treatment in many developing countries, strategies should be put in place for retraining of care deliver personnel in addition to task shifting strategies Healthcare delivery systems of many developing countries are often poorly responsive to the treatment and control of chronic NCDs (and associated risk factors) (Abegunde, 2011).

Tomlinson et al have also suggested increasing the availability and affordability of generic medications through the revision of local intellectual property laws such that only genuine innovator drugs are protected by patents so that the health system can then have access to cheaper generics that are more affordable (Tomlinson et al., 2017). For patented medicines, several other options exist to promote affordability. These include national clinical guidelines which recommend essential medicines for which generic products are available; therapeutic substitution; reimbursement measures (e.g. reference pricing); local production through voluntary licenses; and the flexibilities of international trade agreements to introduce generics while a patent is in force, such as government use and compulsory licenses for local production or importation (Ewen et al., 2017).

Differential pricing is another approach that has been put forward to improve access to NCD medications. This method has successfully been used to improve access to quality antimalarials, vaccines and antiretrovirals and involves manufacturers pricing medications with an eye on patients' ability to pay. A trial of differential pricing for patients on medications for hypertension and diabetes was done in Ghana which showed that while differential pricing improved the ability of patients to purchase the innovator brands under study, this could not be sustained for the subsequent prescription. This was partly attributed by the authors of the study to the insufficient reduction in the prices of the medications to make them truly affordable in the resource limited context (Sarfo et al., 2019).

Although WHO renewed efforts to support the enhancement and the development of countries' healthcare systems will ultimately help to improve primary care systems worldwide, efforts to improve financial access to essential NCDs medicines are often lacking (Kelly et al., 2012). Access to medicines and improvement of financial access are both encapsulated in the Millennium Development Goals (MDGs), providing a global framework for appropriating the synergies between health and economic access. In cooperation with pharmaceutical companies, MDG 8.E. target 17 seeks to provide access to affordable essential drugs in developing countries. This goal is to increase the population with access to affordable, essential medicines on a sustainable basis.

Promoting affordable prices for NCDs medicines can contribute to improving their availability (Abegunde, 2011). Various policy interventions can be implemented so support the affordability of medicines. These include: improved public procurement (although this is often not a problem); social marketing of generic essential medicines through the private sector; generic promotion policies (including preferential registration procedures, quality assurance of generic products, generic substitution, financial incentives and education of prescribers and consumers); separating the prescribing and dispensing functions; controlling the wholesale and retail mark-ups through regressive mark-up schemes; and exempting essential medicines from import tax and VAT (which can be classified as a tax on the sick) (Ewen et al., 2017). For patented medicines, several other options exist to promote affordability. These include: national clinical guidelines which recommend essential medicines for which generic products are available; therapeutic substitution; reimbursement measures (e.g. reference pricing); differential pricing; local production through voluntary licenses; and the flexibilities of international trade agreements to introduce generics

while a patent is in force, such as government use and compulsory licenses for local production or importation (Ewen et al., 2017).

Another way is to strengthen the manufacturing capability of the pharmaceutical sector locally such that they can manufacture generic and biosimilar versions of these medications and provide them at a lower cost to patients. This must be done in tandem with the regulatory agencies as the regulatory barriers limiting the development of these generic medications must also be addressed (Akumiah et al., 2023). Governments will need to assess risk areas in boosting local manufacturing such as the availability of raw materials as well as local production of critical inputs (Mikkelsen, 2023).

While improving local manufacturing capability remains key in meeting local needs for NCD medication, it is worth noting that local manufacturing does not always lead to improved availability and affordability of medications. For instance, metformin, a locally manufactured and low-cost anti-diabetic medicine in Ghana, was still found to be unavailable in 65% of health facilities and 45% of district hospitals (PATH, 2020). Wirtz et al also noted the paradoxical situation in India where medicines remain unaffordable despite their high availability (Wirtz and Moucheraud, 2017).

Studies have proposed strengthening health systems and the healthcare workforce in Ghana as essential strategies to enhance the availability of NCD medicines. The improvement of healthcare infrastructure plays a critical role in this endeavor. It entails investing in the development and enhancement of healthcare facilities, with a particular focus on rural areas where access to quality healthcare is often limited. Upgrading storage facilities is of utmost importance to ensure optimal conditions for storing medicines, thereby preventing degradation, and minimizing wastage. Furthermore, enhancing transportation systems is necessary to facilitate the efficient distribution of NCD medicines from central warehouses to healthcare facilities, especially in remote areas (Wang et al., 2019).

In addition to infrastructure improvements, increasing the number of trained healthcare professionals is imperative for ensuring adequate provision and distribution of NCD medicines. The competency of the healthcare workforce is a key factor in this regard. By investing in the training and education of healthcare professionals, Ghana can ensure the availability of a skilled

workforce capable of prescribing, administering, and monitoring the use of NCD medicines. This encompasses not only physicians but also pharmacists, nurses, and other healthcare workers involved in the delivery of NCD care. Strengthening the capacity of the healthcare workforce is vital to meeting the growing demand for NCD services and to ensure that NCD medicines reach the patients who require them (Orians et al., 2009).

Furthermore, it is essential for Ghana to prioritize the enhancement of its pharmaceutical supply chain system and address financial challenges. The improvement of efficiency and reliability within the pharmaceutical supply chains is of utmost importance to ensure a consistent and timely availability of NCD medicines (Lu et al., 2016). To achieve this, implementing robust inventory management systems becomes crucial in preventing stockouts and minimizing wastage (Wagner, 2018).

Moreover, streamlining the reimbursement process of the NHIS to health facilities is necessary to guarantee prompt and timely payments (Noordman et al., 2010) By simplifying and expediting this process, healthcare facilities can receive the necessary funds without unnecessary delays. In addition, these measures will greatly contribute to a more efficient and reliable distribution of medicines, reducing the occurrence of stockouts and minimizing wastage. It is also necessary to improve upon the metrics and data collection tools to appropriately monitor progress in improving access to NCD medications (Wirtz and Moucheraud, 2017).

CHAPTER THREE

3.0 Methods

3.1 Description of site

The study was conducted across six regions in Ghana namely Greater Accra, Ashanti, Central, Bono East, Eastern and North East regions. These regions were selected based on the proportion of total number of registered pharmacies and over-the-counter medicine sellers (OTCMS). Data from the pharmacy council was based on the initial number of regions in Ghana i.e., ten (10). The regions were ranked and the top six selected. However, Brong Ahafo region was replaced with the Bono East while the North East was included to ensure representativeness across the 3 ecological belts (northern, middle and southern). The Western region was excluded from among the top 6 because at the time approval to commence study was granted, the period for field data collection had elapsed, and any inclusion would have significantly delayed the work further. Table 3.1 provides details of the total numbers of registered pharmacies and OTCMs received from pharmacy council, and which served as the sampling frame from which the facilities were drawn.

Table 3.1: Number of registered pharmacists and over-the-counter medicine sellers (OTCMS) in Ghana (based on the old (10) regions of Ghana) [*Source: Pharmacy Council of Ghana, 2023]*

Pharmacist		**OTCMS**	
Region	**Registered number**	**Region**	**Registered number**
Greater Accra	3178	Greater Accra	5240
Ashanti	1200	Ashanti	5113
Western	284	Western	3052
Central	273	Central	2989
Brong Ahafo	232	Brong Ahafo	2770
Eastern	219	Eastern	2449
Northern	146	Volta	1318
Volta	124	Northern	1229
Upper East	51	Upper East	446
Upper West	33	Upper West	395
Total	**5740**		**25001**

3.2 Study design

The study used a mixed-method cross-sectional study design involving two components (i.e., quantitative and qualitative surveys). There was also the collection and analysis of primary and secondary data. Secondary data and grey/published literature (including policies, plans, guidelines, strategies, reports, and publications) were reviewed, and these provided the relevant information to attain the set objectives of the assignment. Primary data was derived from key informant interviews and facility surveys from randomly selected facilities across six (6) regions.

3.3 Study approach and data collection

Both primary and secondary data were collected simultaneously and subsequently triangulated to facilitate an appropriate interpretation of the overall results. It was anticipated that a more robust result would be generated from a mixed method study than using two approaches independently.

3.4 Secondary data collection and analysis

For desk review, secondary quantitative and qualitative data were collected from grey and published literature on the availability and accessibility of NCD medicines in Ghana. The desk/literature review sought to ascertain the current situation with respect to NCDs medicines gap. The review used the citation chasing approach which involves identifying/locating sources that have been cited by other authors and reference documents. This approach was employed to ensure that only relevant and related documents/materials reviewed. The relevant portions of each material were read and reread on a document-by-document basis to identify any common themes or unique areas relevant to the assignment.

3.5 Primary data collection & analysis

Primary data consisted of two broad arms- quantitative and qualitative:

3.5.1 Component 1: Quantitative arm

3.5.1.1 Study participants

The study involved two main study domains: i.e., pharmacy shops and OTCMS. Participants for this arm of the study include registered pharmacists, pharmacy technicians or recognized

professionals providing services in any of these outlets in the selected regions. Further, any of the professionals in selected public, faith-based facilities (CHAG and/Ahmadiyya) were included.

3.5.1.2 Inclusion and exclusion criteria

The study involved individuals aged 18 years who were currently practicing as drug dispensers, either as pharmacists or OTCMS. These participants must be registered members of the Pharmacy Council of Ghana. Those whose licenses expired were excluded from the study. Internship pharmacists or someone learning under OTCMS were also excluded.

3.5.2 Sample size- Quantitative Analysis

3.5.2.1 Power calculation

The study was powered to address the main aim of identifying the non-communicable medicine gap. The powering of the study was based on an anticipated enrollment of 1540 pharmacists and OTMCS using the estimated sample size for a one-sample proportion test. The study assumed 50% of the null hypothesized value and 46% targeted alternate hypothesized value. We further adopted the z-test for a one-sample test at 85% power at a 95% confidence interval and 10% non-response rate. The power calculation (*power one proportion 0.5 0.46, power (0.85)*) in Stata 16.1 (StataCorp) was used to estimate the required sample size for the study.

In line with the aim of the study, we propose stratifying the size by enumerating 70% (giving us 586) of the total sample size among pharmacists and 30% (giving us 228) among OTCMS. This is because pharmacists handle all classes of medications compared to OTCMS, who are allowed to handle class C medications (a class of medicine that are sold or dispensed only by a registered pharmacist) in Ghana. For this reason, the study assumes 70% of the drugs among pharmacists and 30% among OTCMS. The proposed sample stratification and related sample size by study domain (pharmacist and OTCMS) and region are presented in table 3.2.

Table 3.2 Stratification of study participants by region of operation in private vendors

Pharmacist			**OTCMS**		
Region	**Registered number**	**Sample size**	**Region**	**Registered number**	**Sample size**
Greater Accra	3178	365	Greater Accra	5240	64
Ashanti	1200	138	Ashanti	5113	63
Central	273	31	Central	2989	37
Brong Ahafo	232	27	Brong Ahafo	2770	34
Eastern	219	25	Eastern	2449	30
Total	**5102**	**586**		**18561**	**228**

3.5.3 Sampling

A simple random sampling method was used to select participants. This method was appropriate because the Pharmacy Council of Ghana provided the list of all registered pharmacies and OTCMS in Ghana upon request. Participants were randomly selected from this list based on the target population by region. When a potential participant declined to participate, the opportunity was extended to the next respondent.

3.5.4 Data analysis

Data was captured using the KoboCollect App version 2022.1.2 on an android phone/tablet and was stored on the cloud for retrieval. Data was accessed on the cloud using login identification and password. Data downloads were done in a comma-separated values (CVS) format and further exported to Stata version 16.1 for cleaning, processing, and analysis. After organizing and cleaning the data, frequencies and percentages were presented to all variables related to the study objectives. The following outcomes were estimated (1) availability of medication was calculated as the proportions of facilities having a branded or generic version of each NCD medication available in stock (2) median price of each NCD medication were also estimated and (3) stockout of medications was calculated. The availability and stockout of study medications was evaluated by facility type, level of facility, type of stock and regional levels.

For inferential analysis, univariate association analysis was employed. For univariate data association analysis, categorical variables were analyzed using the Pearson chi-square ($\chi 2$) test, while t-test and Analysis of Variance (ANOVA) were used to analyze significant mean differences for continuous variables normally distributed. If a variable was not normally distributed, the Mann-Whitney U Test or the Kruskal Wallis test was employed separately to assess significant median differences based on the category of the comparison variable.

A Geospatial analysis specifically Geographic Information System (GIS) was employed in this study. By employing the GIS, we can examine the spatial distribution and geographic patterns of the stockout of medications and median pricing of the medications of NCD's in Ghana. This GIS approach enables us to identify regional disparities and pinpoint areas with limited access to essential NCD medications. Additionally, to support policymakers with readily available quality data for targeted policy and interventions strategies, the study produced interactive web-based maps for the stockout and median prices for the NCD medications to improve visualization and identification of regions for urgent interventions.

All estimations were done considering the 95% confidence interval and p-value$\leq$0.05 were deemed significant. Data is presented as graphs e.g., bar charts, histogram among others. Missing values more than 30% were imputed to extrapolate values.

3. 6 Component 2: Qualitative arm

The qualitative arm involved in-depth interviews with key stakeholders sampled from twenty-two (22) institutions, both public and private (self-financing and FBOs), in addition to some participants in the quantitative arm. For all the key informant interviews, appropriate structured interview guides were developed and used. Individuals interviewed were sampled based on their role *(i.e., policy/administration, service delivery, academia, regulation, manufacturing, professional associations and patient group(s))* and were purposively selected. Interviews were conducted virtually, and in-person based on the preference and availability of the respondent. The interviews aimed at exploring the existing gaps with respect to NCD medicines and respondents' recommendations for improvement. As with all qualitative research, the actual questions asked

emerged during the interview situation and in many instances diverted from the guide. The average time for each interview was 47 minutes.

3.6.1 Sample size- *Qualitative Analysis*

This component adopted the method of saturation to arrive at the sample size.

3.6.2 Data collection and analysis

The interviews were conducted virtually on the Zoom virtual platform or in-person and were recorded after verbal consent was sought from the respondents. Notes were taken where respondents declined to be recorded. There were 2 respondents who declined to be recorded during the data collection phase of the assignment. Interview files were transcribed verbatim and critically examined for accuracy and representation of the responses. Qualitative data from the key informant interviews were analyzed using the content and thematic analysis technique. The analysis of the qualitative data was done using NVivo V.14. The quotations presented in this report are all verbatim quotes except in a few instances where they have slightly been modified for conventions of English grammar and readability.

The protocols and procedures employed in this assignment were very detailed and ensured trustworthiness. These included: **credibility --** we ensured the respondent understood the questions by repeating the central questions in the study several times; **dependability** - during the interview process, we took detailed notes and also recorded the interviews; **confirmability** - there was a review and discussion with colleague consultants and researchers with relevant expertise in the study area; **transferability** - full descriptions of contexts are provided including the use of actual quotes relevant to the respondents.

3.7 Training of field data collectors

Members of the data collection team were trained virtually for 6 hours on the data collection instruments and the facility selection. They were further equipped with the basic skills in the collection of the variables of interest, communication, and negotiation skills. The training also covered the use of the Software KOBO Collect. There was a total of 66 data collectors from across the six regions.

3.8 Pilot/Pre-testing

There was a day's pre-testing of the data collection tool by all the data collectors in their respective districts. Data collectors were asked to select any type of facility in the district where they live. There was a debriefing session the following day where data collectors shared their experiences and concerns with the tool, the software, and the challenges in locating the facilities to be involved in the project.

3.9 Methodological and data limitations

There are inherent limitations to the qualitative primary data collection for this study that need to be acknowledged to guide the interpretation of the study of findings. Key informant interviews are frequently used in social science research to help gather sufficient information, insights and identify key drivers/variables/information prior to the design and formulation of a policy or intervention. Even though this is useful, it is important to understand where participant selection and interviewer biases can be introduced so the findings ought to be cautiously interpreted, framed, and validated.

Further, the findings of the desk/literature review were mostly informed by the availability of the necessary documents *(both grey and published)*. Unfortunately, it is likely there could be other key materials that could have complemented the findings of the study but might not have been found. However, as much as possible, sufficient effort was made to get as many relevant documents and materials on the subject matter

Acknowledging the limitations above, we mitigated these biases through: (1) careful selection of respondents, (2) use of experienced interviewers, (3) reviews of transcriptions/analyses by multiple individuals, and (4) triangulation of the interview findings with findings from the literature review. Internet connectivity challenges were mitigated by either postponing interviews or working within the constraints to get the interviews done.

CHAPTER FOUR

4.0 Results

4.1 Findings from quantitative studies

4.1.1 Background characteristics

There was a total of 591 respondents from 6 regions i.e., Greater Accra, Ashanti, Central, Eastern, Bono East and Northeast. The majority of the respondents were from Greater Accra (224, 37.9%) while the least number of respondents were from the North East region (4, 0.7%) (Table 1).

Table 1: Regional breakdown

Regions	**Freq.**	**Percent**
Greater Accra	224	37.90
Ashanti	130	22.0
Central	105	17.7
Eastern	67	11.3
Bono East	61	10.3
North East	4	0.68
Total	**591**	**100.00**

Most of the facilities visited were community pharmacies (OTCMs and pharmacy shops) (504, 85.2%) (Table 2). Further, more than half of the community pharmacies visited were actually pharmacy shops (Table 3) while majority of the public facilities visited were district hospitals (47.7%) (Table 4).

Table 2: Type of facilities

Type of facility	**Freq.**	**Percent**
Private self-financing [Community pharmacy (OTCMs and Pharmacy shops)]	504	85.2
Public	71	12.0
Private self-financing (Hospital)	8	1.4

Faith-based (CHAG)	8	1.4
Total	**591**	**100.00**

Table 3: Type of private self-financing facility

If private self-financing, specify	**Freq.**	**Percent**
Pharmacy shop	315	53.3
OTCMS	198	33.5
Primary	71	12.0
Secondary	7	1.2
Total	**591**	**100.00**

Table 4: Type of public facility

If public facility, level of facility	**Freq.**	**Percent**
District hospital	45	59.2
Health center	17	22.4
Polyclinic	12	15.8
Tertiary	1	1.3
CHPS	1	1.3
Total	**76**	**100.00**

Majority of the respondents were males (310, 52.5%), aged 30-39 years (238, 40.3%), were educated up to the tertiary level (407, 68.9%), were Christians (540, 91.4%), single (324, 54.8%) and had worked in the facility between 1-5 years (347, 58.7) (Table 5). More than two-thirds (498, 84%) of the facilities visited do not accept the national health insurance card. further, about (516) 87% of the respondents had taken their full doses of COVID-19 vaccine.

Table 5: Demographic characteristics of the respondents

Variables		Frequency (n=591)	Percent
Age group	<19 years	2	0.3
	20-29 years	231	39.1
	30-39 years	238	40.3
	40-49 years	53	9.0
	50-59 years	32	5.4
	60 years or more	35	5.9
Gender	Male	310	52.5
	Female	281	47.5
Educational Level	None	11	1.9
	JHS	8	1.4
	SHS	165	27.9
	Tertiary	407	68.9
Religion	Christianity	540	91.4
	Islamic	37	6.3
	Traditional	3	0.5
	Others	3	0.5
	Unknown	8	1.3
Marital status	Single	324	54.8
	Married	252	42.6
	Divorced	7	1.2
	Co-habiting	8	1.4
Number of years working in the facility/Pharmacy	<1 year	99	16.8
	1-5 years	347	58.7
	6-10 years	86	14.6
	>10 years	59	9.9

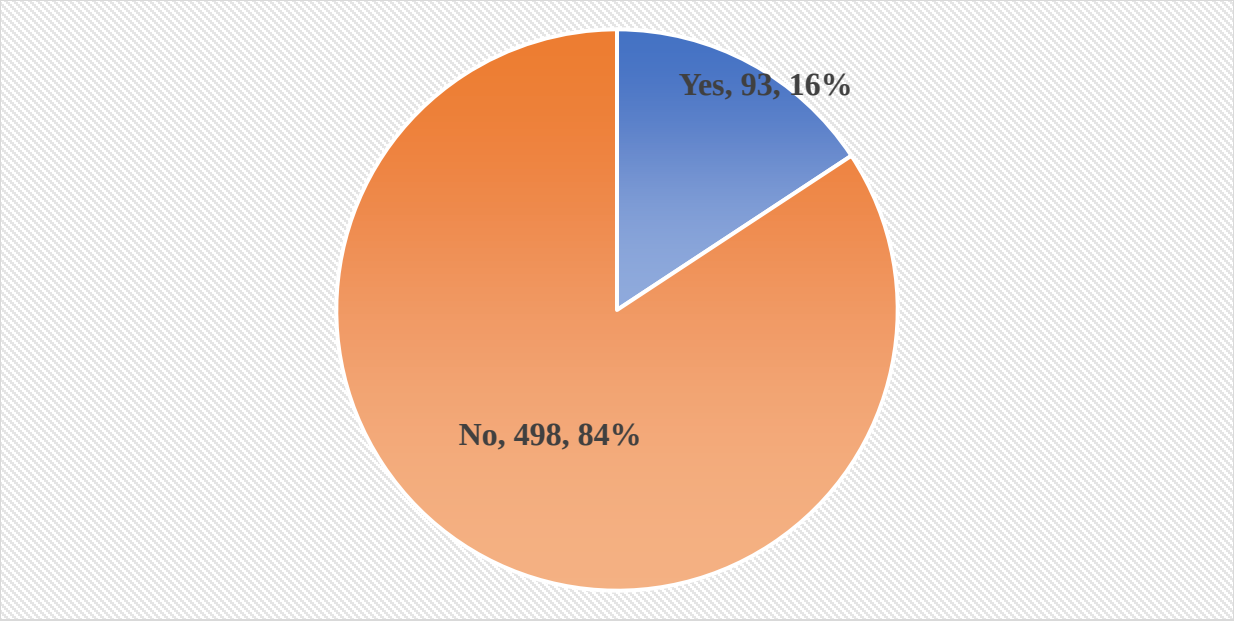

Figure 1: Does the facility accept national health insurance.

4.1.2. Medications

Availability of medicines varied across the study regions and depended mostly on the type of medications.

*Drugs meeting the WHO criteria of 80% availability of essential medicines, including generics in health facilities are highlighted in bold.

Table 6: Availability of Drugs to manage various NCDs

No	Condition	Total Availability (%)	Availability across levels of Facilities (%)			
			OTCMS	Community Pharmacy	1^0 Level Health facility Pharmacy	2^0 Level Health facility Pharmacy
1	Hypertension	**85.3**	58.1	**99.4**	97.2	**100**
2	Diabetes	75.0	33.8	**96.5**	**98.6**	**100**
3	Asthma	68.0	31.3	**85.1**	**93.0**	**85.7**
4	COPD	71.1	52.5	**80.0**	**81.7**	**85.7**
5	Sickle Cell Disease	**97.2**	**94.4**	**99.4**	**95.8**	**100.0**
6	Cancer	6.4	2.5	9.5	2.8	14.3
7	Mental health disorders	78.5	44.4	**95.9**	**94.4**	**100**

The availability of drugs (medicines) for the management of various NCDs was assessed as the percentage of facilities stocked with drugs for the management of the conditions, as well as drugs for the management of some acute complications of the diseases. See Appendix 1 for the availability of specific drugs.

Drugs (medicines) for the management of sickle cell disease and hypertension had the highest availability with 97.2% and 85.3% respectively. The high availability of drugs (medications) for the management of Sickle cell disease was most likely influenced by the presence of analgesics, IV fluids and antibiotics (Broad spectrum Cephalosporins) which are the mainstay of the management of acute sickle cell crises and are more widely available and used in the management of many other conditions as well. The availability of hydroxyurea, a drug used to prevent these sickling crises, however, was low, with only 9.8% of facilities sampled having it available (see Annex 1).

Drugs (medicines) for the management of Cancers were the least available with only 6.4% of facilities assessed carrying them. This is likely due to the specialized nature of the management of cancers as well as the high cost of most of these drugs (medicines). Generally, availability of drugs

(medicines) increased according to the level of the facility. The higher the level of health facility, the more available the drugs (medicines) are.

Table 7: Availability of drugs to manage Hypertension

	Drug Class	Total Availability (%)	Availability across levels of Facilities (%)			
			OTCMS	Community Pharmacy	1^0 Level Health facility Pharmacy	2^0 Level Health facility Pharmacy
	Beta Blockers	66.1	14.1	**95.2**	78.9	**100**
	Calcium channel blockers	**83.6**	53.5	**99.1**	**97.2**	**100**
	ACE Inhibitors	71.1	25.8	**95.2**	**87.3**	**100**
	Angiotensin Receptor Blockers	64.6	22.2	**95.9**	76.1	**100**
	Diuretics	**80.7**	47.0	**97.8**	**97.2**	**100**
	Alpha Blockers	5.2%	0.0	9.2	2.8	0.0

*The availability of antihypertensives was assessed as the percentage of facilities stocked with drugs (medicines) under the listed medicine class. See Appendix 1 for availability of specific drugs (medicines)

Drugs for the management of hypertension generally had a high availability, with between 64.6% and 83.6% of facilities assessed carrying different classes of antihypertensives. The exception to this was the alpha blockers which had an availability of 5.2%. This is likely due to the fact that alpha-blockers are typically not the first line of management for hypertension and are used in conjunction with other drugs when blood pressure is difficult to control.

The most commonly available antihypertensives were the calcium channel blockers (CCBs), Amlodipine and Nifedipine, as well as Bendroflumethiazide, a thiazide-like diuretic which were stocked by 79.7%, 78% and 72.8% of facilities assessed respectively. CCBs and thiazide-like diuretics are the first line drugs in the management of hypertension and according to the national guidelines for the management of cardiovascular disease, they can be prescribed at any facility with a physician assistant upwards.

Table 8: Availability of drugs to manage Diabetes

	Drug Class	Total Availability (%)	Availability across levels of Facilities (%)			
			OTCMS	Community Pharmacy	1^0 Level Health facility Pharmacy	2^0 Level Health facility Pharmacy
	Soluble Insulin	27.9	0.0	34.9	69.0	**85.7**
	Mixed Insulin	26.6	0.0	36.2	52.1	**85.7**
	Biguanides	75.3	34.8	**95.5**	**95.8**	**100**
	Sulfonylureas	57.9	17.2	78.7	76.1	**85.7**
	DPP-4 Inhibitors**	8.1	0.0	14.9	1.4	0.0
	Thiazolidinediones	24.0	0.5	36.5	32.4	42.9
	SGLT2 Inhibitors**	5.8	0.0	10.5	1.4	0.0
	GLP-1 agonists**	0.5%	0.0	0.6	1.4	0.0
	Combination OHA	35.4	1.5	63.5	7.0	14.3

*The availability of insulin and Oral Hypoglycaemic Agents (OHA) was assessed as the percentage of facilities stocked with drugs (medicines) under listed medicine class. See annex for availability of specific drugs

**DPP-4: Dipeptidyl Peptidase 4, SGLT2: Sodium-Glucose Transport 2, GLP-1: Glucagon-like Peptide 1

There was poor availability of drugs for the management of diabetes with no drug hitting the WHO's recommended target of 80% though this may have been influenced by the fact that many of the medications were not stocked by OTCMS. Metformin (a biguanide) was the most available oral hypoglycaemic agent while for all the various types of insulins, less than 50% of facilities assessed stocked them. The number of facilities assessed which stocked glucagon and 50% Dextrose which are used to manage hypoglycaemic emergencies were low although this may be attributable to the fact that such cases are usually managed in a hospital setting so they may not be stocked in community pharmacies and OTCMs which are not in the vicinity of a health facility.

Table 9: Availability of Drugs for the management of Acute Complications of Chronic Conditions

	Drug Class/Drug	Total Availability (%)	Availability across levels of Facilities (%)			
			OTCMS	Community Pharmacy	1^0 Level Health facility Pharmacy	2^0 Level Health facility Pharmacy
	IV Fluids	**80.9**	47.0	**97.8**	**98.6**	**100**
	Antiemetics	61.3	18.7	**85.4**	71.8	71.4
	Antibiotics	**90.4**	71.7	**99.7**	**100**	**100**
	Antiarrhythmics	25.3	1.0	41.6	19.7	42.9
	Nitrates	17.8	0.5	29.5	15.5	0.0
	NSAIDS	**99.2**	**98.0**	**99.7**	**100**	**100**
	Opioids	60.4	12.1	**84.8**	**83.1**	**100**
	Nebulized Salbutamol	48.2	12.1	61.3	**88.7**	71.4
	Ipratropium bromide (Nebulized)	10.3	0.0	15.6	15.5	14.3
	IV Aminophylline	13.9	0.01	14.0	49.3	14.3
	Soluble Insulin	20.3	0.0	23.2	59.2	71.4
	Glucagon	1.4	0.0	2.5	0.0	0.0
	IV Labetalol	18.5	0.0	21.6	50.7	71.4
	IV Furosemide	34.5	3.5	42.5	77.5	**100**
	IV Mannitol	17.3	0.0	18.7	56.3	42.6

The availability of drugs for the management of acute complications of NCDs was assessed as the percentage of facilities stocked with drugs or drugs under the listed medicine class. See annex for availability of specific drugs

Poor management of NCDs may result in some acute complications such as, strokes, arrhythmias, heart failure, sickle cell crises and asthmatic attacks which also need to be managed to reduce morbidity as well as prevent mortality. The availability of these drugs was influenced by their use

in the management of other conditions, with analgesics such as NSAIDS, IV Fluids and antibiotics which are used in the management of acute exacerbations of Sickle cell disease and COPD having high availability of 99.2%, 80.9% and 90.4%. These groups of drugs are used in the management of many acute and chronic conditions and as such are necessary and cost effective to stock. The availability of the drug dropped the more specialized its use with drugs like nebulized Ipratropium bromide, which is used in the management of severe asthmatic attacks and glucagon which is used to manage hypoglycaemia being available in 10.3% and 1.4% of facilities assessed respectively. The availability of these drugs for the management of acute complications of NCDS, were relatively higher in the pharmacies of secondary level health facilities which likely reflects their capacity to manage these conditions.

According to the Food and Drugs Authority (FDA) classification of medicines, OTCMS are permitted to carry very few of the drugs used in the management of NCDs. The drugs used in the management of NCDS that they are allowed to stock include aspirin and analgesics such as ibuprofen, paracetamol and diclofenac. They are also allowed to stock anti-asthmatic compound preparations, containing not more than 120mg of Theophylline and 11mg of Ephedrine. However, from the assessment, the OTCMs were found to stock a wide range of medications for the management of various NCDs including those they are not legally allowed to carry.

Median Prices of NCD Medicines

The prices of the medicines varied from as low as 0.2 (0.15-4.00) for Paracetamol Analgesics oral to as high as 196.48 (165.00-234.25) for Combination Inhaled and Long-Acting Beta-Agonist (Table 10).

Table 10: Median prices of medicine available

Name of medicine	Median price (GHC)
Beta Blocker	1.59 (0.93-2.52)
Calcium Channel Blockers	3.23 (1.88 – 4.11)
Ace Inhibitors	1.63 (0.93 – 2.13)
Angiotensin Receptor Blockers	4.17 (2.88 – 7.08)
Statins	3.43 (0.76 – 4.08)
Diuretics	1.71 (1.05 – 2.47)
Anticoagulants/ Antiplatelets	53.97 (40.28 – 64.34)
Alpha Blockers	1.63 (1.26 -2.83)

Alpha Agonists	2.17 (1.75 – 2.66)
Corticosteroids Tab	1.30 (0.74 – 5.85)
Corticosteroids IV	37.50 (12.43 – 53.00)
Para Analgesics IV	2.00 (1.25 – 4.00)
Para Analgesics Oral	0.2 (0.15 – 4.00)
Para Analgesics Supp	23.00 (20.00 – 28.00)
NSAIDS oral	1.05 (0.76 -2.00)
NSAIDS IV	2.00 (1.10 – 3.00)
NSAIDS supp	2 (1.00 – 2.00)
Opioids oral	21.00 (11.80 – 40.75)
Opioids IV	26.20 (21.00 – 30.00)
Ischemic Heart Disease (Angina Pectoris, ACS)	3.00 (1.69 – 5.36)
Stroke	16.05 (10.44 – 21.21)
Vasodilator	25.00 (16.00 – 31.20)
Antiarrhythmics	18.53 (11.04 – 27.71)
Asthma Nebulized	42.12 (27.15 – 69.79)
Asthma Inhaler	94.63 (79.98 – 120.13)
Combination Inhaled and Long-Acting Beta-Agonist	196.48 (165.00 – 234.25)
Chronic Obstructive Pulmonary Disease, Inhaler	12.50 (7.20 – 17.50)
Chronic Obstructive Pulmonary Disease, Syrup	9.75 (6.76 -19.50)
Antibiotics	2.74 (1.68 – 6.85)
Diabetes	17.30 (17.10 – 31.90)
Insulin	94.63 (63.19 -111.25)
Mixed insulins	97.50 (71.48 -118.83)
Sulfonylureas	1.39 (1.14 – 2.47)
DPP-4 Inhibitors	14.07 (9.05 – 21.98)
Thiazolidinediones	9.19 (5.96 – 12.78)
SGLT2 Inhibitors	27.45 (26.25 – 30.65)
GLP1 agonists	-
Combination OHA	8.98 (7.38 – 11.57)
Cancer chemotherapy agents	16.00 (5.07 – 22.33)
Antiemetics	3.20 (1.47 – 4.00)
Genetic Diseases (Sickle Cell)	9.11 (5.01 – 15.83)
IV fluids	12.00 (9.53 – 15.00)
Antibiotics	14.43 (9.38 – 18.94)
Mental health disorders	2.90 (1.98 – 4.49)
Benzodiazepines	1.93 (1.55 – 4.30)
Antipsychotics	1.03 (0.59 – 1.88)
Antidepressants: TCAs	1.48 (0.79 – 1.84)
Antidepressants: SSRIs	1.33 (0.90 – 1.75)
Anticholinergics	1.54 (1.01 – 2.24)

4.2 Findings from qualitative studies

4.2.1 Introduction

This section of the report presents the findings of the qualitative aspect of the study A total of 29 respondents were interviewed from 22 institutions across the country and include patients, healthcare providers, regulators, and others in policy and administrative role. Table 1 presents details of the demographic characteristics of the respondents.

Table 1: Demographic characteristics of respondents.

Description of respondents	**Freq (%)**
Category	
Academia	
Fellow- CDD	
Total	**1 (4.55)**
Association	
Pharmaceutical Society of Ghana (PSG)	
Ghana Medical Association	
Ghana Coalition of NGOs in Health	
Pharmaceutical Manufacturers Association	
Total	**4 (18.18)**
Policy	
Ministry of Health (MoH)	
Ghana Health Service (GHS)	
Christian Health Association of Ghana (CHAG)	
Total	**3 (13.64)**
Regulation	
Food and Drugs Authority	
Ghana Revenue Authority- Customs Division	
Ghana Standards Authority (GSA)	

National Health Insurance Authority (NHIA)	
Total	**4 (18.18)**
Manufacturing	
Kinapharma	
Total	**1 (4.55)**
Service delivery	
Patients	1
Providers	9
Total	**10 (45.45)**
Level of Facility	
Tertiary	2
Secondary	1
Primary (District Hosp)	4
Primary (CHPS)	2
Total	**22 (100.00)**
Gender	
Male	19 (65.52)
Female	10 (34.48)
Total	**100**
Education	
Tertiary	26 (89.66)
Secondary	3 (10.34)
Total	**100**
Category of institution	
Public	18 (69.20)
Self-financing private sector	5 (19.20)
Private sector (FBO, NGO etc)	3 (11.50)
Total	**100**

One of the main objectives for NCD care is improved treatment outcomes. Therefore, anything that stands in the way of this objective is a gap that must be addressed. We explored the views of respondents on the availability of NCD medicines in Ghana:

4.2.2 Availability of NCD Medicines in Ghana

It was generally agreed that Ghana has almost all the required drugs for the management and treatment of noncommunicable diseases. Respondents were of the view that these medicines were available either in public or private health facilities or the community pharmacies and on national essential medicines list. These medicines were also available either through local production or imports.

"… most of the other drugs or most drugs are available if you are looking for it even if you won't get it in a public health pharmacy, you will get it in a private pharmacy. So, most of the drugs are available…" (Respondent_ Provider_01)

Comparatively, NCD medicines are available more in the private and community pharmacies than the public facilities. Further, emergency medicines are also less readily available than those for chronic care:

"… It is only a few emergency medicines that are not easily available for cardiac conditions; like you have somebody having Supraventricular tachycardia, you need iv adenosine a lot of the time you send patients to the pharmacies across Korle Bu which are private pharmacies for patients to get this purchase. If you have thrombolysis, the medication – tPA, is not usually stocked in Korle Bu so that one too we must get it across some of the pharmacies, sometimes we even must call Movenpick pharmacy to get some of the medications quickly brought in for us to handle some of the patients. But by and large, many of the medicines are available and we do give them…" (Respondent_ Provider _02)

Some respondents also indicated that, though most of the medications were available, they were not always available in public facilities unlike in the community pharmacies because of issues of stockouts mainly because of NHI and this accounts for most of the empty shelves, especially in public facilities:

"… But generally, if you were to look at for example the hypertension, diabetes which we will say maybe the main ones, generally they are available now. I would look at it from the physical

availability in the sense that hospital based, and then should I say community pharmacy… Community pharmacy based generally you have almost all the medications all the way to the advanced ones on the market depending on the demand. And then you have the hospital based one being the, where there are challenges because of stockouts and other issues and mainly because of the NHIA issues that come… But generally, they are available. The common ones, the nifedipines and co are available. Now when you move to the anti-cancer medications and co, of course those ones too, mainly they are in the hospitals rather than in the community pharmacies. (Respondent_ Manufacturing_ 02)

Similarly, another respondent was of the view that, apart from the chemotherapeutic agents, most of the common NCD-related medications were readily available:

"… apart from, let me say some chemotherapeutic agents, largely we have quite a lot of them. If you take the common ones, diabetes, and hypertension, we have quite a very wide range of medicines, both the generics and innovator brands; we have so many of them, so many of them in the in this country actually…" (Respondent_ Policy/Admin_ 03)

4.2.3 Cost of medicines

Though respondents acknowledged the availability of medicines especially for chronic care in Ghana, the cost of these drugs was a limiting factor to access. Medicines' cost in Ghana was generally described as "too expensive" and because of this, most of the facilities/pharmacies end up discarding these drugs (medicines) because they get expired on the shelves. Oftentimes, these drugs (medicines) are priced far beyond the means of patients, especially when they are not on the NHI-list:

"…If you stock your pharmacy with these drugs, they tend to expire on you because the patient will not buy it, they can't afford to buy it… the cost is what becomes a deterrent for most of the clients; so, when you keep seeing your clients coming in with CVA sometimes it's not about the quality of care, it's about the quality of the drug they've been purchasing and sometimes they default in medication because it has become too expensive for them to purchase…" (Respondent _ Provider_03)

Further, the drugs (medicines) are very expensive for certain conditions as well though they are readily available. Unfortunately, due to cost, patients are not able to afford them when they are prescribed, and this further worsens their conditions:

"… Yes, the drugs are available, it's the cost that is an issue. It's not all of them that are very expensive but all things being equal, once you say a patient has a heart failure, especially the

type that we call reduced ejection fraction, then they need to be on either an ACE inhibitor or an ARB, and neurolysin inhibitor; they need to be on the mineralocorticoid receptor antagonist; they need to be on an SGLT2 inhibitor and they also need to be on a beta-blocker. Because evidence have shown that, when they are on these, then you have much improvement but what happens is some of them cannot afford, or let me say, most of them cannot afford, especially, when it comes to the neprilysin inhibitors and the SGLT2 inhibitors. So, usually we must deal with the ones that the patient can afford, probably, the ACE inhibitors, ARBs, the beta-blockers and also the mineralocorticoid; and even the mineralocorticoid receptor, antagonist, they are getting expensive…." (Respondent_ Provider_ 04)

Unfortunately, the socioeconomic status of the patient plays a key role with respect to accessibility to medicines in Ghana. The situation gets worse especially where patients are not registered under the NHIS:

"…Then there can be the socioeconomic gap, where the person has got a prescription, understands the prognosis because the doctor has explained… But from an affordability point of view, cannot purchase the medicine, and doesn't have NHIS…" (Respondent_ Expert_01)

It was also indicated that, because of cost, some patients do adopt subtle behaviours such as self-medication and even avoid going to the hospitals when they are sick. For some respondents, the average cost of medication in the country is just too expensive:

"… a lot of people go to buy their own medications without being diagnosed. Sometimes because of the costs at the facility, you take your card, you pay, you do this, you do this. So, if at the end of the day they will tell me it's malaria, then why not walk straight to the over the counter and get lunarte or something else and move on. The cost is also a factor. I don't know, but they issue NHIS cards and still people pay at the facility. So, they are burdens not to even visit, but to buy on their own, do self-medication and self-treatment and it is also very worrying. So, the average cost is expensive, I can put it that way. The average cost, because people who are holding cards still do some form of payment, and aside that, like I am telling you, they are not even satisfied with their treatment, so something needs to be done…" (Respondent_ Association_ 04)

Community pharmacies and health facilities also adopt various strategies in their quest to enable their clients/patients get the medicines prescribed them sometimes by either selling generics or brands depending on the socioeconomic status of the client:

"… If you stock your pharmacy with these drugs, they tend to expire on you because the patient will not buy it, they can't afford to buy it if I write maybe amlodipine, losartan combination for a client, usually I will write it in a generic form. If the client go to a high-end pharmacy, the client

might probably be sold something like Exforge but if the client goes to a low end pharmacy they might sold just generic amlodipine plus generic losartan to take together so they realize that that one is cheaper but the problem with that one is that it's coming in singles, that has issues with compliance because now the client is two drugs at once instead of one drug at once and then sometimes they tend to forget, sometimes some it get finished before the other, someway somehow they manage to do that so then the issue of compliance and adherence comes in. So, the clients may not consciously be not taking the drug as it should and compromising on the quality of treatment but the circumstance around the client is what causes that to happen…" (Respondent_ Provider _01)

Further, the study explored the current gaps that affect medicines availability and the possible factors in Ghana. These findings are organized thematically and presented in the following:

Facility/Prescribing levels

Another factor that affects access to NCD medicines is the categorization of prescriber or facility levels which determines which cadre of staff and at what level of the health facility can he or she prescribe any of the NCD medications. Unfortunately, the facilities are not reimbursed by the NHIA when they go contrary to this directive, and for that matter are not reimbursed. This according to providers affects access and adherence to treatment by the patients:

"… Until December of last year we were classified as a polyclinic, so there were certain drugs that technically we were not supposed to prescribe or that if we prescribe we will not be reimbursed by the national health insurance which was difficult because like I told you in the beginning I am a family medicine resident, I am deputy chief medical officer so I am supposed to be able to prescribe almost the drugs, but if I prescribe it insurance will not reimburse the clients and in our community, a lot of people are heavily dependent on the insurance so then that creates a challenge, If you stock your pharmacy with these drugs, they tend to expire on you because the patient will not buy it, they can't afford to buy it; so that is the challenge with the drugs and its accessibility to the people…" (Respondent_ Provider_01)

Another respondent also explained further how these facility/prescription levels are having a negative effect on some aspects of service delivery such as medical missions and specialist outreach consultations in the country:

"… if as a cardiologist, I go on a medical mission to let's say the Bawku Regional Hospital and I go and see patients who have heart failure, health insurance is not going to pay for some drugs that are prescribed there even if they are on insurance because the level that they have assigned to that hospital is, probably, up to medical officer level. So instead of having a system whereby

we have the prescriber level, we want the cheap way, which is the institutional level. If I go to a CHPS compound today and I go and see a patient as a cardiologist, a patient who has hypertension, health insurance will not be reimbursed if the patient is given some antihypertensives at the CHPS compound even though I am a cardiologist. So, this is a big thing, we've raised it – I was on a committee for the health insurance, and we were reviewing drugs and other things, and we were always talking about it and they will tell you that is not what the policy says, so it even affects missions…" (Respondent_ Provider_04)

Unfortunately, this policy (prescriber/facility) will further have negative repercussions on some of the interventions like referral and the teleconsultation call center that are being advanced by projects such as the Ghana Heart Initiative (GHI). It was mentioned that GHI has developed a call center where providers at the lower levels are supported to treat/manage their cases before they consider referring up. However, the concern is, what happens when a prescription is suggested by this specialist at the higher level to the non-specialist at the lower level that he or she is not allowed to prescribe or dispense? These prescribing levels have implications on cost and a determination of whether one's facility will be reimbursed or not:

"… It depends on the prescribing level NHI has assigned to the drug, that will determine if you can prescribe that drug for the person or not. If you prescribe outside the prescribing level, it means you are telling the patient to go and buy it which also is not the best because some patients don't have the money, all they have is the NHIS so you must prescribe within what the NHIS can afford for your facility…" (Respondent_ Provider_02)

Some respondents with policy/administrative and regulatory roles also expressed varied opinions on this. Some were of the view that the prescribing level was good to ensure patient safety and quality. They were of the view that there was the need to restrict medications across various levels because of the quality of expertise and the diagnosis capability at the respective levels.

"… But as I say, it's not a bad thing in this sense, because the medications have what goes with them. If you are writing certain medications, you want to be sure of their blood, like liver function, renal function, also check whether for example, if you are going to give injection to the patient, it has a very narrow therapeutic window. What it means is, any mistake over overdose you have a problem. Also, they have serious interactions with potassium and any mess with the potassium can kill the person. And so, you want to have the capacity to be able to test potassium at that level. Most health centers don't have that capacity. So, if you say, oh, let the person go and receive the medications there, that professional one, knowledge wise is not trained to dispense that medication. They also don't have a pharmacist there to advise. Mostly they are MCAs or DTCs. So, you want to be careful how you give that…" (Respondent_ Association_ 04)

According to respondents, the category of professional that can prescribe what drug (medicine) and at what level of the health system was set by the regulator. For instance, there are drugs (medicines) that are categorized as over-the-counter, pharmacist-initiated, or prescription-only medicines:

"… whether the product is classified as over-the-counter medicine, or a pharmacist-initiated medicine or a prescription only medicine. So, who can prescribe what... For prescription only medicine, it is only a certified medical officer who can actually prescribe that drug for it to be used, and if it is a pharmacist initiated, a pharmacist or a medical doctor can also prescribe that drug; and least it is an over-the-counter medicine, you don't necessarily need a form of a prescription to get it. So, you can walk into a pharmacy or over-the-counter medicine seller and then you will acquire it, that is for over-the-counter medicine… So, it is a, it is part of the conditions of approval. We will tell you how the product is supposed to be distributed in terms of the explanation I have given… FDA does the classification…' (Respondent_ Regulation_ 01)

These prescription levels are, however, set during the development of the Standard Treatment Guidelines (STGs) by the Ministry of Health (MoH). The prescription level is influenced by the level of expertise required and available to manage any possible drug (medication)-related adverse events. Other considerations are the diagnostic capacity available in the facility and the nature of the drug being prescribed:

"… when we are developing our standard treatment guidelines, for each medicine that we list we indicate at what level… what determines these levels? The level of expertise that you require. If you are taking paracetamol in other jurisdictions for a long time, it is required that your liver function test should be done at least twice or quarterage whiles you are on other medications. So, the level will be determined considering many factors, one of which is drug, the nature of the drug itself, and kind of expertise that you require, you want to find out whether at the level that we've assigned that can be used, whether the required expertise is available… People are taking drugs that at their level they are not supposed to be prescribing, so it is a gamut of issues…" (Respondent_ Policy/Admin_ 01)

In instances where prescribers have however defied the restriction of prescription levels, patients have had to make out-of-pocket payments when the medication covered under the NHI else the facility will not be reimbursed:

"… we have a lot of primary level hospitals where there are certain antihypertension, or I mean cancer medications that you cannot prescribe at your level. In those cases, you actually are

forced to say that the patient should pay, because not paying will mean that they not having access to their medicines. And when people begin to pay, then it becomes a challenge. So, there is a policy and practice mismatch somewhere that limit access and is purely due to the access levels..." (Respondent _ Policy/Admin_ 03)

In addressing the associated challenges with prescription levels and improving accessibility, respondents suggested the need to strengthen the referral system and the capacity at the district or primary hospital level.

"... So, if we really want to help the people, what we can do is that for the first contact or first to three contacts, let it be done at the district hospital. And so maybe people have come to screen people. They found that somebody BP is 180/110, referring to the district hospital; let the doctors work out all the investigations, but after that refer to the clinic for the routine medication or the refills to be done at intervals. So, every six months, maybe the person can now come to the District Hospital for review, or maybe one year's review by the physician specialist or the medical officer, whatever it is. But you cannot say that every month even when you are doing refills, people should travel all the way to the District Hospital to be seen. That's the point that I am coming from. So, we can design something out of if you don't want them to be seen by Physician Assistants because we fear complication..." (Respondent_ Policy/Admin_ 03)

The Ghana Health Service (GHS) is introducing the concept of the Network of Practice (NoP) as a way of addressing the challenges associated with prescribing levels. With this concept, there will be a model health center that will be adequately equipped to sufficiently improve access to care including NCDs, and the NHIA will reimburse as and when. One of the respondents provided some further insights:

"... this time we are promoting the concept of network of practice. The networks are going to be credentialed by NHIA, so once you are within the network you can prescribe, and they'll pay for it. It is a concept that would really help to improve access... currently it's only I think Central, Volta and Ashanti or so, I am not sure about that. But Central has started, we've just started recently. So, they model the health centre and they are trying to strengthen the subdistrict level; so, the model health centre is given logistics and capacity and everything to build their level up a bit. And the satellite facilities around the model health centres and they would report to the model health centre and if there is an issue they can quickly refer. So, once you are within that network all your facilities are credentialed..." (Respondent_ Policy/Admin_ 03)

4.2.4 Policy incoherence

Some respondents though commended the MoH for the many policies available in ensuring improved access and availability of quality and safe medicines on the Ghanaian market, they

however expressed concerns about how incoherent some of the policies are because of its effect on access especially for patients' resident in communities with no access to specialist care:

"… and it's a little unfortunate that some of our policies, I mean, the policy and practice do not… there is a mismatch between our policy and practice. So, you are somewhere in Agyakufa, a village in the Brong-Ahafo where it is a physician assistant that is there; very large community with surrounding neighborhoods… Where this is the only facility that is serving the community and then insurance says that at that level maybe you can't prescribe antihypertensives. But there are people in that community who have hypertension. So straight away what you are saying is that if you have hypertension in this community, you cannot go to this clinic because is a physician assistant who is there; at the level that they are, they are not level B, so they cannot prescribe antihypertension. What do the people do? It means that they now must go to the District Hospital somewhere in I mean Dorbu before they can access, when the person doesn't have money for transportation to go, it means that his hypertension, he has to get complication because now he can't have access to anti-hypertensive, he's diabetic, he can't have access to antidiabetics and things like that. So that is I mean another challenge…" (Respondent_ Policy/Admin_ 03)

Other areas of policy incoherence were incentivizing players in the manufacturing sector. For instance, respondents were concerned that some of the government policies favored importers more than manufacturers. This was at variance with the efforts by the government to create the required investment climate for industry including the pharmaceutical sector:

"… there are policies that favour industry… we used to have a legislative instrument LI-2218, and in it had raw materials and packaging materials that had VAT exempted for those raw materials and packaging materials. So, it favored industry, but we were campaigning for it from the current government, we have to revise that and then some imported medicines that are not made locally to also have VAT exemption. So even though it is an incentive for importers, it is a disincentive for manufacturers when you decide to go into the manufacture of those products. Because what will happen is that your products would attract VAT, but their products will not attract VAT… we currently pay VAT for alcohol and sugar because those products or those inputs can be used in several industries. But people who import them and then have them as finished product sometimes do not pay VAT on that product if that product is in that LI 2255…" (Respondent_ Association_ 02)

Some respondents recommended the need to revise the policy on prescribing level to ensure that at least lower-level facilities are able to do drug (medicine) refills for stable patients as a way of improving access and even decongesting the secondary and tertiary-level facilities:

"… to be able to enable greater access to care, we may have to review the level of care for some of the NCD conditions to make them, to bring them closer to the community. In fact, I think that generally we should be prioritizing more community care for some of these conditions than you know, elevating to the higher levels of care for some of them that are not as risky as they should be for them to assess care at that level…" (Respondent_ Association_ 01)

4.2.5 Quality & Efficacy of Medicines

Quality and efficacy concerns of the medicines varied from the respondents and there was no consensus on this. While some respondents indicated that some of the medicines on the counters are of poor quality and substandard, others thought otherwise:

"… I think we haven't had any problems with the medicines from the medicines we get from KK pharmacy. I don't remember having any problem with any of those are far as the efficacy is concerned… (Respondents_ Provider_03)

Some of the providers indicated that, some of the key stakeholders in policy/administration equally have reservations with the quality of drugs on the market including those on the NHI list. According to them, most of these so called "big men" prefer to buy drugs that are branded than the generics on the NHIA-list because of their quality:

"… I was seeing somebody who was a big person at the national health insurance and then I'll tell him that "oh, you'll get your drugs from the pharmacy" then he'll say "oh doctor no, write for me to go and buy" I won't consider. So, it's like you are sitting there approving these drugs and then when it comes to you, you think that you have to get some other drugs, so these are some of the difficulties that we have…" (Respondent_ Provider_04)

Some respondents were of the view that the quality of medicines approved by the regulator were good and without any issue:

"… For those that are approved and go through the right regulatory framework, I think the quality is fine. Generally, the FDA is doing quite a good work regulating medications, but of course we've seen a few medications slip through like oxytocin, if you heard FDA's communication recently of that oxytocin that wasn't working well… The quality is wise when they go through that system as I keep saying generally the quality is fine. The issue has been those that get into the system without the proper regulatory..." (Respondent_ Association_ 04)

However, in spite of the assurance that products registered by the regulator are of utmost quality, some respondents still had concerns with the quality of products on the shelves. Others even associated the NHIS with suboptimal medicines:

"… for the quality of medicines, it is a bigger advocacy issue for all of us to talk about. Because I don't see the reason why I should be giving B when we think A is the best, but we might not always find A in the facilities. In some cases, if you don't probe further as a patient to know that there is A, you are always tempted to be given C and if you say no, I [may] react to something you are giving B. We have to open up to our patients, especially for those who can afford and give them the best… the fact that the person is holding an insurance card also doesn't mean we give them something near to the best. That's the biggest question. Something near to the best is ok. So, for the quality of medicines, it should always meet the standard. But what is the standard? When we hear it is being approved by FDA, the people are tempted to say the standard is met, so you get confused. So honestly for the quality of medicines, do we have the highest quality of medicines to me in the facilities, no, that's one, I can confidently say no… We are not serving the very best of medicines in the facilities…" (Respondent_ Policy/Admin_ 02)

In addressing the quality and other issues related to medication safety, the CHAG for instance is implementing a program called "Med-For-All" where they are leveraging on technology to establish a digital supply chain platform. This platform further utilizes a spectrophotometer device referred to as "true scan" to check the quality of medicines. CHAG collaborated with the FDA during the establishment of this platform to ensure that every single medicine on the platform was duly registered by the FDA:

"… we have made attempt within our network setting up a platform and is a digital supply chain platform making sure that all the medicines that are coming on the platform are duly first registered with FDA, they're coming from reputable pharmaceutical companies. And not only that, but we also go to the extent of checking the quality using true-scan, which is a spectrophotometric device through this. And we work with Noguchi Memorial Institute for Medical Research to sample medicines from some of our facilities to test using this device. The last testing that we did, we actually provided that same, the samples that we tested to FDA and they also tested in their system and they confirmed the quality…" (Respondent_ Policy/Admin_03)

4.2.6 Smuggling and Fake Medicines

Another major concern that has impacted on the availability of quality and safe medicines on the Ghanaian market are the issues of smuggling, fake and/or substandard medicines. Respondents

were concerned that, some of the drugs in the country might not have come through the approved routes (air and sea) because of the numerous porous land borders.

Most of the respondents were generally of the view that, in spite of the efforts of the FDA, there were still fake and/or substandard medicines on the market:

"… there are substandard medicines, I mean that one it is known…" (Respondent_ Policy/Admin_ 04)

"… FDA is working very at that [smuggling and substandard]. You and I know that the incidence of fake medicines, there are substandard. So, when you talk about the whole industry, substandard medicine is part of it, substandard, that is not fake, but if you don't have the right amount of ingredient in it then they are fake… there is a lot, FDA is doing a lot there, Ghana Standard Authority, the Ghana Revenue Authority, the Customs they are to strengthen our borders in other to curb the incidence of smuggling" (Respondent_ Policy/Admin_ 04)

"…But now even though FDA is doing well we have samples of some of the medicines in the system which are not too good… So, the issues are there; I know FDA has tried its best but then the issues are not gone completely…" (Respondent_ Policy/Admin_ 05)

In spite of all the efforts by the various medicines' regulatory bodies in the country particularly FDA, Pharmacy Council and by extension the Customs Division of the Ghana Revenue Authority (GRA) to ensure that pharmaceutical products on the market are safe and of utmost quality, some of the respondents recounted their experiences with substandard and/or fake and/or falsified medicines in the market:

"… some of us have actually encountered very bad medicines that we have used where patients are not getting well… When I was working in the north. I remember somebody came with some fungal infection, I used all the medicines that I knew, and anytime the patient was coming, I was having palpitation because I didn't know what next to do… Our ED's wife had asthma in Sunyani, they used salbutamol it didn't work, they had to drive all the way to Bantama to buy the same generic salbutamol and it worked… also had used oxytocin, very critical medicines for controlling hemorrhage in pregnant women. Use quite a number, but it wasn't, they were not working, and the patient bled to death. You know, only to find out later that the active ingredient was not enough. So, our borders I will say, may not be tight enough…" (Respondent_ Policy/Admin_ 05)

Further, there was also a consensus from all the respondents about smuggling of medicines through these porous borders and this was an expressed concern:

"… Our porous borders are also contributing [to] the availability of poor quality and less efficacious medicines on our markets. There is the FDA that should be able to give you some

more information on what they are doing… The porous borders make this difficult. Most people smuggle these medications through the porous borders to the country especially with the intent of evading the required taxes…" (Respondent_ Policy/Admin_ 01)

Though respondents admitted to the occurrence of smuggling, they added that, once the medicines go through the approved routes and approved by the FDA, their quality is assured

"… there is smuggling. So, there are approved routes through which medicines are supposed to come into the country, once medicines have come through those approved routes or go through the approved processes, once they are authorized in the market by the FDA that guarantees that the quality is right. However, like you said, there are unapproved routes that people coming through… So that could be an avenue through which substandard medicines could come into the market… Those are criminal and that one it requires the combination of efforts of security agencies and the Food and Drugs Authority itself to be able to curb that…" (Respondent_ Association_ 01)

The Ministry of Health is collaborating with ECOWAS member countries to introduce the concept of medicine traceability across the subregion as one of the ways of curbing smuggling and guaranteeing the quality and safety of medicines:

"… there is also discussion on medicine traceability even at ECOWAS level with Member countries for which Ghana is part. The concept of this is that a barcoding system will be introduced so every medicine can be scanned by the end user and even retailers to make a determination of their genuineness. Once the bar code fails, these medicines can be traced and removed from the market…" (Respondent_ Policy/Admin_ 04)

The concept of medicine traceability was further explained by another respondent. There are possible challenges if unaddressed can affect its successful implementation:

"… That is, they are trying to follow through with these rules of origin procedure thing, using the barcode, the manufacturer. So, you create the barcode, you have a database of the compiled information, grouped plus the original, so when you scan and you stop, when you look at it, it is not original. But one point you could see is that that is also infiltrated by the criminals. Are you getting me? I'm sure you get what I mean. So, it's just a matter of updating the data. Because now the original barcode and the generation of the code can also be infiltrated. It is an IT system that can be broken into by, so we could; have they claim they are somebody who will still scan, and it will still come as original, but it is fake. You may be burdening or over burdening a customs officer to be concentrating too much on this when the role is secondary, secondary roles are supposed to be facilitated, let's do it quicker focus on the main public protection and security of revenue…" (Respondent_ Regulator_ 02)

Another mechanism put in place to ensure availability of quality and safe medicines is post-market surveillance established by the medicine regulator, FDA, where patients and health facilities/providers are able to report their concerns with medicines:

There are also drugs and therapeutics committees in most health facilities that reviews medications and ensure they are safe and of the required quality:

"… facilities now have like my facility, I'm on the Drugs and Therapeutic Committee where we review our medications for that to put the facility in check; those that the clinicians report as working well or not working or patients not responding to, and we forward that to FDA…" (Respondent_ Association_ 04)

There is the need for the FDA to however, strengthen its pharmacovigilance regimen and be more proactive because there have been instances where some products have slipped through the system:

"… In 2021 we bought quite a number of hand sanitizers for our facilities; and part of our infection prevention and control we train all our hospitals to test the alcohol content of the hand sanitizer, I am just using this as an example. So, at the Holy Family Hospital in Techiman the pharmacists actually tested the alcohol content of the hand sanitizers that they were using. Some of them were 90%, some of them were 80% on the label approved by, supposedly approved by FDA... But they were lower, I think one of them was about 50%, some 46%. So, we actually reported straight to FDA, and they were very quick about it. They responded immediately dispatched to people, to our office, we gave them the batch numbers and the samples, and they followed immediately. And I heard that they were recalled from the system. So, in terms of response, they are doing well. I think that feedback by way of reporting adverse reactions and some of those observations, we need to do more education so that every pharmacy is now conscious about it. And if we begin to report as part of our routine reporting, even on DHIMS, how many reports have been sent to FDA by pharmacist, I think it will work. There is some attempt, responses is good from FDA, but we may need more awareness to actually tighten that bit of it…" (Respondent_ Policy/Admin_ 05)

In spite of some of the weaknesses identified by the respondents of the medicine's regulator FDA, all the respondents agreed that Ghana's FDA was one of the best on the continent having achieved WHO Maturity Level 3. Further, the entire FDA is ISO accredited, with its laboratory also holding two other accreditations:

"… if you take our locally manufactured products, FDA is always on our neck. They are taking samples, are batch size and everything and so they are always analysing. It has to be the best quality. And FDA has World Health Organisation Maturity Level-three as an agency and when it comes to post market surveillance, they have maturity level-four… On the continent, it is only Tanzania that has maturity ML3, recently Nigeria and Egypt have attained and South Africa and Ghana, so just about five agencies on the whole continent that have ML3, Ghana has ML4 when it comes to post market surveillance. So, they really, really monitor what goes on…" (Respondent_ Manufacturing_ 02)

Respondents also indicated that the quality and safety of medicines that go through the FDA were guaranteed; however, for those that do not, they are the cause of the many problems that exist. It was also worth noting that there is a very good working relationship with the Customs division of the GRA, FDA, GSA and Pharmacy Council in ensuring the quality and safety of medicines in the market.

"… FDA is the official authority when it comes to food and drugs, and its consumption in the country. However, the majority being imports, they play a role in granting the certification and assisting customs in the examination; that needs to be understood very well. So, the role is an augmenting role… the registration and certification of permits, and issuance of permits for clearance is by FDA. So, the agents on behalf of the importer, one of the documents they really need to have for the clearance of medicaments is the Foods and Drugs Authority's clearance certificate, approved or authorized permit…" (Respondent_ Regulator_ 02)

4.2.7 Generics versus branded medicines

Respondents further indicated that the cost of medications becomes expensive and out of reach of the average patient because for some of the conditions, like heart failure, generics are not available except the branded ones. The situation is worsened by the fact that patients have to take multiple doses which further compromise their affordability.

"… At the chronic care level, the medicines are available, but some are very expensive and therefore the ordinary patient cannot afford. So, for instance, if you talk about even heart failure; if a patient is diagnosed as having heart failure, there are five (5) drugs or classes of drugs that whatever it is the patient will have to be put on, not at a go but as and when they can tolerate and some of these drugs the patient cannot afford so you know that they need to be on these drugs the patient cannot afford. So, you know that they need to be these, but they cannot afford so they are not it. There are no generics for some of these drugs as well…" (Respondent_ Provider_02)

Further, respondents were also concerned about the level of efficacy of some of these generics compared to the branded medications even though all medicines that come through the approved routes go through the required regulatory processes and procedures of the FDA. It was indicated that patients tend to do extremely well on branded medicines than generics:

"… the issue of generics; there are so many of them for some of these medications that at times you wonder how they get into this country and some of us call some of them. Why do we say that a patient may be on a particular brand of drug and nothing is working; if you are able to convince them to be on some other brand, though more expensive, the same so-called drug, gives you results that is very remarkable when you complain to our people, they will say that yes that is what is on insurance. And so once at the national level that's what's on the insurance, what do you do? You can't throw them out…" (Respondent_ Provider_ 01)

Some of the respondents also questioned the quality of some of the generics on the market. According to them, there are instances where patients have died while on a generic medication which was expected to improve his/her outcome:

"… the issue of generics; there are so many of them for some of these medications that at times you wonder how they get into this country and some of us call some of them. Why do we say that, a patient may be on a particular brand of drug and nothing is working; if you are able to convince them to be on some other brand, though more expensive, the same so-called drug, gives you results that is very remarkable when you complain to our people, they will say that yes that is what is on insurance. And so once at the national level that's what's on the insurance, what do you do? You can't throw them out…" (Respondent_ Provider_ 04)

However, some respondents were also of the view that the issue of generics and brand should not even arise because once the medicine is authorized by the regulator, the quality is assured:

"… as long as that product is registered, whether is branded, you can only find it in the pharmacy or it is on the NHIA list or whatever, it does not matter at all in terms of quality, doesn't matter. The bottom line is that the product has to be registered. And we should never assume as if a product is branded and we can find it in the pharmacy and it is not on the NHIA list, it means that it surely offers good quality, no, and vice versa. So, the bottom line is that the regulator must see and confirm that this is a good product, it is registered, it has the minimum quality that has, will guarantee safety and efficacy…" (Respondent_ Regulator_ 01)

4.2.8 Lack of policy coherence

There are several policies that governs medicines and its availability in Ghana. However, respondents blamed a lack of policy coherence as a barrier to NCD medicines availability in the country. A reference was made for instance with the introduction of 15 new taxes recently affecting even sanitary products, which has further compounded the cost of these products making it difficult for adolescent girls to afford. This has interestingly affected their enrollment to the free senior high school that the government is pursuing.

"… and you are saying that the tax should be taking off menstrual products, and I agreed. But what I find surprising is the fact that we have a government that said these things need to be given to children for free… Then this government came and said they were introducing free SHS to improve access, good idea; but in doing so, they impose fifteen (15) taxes on menstrual products, which is known to be the main driver for non-attendant of young ladies in SHS. So how then do you tell me that we want to solve a problem? Where is the policy coherence? …. Because if you give the girl free education and she cannot pay for sanitary pad, it means five days every month she is not going to attend school, which is going to impact on her academic outcomes. So, what is the point of free SHS…" (Respondent_ Expert_01)

4.2.9 Concerns with National Health Insurance Scheme

There were a number of concerns and misgivings about the NHIS and its impact on access to NCD medicines in the country. These concerns included the delayed reimbursement which affects the cash flow of health facilities, the type of medicines on their medicines list which were informed by the Standard Treatment Guidelines (STGs) and the quality of medicines generally. The following presents some illustrative quotes from respondents:

"…the gap which comes from the insurance architecture, where the doctor thinks based on; even if you look at the Ghana standard treatment guidelines, let's not go to any complex guidelines. The doctor thinks no based on my diagnosis, based on my personal understanding of the individualization care of the patient I am dealing with, these are the combinations of medicines that I am going to prescribe because maybe I have started from step one; let's look at antihypertensives; I have prescribed let's say a beta blocker or calcium channel blocker or inhibitor. The blood pressure is not advancing by flow control. I've done my labs and all that and I think maybe I have had a dielectric of the salt.... Or I have to change, and I go to a new starting; and one of the medications they are prescribing is not on the NHIS, or it is on the NHIS, but because of co-payment the patient cannot get it and the patient is not prepared to pay. That is a gap as well…" (Respondent_ Expert_01)

Respondents indicated most times patients prefer purchasing their drugs (medicines) than taking drugs (medicines) that are on the NHIS medicines list at NHIA-credentialed facilities:

"… I was seeing somebody who was a big person at the national health insurance and then I'll tell him that "oh, you'll get your drugs from the pharmacy" then he'll say "oh doctor no, write for me to go and buy" I won't consider. So, it's like you are sitting there approving these drugs and then when it comes to you, you think that you have to get some other drugs, so these are some of the difficulties that we have…" (Respondent_ Provider_ 08)

Other respondents had concerns with the capping of the NHI Fund, which they believe affects their liquidity position and invariably also impacts credentialed facilities. Respondents called for stakeholders to review this:

"… the capping on the NHIS should be reduced or if possible, I don't know, they said it's an Act and so Parliament can do something about it if they know that anybody that is sick is halting the economy we would have worked hard to do something about it and free this particular system that supports the indigenes and a lot of vulnerable people in the community… currently it's capped at 25%... means that they give for every amount, for every levy that comes in, the SSNIT contributors money, aside the premium and all other levy on the, taxes that are taken, Parliament has an Act that says they should take about 75% of the money and give 25% to the fund. So, if we say NHIA, the total contribution of NHIA fund is about, let me say one million, NHIA is not getting one million, they are getting just about two hundred and fifty thousand. The rest is in government consolidated to be used for all other things, building of roads and other things. And that is where we say that for health, something can be done because the monies that accrue into the fund can solve a lot of our challenges. So, if they are giving them 50% or 75%, it will really go far. Because if it is 25, they are receiving to do this work then if they receive 75%, they could have done best. So that's the capping I am talking about…" (Respondent_ Association_ 04)

Respondents also indicated that the low tariffs were also a disincentive for stocking certain types of medications in their respective facilities because they only end up losing. However, those who stock those medicines ask patients to pay a top-up to shore up the difference in cost price:

"… You know that is what they do, they don't stock it; they write prescription for you, and you will go and buy. You know, it's a survivor kind of, because it's a revolving fund, and if I am decapitalizing, you see, especially if the medicine is expensive and they are not paying the competitive market price for it and then it doesn't make sense to stock it. So, they don't want to get into trouble. Those who think that they want to facilitate access to the stock, and they ask the patient to pay for it. Now they are rather being termed as criminal… and they don't change their medicine prices quite often, regular…." (Respondent_ Policy/Admin_ 03)

The delay in reimbursement according to respondents hurts rural facilities most because of their inability to stock medicines. This is because it affects their ability to pay their suppliers as well. For instance, some facilities according to respondents were owed in excess of 6 months:

"… even though a lot of people have National Health insurance, because the insurance delays in reimbursing the facilities and they fund on copayment, it become very difficult for a lot of the facilities that are in rural areas to stock… We actually got to a point where pharmaceutical companies were not willing to supply these facilities medicines because they owe them and some of them actually showed them our debt. So, they have been supplying you with medicine for about 10 months and you haven't paid them because insurance has not paid you. And you continue to, you want them to continue to provide you with medicines… Insurance prices are actually out of range, facilities are not paid, so they are not able to stock, so they have a lot of stock out and when people move to the facilities, they don't get the medicine. So, this is actually the biggest issue…" (Respondent_ Policy/Admin_ 05)

There are also concerns about how unrealistic the prices of medicines set by the NHIA are which also influences the decision of facilities to stock or not to stock:

"… because it's NHIA based, the cost is then driven by how NHIA determines its cost at the national level… For NHIA they set the prices... You know their tariffs vary from what you want to call the traditional government institutions, the private and then CHAG… whether your primary center, a secondary or not, yeah. So, in terms of CHAG, if you are CHAG facility and then you are on primary, you will take the same tariff anyway… Realistic tariffs and then paying facilities on time. Realistic tariffs for medicines, paying them on time and as we discussed the other issues of access, ensuring that specialists who are created to manage certain things at certain levels, those services are credential rather than the entire facility having to do that and then those other ones to have…" (Respondent_ Association_ 04)

4.2.10 Prices of medicines

The prices at which medicines are sold have also been identified as one of the main barriers to access. Unfortunately, the high cost that medicines are sold makes it difficult for them to have access and comply with treatment:

"… so, it is difficult for them to comply most of the time. So, we write a certain class of medication for someone, and the person will come back for review and the person would say ooh I couldn't buy this medication oh because the facility didn't have some and they said you should

buy, and the person would come back with high BP's ahaa so these are most of the challenges we have…" (Respondent_ Provider_ 05)

Providers are concerned about the cost implications of their prescriptions as it impacts the outcomes of the care:

"… they come you want to put them on medication that you think will be best for them but they can't afford it so you just have to do with some generics or some other medications…" (Respondent_ Provider_ 07)

Sometimes, the providers are forced to change the medications of their patients because of their inability to afford them. It is generally agreed that, the medicines are available but cost is a major barrier to access:

"… At the chronic care level, the medicines are available but some are very expensive and therefore the ordinary patient cannot afford… if you talk about even heart failure… if a patient is diagnosed as having heart failure, there are five (5) drugs or classes of drugs that whatever it is the patient will have to be put on, not at a go but as and when they can tolerate and some of these drugs the patient cannot afford so you know that they need to be on these drugs but the patient cannot afford. So, you know that they need to be these but they cannot afford so they are not it. There are no generics for some of these drugs as well… Yes, the drugs are available, it's the cost that is an issue… evidence has shown that, when they are on these, then you have much improvement but what happens is some of them cannot afford, or let me say, most of them cannot afford… some patients do have side effects from it and you need to change it but they cannot afford the alternative which is very expensive…" (Respondent_ Provider_ 08)

Some of the respondents also blamed the attitude of some of the providers for the high cost of medicines for NCD care. For these respondents, providers are very quick in switching and prescribing very expensive medications. Further, providers are also blamed for not adhering to the Standard Treatment Guidelines (STGs):

"… Medicines have become expensive and sometimes out of reach of patients… Prescription attitudes of the prescribers is a contributory factor. I had a visitor from the US to Ghana recently who was on diuretics. She was taking the medication I was prescribing when I was practicing as a house officer so many years ago. Today, no doctor in Ghana is prescribing that. They are all prescribing the very expensive and modern brands which is out of reach of most of the patients… The STGs are also not being adhered to by prescribers. This is another worry. Most of the prescribers side-step the available guidelines and do their own thing by way of prescriptions.

Unfortunately, the mechanisms for monitoring are also not available in most instances…" (Respondent_ Policy/Admin_ 01)

Ghana as a country has developed an essential health services package that defines the basic minimum of health service across the various level:

"… we are supposed to have a certain list that will take care of minimum requirement at the most basic level; that is the concept. It guides us to use our resources wisely… for instance, for Ghana we should be able to say that, if it is malaria that we are treating these are the medications that we use at the various levels. If you pick the document, I am sure you will know, it shows you what medicines you will use; it is very intentional, looking at the expertise that you will require when you are applying or using a certain medication or the kind of equipment that are available to monitor your blood level, your sugar level, kidney function, liver function before we…. It is very well thought-through process for arriving at the essential medicines list, that is one… We have what we call the essential health services package, that one defines for us as a country the minimum; So, we are a country, we are faced with all kind of disease, we are not able, because of our resource constraint we are not able to provide for all the disease conditions… So, the essential health services package defines the health services that is minimum that we think that every Ghanaian should get if you attend any health care facility within Ghana, this minimum package should be available to you. So is a very well though-through process that defines that…" (Respondent_ Policy/Admin_ 01)

The other concern with drug (medicine) prices was the extent of variation even among public health facilities. Some respondents were of the view that price variation is as a result of many factors including source of import, geographical location or destination of the product, cost of import duty and taxes, import dependency, incentives for local manufactures, regulatory incentives and medicine supply chain.

4.2.11 Source of import

The source of where the medicine comes from:

"… People procure from different sources. So, somebody is buying from India, another person is buying from UK and other is coming from the US, their taxes are different, so obviously they cannot price it the same…" (Respondent_ Policy/Admin_ 07)

4.2.12 Geographical Location or the destination of the product

with the final retail point of the medicine in the country also counts. Because most of the manufacturers are located in Accra and Kumasi, transportation of medicines from these locations to any other parts of the country, especially in the north, impacts greatly on its price:

"... You see, the variables are many depending on, even geographically where the person is located. So, what we sought to do is to bring them all on board, then we took them, we compartmentalize them under the umbrella of the pricing committee. The taxes for the manufacturer are you know, the tax components too are very different depending on who you are dealing with… what we a seeking to do is to try and define margins, guidelines that will guide each of these companies so that for instance if you take our public health institutions, if you take the price of tablet; one tablet of paracetamol in any health facility should be the same. This is what we are doing to address the issue…" (Respondent_ Policy/Admin_ 01)

4.2.13 Cost of import duty/taxes

The cost of import duty at the ports of entry also accounts for the price and price variation of NCD medicines in the country. Respondents were also of the view that the general cost of doing business in the country was generally expensive and manufacturers have also learnt to pass on the cost to the patients:

"... and I think it was even worse, I think two years ago and last year because of the depreciation in our currency… So, they import it, currency has been depreciated; some of them go for money. So, the cost of funds or the cost of doing business, taking money from the bank, supplying facilities without getting paid it's a big issue…" (Respondent_ Policy/Admin_ 05)

4.2.14 Import dependent

Unfortunately, the manufacturing capacity of the pharmaceutical industry in Ghana is still evolving and most of the medicines used are imported. It is estimated for instance that, less than 25% of the medicines that are used in Ghana are locally manufactured and this factor contributes to the increasing price/cost of medicines in Ghana:

"... I think as a nation we should keep on encouraging local manufacturing. Because from where we sit, we see having just about 10 to 15% of the products that we have on our database being locally manufactured and the rest being imported. So obviously if you have to import huge

percentage of your product like that, it'll impact obviously accessibility. Because it is going to affect pricing… we believe that increasing local capacity for manufacturing, I think will go a long way to improve access and to ensure that it is sustained, sustainably we have in stock for some of these products…" (Respondent_ Regulator_ 01)

4.2.15 Incentives for local manufacturers

There are over 50 pharmaceutical companies producing both generic and prescription drugs (medicines) including oral tablets, liquids, powders, capsules, ointments, intravenous infusions, topical creams etc. in Ghana[1]. All of these companies are expected to follow the Good Manufacturing Practices (GMP) and Good Distribution Practices (GDP) as well as get their approval from the FDA. The funding for these companies is through public and private sectors. It is instructive to note that, all the respondents indicated that, there were some incentives for local manufacturers in Ghana to ensure that the country meets its needs with respect to medicines and more specifically for non-communicable diseases. Some of the areas of incentives identified include tax exemptions:

"… government is supporting in terms of tax exemptions for the raw materials and packaging materials for the local manufacture of these products…" (Respondent_ Association_ 01)

…restricted tendering

In addition to tax exemptions, there are also restricted tendering for local manufacturers only. For instance, the country has banned the importation paracetamol:

"… Yes, we have [incentive for local manufacturers], for instance we have what we call the restrictive medicine scheme… So, we are working closely with PMAG, all of them, all of these stakeholders. So, there are tax exemptions for locally manufactured medicines, and we also restrict certain medicines only to locally manufactured. We don't allow any importation of paracetamol; we are expanding the list. We don't just expand we look at documentary evidence to show that once we restrict a medicine to be manufactured solely by local manufacturers, we have the capacity to do it, otherwise we will be shooting ourselves in the leg, there will be shortages and then the issue of nonavailability of medicines including NCDs will come up. So, as I speak with you, we are revising that list; it's a very delicate balance…" (Respondent_ Policy/Admin_ 01)

Further, the Ministry of Health gives between 15-20% domestic preference to local manufacturers whenever tenders for medicines nationally are invited:

"… One other is what we call the domestic preference. When we launch our tender for medicines nationally as a Ministry of Health using our public transit, we give 15 to 20 percent domestic preference. What this means is that irrespective of the pricing we would rather buy from the local manufacturer. Recently we are at a workshop, and I was told that Nigeria does 70 to 80 percentage, and I said whoa. So is a lot that we are doing to strengthen our own local manufacturing, that if we continue doing these good things eventually our availability will be improved, affordability will be improved, accessibility will be improved. So, the little drop of water that we are doing…" (Respondent_ Policy/Admin_ 02)

The government, through the Ministry of Health (MoH) have also introduced a number of initiatives such as the framework contracting and/or pooled procurement and Health Technology Assessment (HTA) as one of the efforts in ensuring that medicines were readily available in all public health facilities and at a quality and prices that are affordable:

"… The MoH is considering pooled procurement as a way of addressing price variability, improve quality and access to NCD medicines in the country. This discussion is currently ongoing…" (Respondent_ Policy/Admin_ 01)

"… we have… are things are guaranteed markets where the government has framework contracting arrangements that support purchase of products which are essential to government or are also on the essential medicines list from local manufacturers. Over the years, some imported medicines have been added. But the initial objective or concept was to support locally manufacturing companies…" (Respondent_ Association_ 02)

…health technology assessment (HTA)

Ghana uses HTA and other technologies to ensure and assure quality and safety of medicines, vaccines, medical devices

"… health technology assessment and what this seeks to do is that is a process, it's a tool if you like Its cost containment tool that help us to choose among others, which particular medicine, procedure, products, service will best suite our circumstances knowing that we are resource constrained country. So, we do this on the basis of the circumstances.

"…We needed to pick logistics out of several, we would use documentary evidence, economic models, financial models, taken into consideration, ethical issues and a whole lot of other to do analysis, to come up with the recommendations for National Health Insurance to be able to decide. So, this is one of the things that we do…" (Respondent_ Policy/Admin_ 05)

…price preference

We also found that there were other incentives such as price preference that local manufacturers that exists but yet to take advantage of:

"… We also have a price preference which based on the research we have done; we realize that it is not being explored. So, what's going to happen is that when there is a tender and then there is a locally manufactured product and there is an imported product, if the locally manufactured product is 15% more expensive than the imported and government goes to buy from the local manufacturer because of all the incentives that we also provide the government being a medicine security…" (Respondent_ Association_ 02)

4.2.16 Regulatory incentives

There are also regulatory incentives spanning from reduced application fees for registration for locally manufactured products, prioritization of local applications and reduced processing times for such. The regulator also has an industrial support department established to support local industries including building their capacities towards Good Manufacturing Practices (GMP):

"… But the FDA Ghana prioritizes local applications. All of them are fast track… So, if you're manufacturing locally in Ghana, the application doesn't take long when you submit them for processing. So, they fall under the short time processing of that three months. They are not part of the six-month processing time… as a country, we've also done well, the application fee for registration for locally manufactured products are really small as compared to the imported product, right. I think about five times or more… we also have a department called the Industrial Support… that department has been set aside specifically to support local industries in, from a technical point of view, to ensure that they are educated. Their challenges in manufacturing issues may result in quality defects and all that are resolved. FDA is building their competency, helping them identify their gaps, guiding them on how to resolve those issues over the years… here you have your inspectors and staff of going straight into your factory to help you solve the problem before you bring out the application for us to say hey, there are issues. We go in there to help you to solve, and I think that is a good incentive for industries in Ghana…" (Respondent_ Regulator_ 01)

The benefits of having a strong local medicine pharmaceutical manufacturing sector are enormous and worth pursuing as a country:

"… when you have products being manufactured here, and the fact that you are able to check the quality of the product more easily than travelling to other countries to validate whether all the processes are being followed. The fact that we provide more jobs for the people in the country,

the fact that we pay taxes, the fact that when you buy locally manufactured products, you will not depreciate your currency and too significantly because you would need fewer dollars to buy raw materials. You would need significantly more to buy, you know, imported medicine, so you'll be able to regulate things like and depreciation and inflation of your currency and all of that and then several other macroeconomic indicators…" (Respondent_ Policy/Admin_ 05)

4.2.17 Medicine Supply Chain

The MoH is currently working on a project called, the Pharmaceutical Disability Strategy or Project" that seeks to address the challenges with medicines supply chain in the country. This effort is being supported by USAID to help introduce systems that will be able to trace and track all commodities in the country. Respondents admitted there were gaps in the medicines supply chain that require redress:

"… yes, there are gaps in the supply chain, in our medicine supply chain. These gaps are not peculiar to NCDs. That is why I took my time to explain to you how we started the supply chain as it stands, the procurement process, the policy perspective…" (Respondent_ Policy/Admin_ 01)

CHAPTER FIVE

5.0 Summary of Key findings

1. With the exception of cancer drugs whose availability was less than 10% (6.4%), all the other medical conditions had drugs availability from 68% for asthma to 97.2% for sickle cell disease.

2. Availability of drugs (medicines) to manage hypertension varied from 5.2% for alpha blockers to 83.6% for calcium channel blockers.

3. Availability of drugs to manage diabetes varied from 0.5% for GLP-1 agonists to 75.3% for biguanides. Further, Biguanides and Sulfonylureas are available across all the levels of facilities; and less than 40% availability in OTCMS compared to other levels of care.

4. The availability of NCD medicines varies depending on the level of health facility, OTCM or community pharmacy.

5. The availability of drugs for the management of acute complications of chronic conditions varied from as low as 1.4% for Glucagon to 99.2% for NSAIDS across all the levels of facilities.
6. The median prices of NCD medications varied from a high of GHS196.48 (165.00-234.25) for Combination inhaled and Long-Acting Beta-Agonist to as low as 0.2 (0.15-4.00) for Para analgesics oral.

7. The cost of medicines has generally been described as “too expensive” in Ghana.

8. NCD medicines were more and readily available in private (community pharmacies and OTCMS) and CHAG health facilities than in government/public facilities.

9. Some public facilities are resorting to co-payment especially for NCD medicines as a way of breaking even.

10. Availability of NCD medicines was influenced more by price and location of the facility.

11. There is smuggling of medicines that is occurring especially at the land borders which compromises the quality of NCD medicines in the market.

12. The strength of regulation, especially of the FDA was highly commended but still more room for improvement especially in the area of post-market surveillance and adverse events reporting.

13. Government has created various incentive measures such as framework contracting, reduced regulatory fees, tax exemptions, and restricted tendering to encourage local manufacturers and improve availability.

CHAPTER SIX

6.0 Conclusions and Recommendations for Policy Action

Conclusion

The following conclusions are made based on the findings of the study:

1. There is more than 90% of the required NCD medicines available and stoked in various health facilities and community facilities across the country.

2. Though the medicines are available, there are significant challenges with access. The main challenge with access is cost- generally, medicines are relatively very expensive in the country. Ironically, more than 80% of the community pharmacies do not accept NHIS and these further limits access.

3. The cost of medicines in Ghana is influenced by several factors including import duty, geographical location of the receiving facility, whether generic or branded product.

4. Smuggling is still a major challenge that affects the quality and safety of medicines on the market.

5. Some frontline healthcare providers especially prescribers have concerns about the quality and safety of medicines on the market because of their own individual experiences of how less efficacious some medicines were.

6. There is a preference of prescribers to branded medication than generic medicines because of their belief that the branded products are more efficacious.

7. The government, through the MoH, has put in place various mechanisms that serve as incentives to encourage local manufacture of essential medicines. Some of these include guaranteed market, framework contracting, and regulatory incentives (such as reduced registration fees and support from the FDA around Good Manufacturing Practices).

8. Healthcare facilities are limited by the type of medication they can prescribe as a result of the level at which they have been credentialled by the National Health Insurance Authority (NHIA) or per the Standard Treatment Guideline (STG). In view of this, the type of medicine a prescriber can prescribe is limited and this affects access especially at the primary healthcare level.

9. Copayment for medicines was identified in many NHIA-credentialled facilities. Providers justified this by indicating that the cost of the medicines was too expensive and there was the need for a top-up to be able to break even or make a little profit.

Recommendations for Policy Action

The following recommendations are made based on the findings of the study:

Government/Ministry of Health

1. The MoH should collaborate with the NHIA to align the benefits package to the Essential Health Service Package (EHSP) to ensure congruence and alignment. The ESPH also needs to be reviewed.

2. The government and for that matter the MoH should remove the capping on the NHIA to ensure that more liquidity is available to them to reimburse facilities on time.

3. The MoH to provide incentives to incentivize local pharmaceutical manufacturing companies to improve their capacity to increase local production.

4. The MoH should as a matter of urgency review the policy on the prescribing level (i.e., the current system that restricts the type of drugs (medicines) that can be prescribed at one level of healthcare delivery based on the type of provider) to facilitate access to quality and safe noncommunicable diseases (NCD) medicines, especially at the primary healthcare level.

5. The health sector should refocus its attention and resources more on primary prevention. Further, the MoH should put mechanisms in place to strengthen secondary prevention in ensuring that those who are diagnosed are maintained on treatment.

6. The MoH should increase funding and resources to the FDA, GHS, and other agencies of the MoH to ensure that they continuously improve on the availability of the quality of medicines in the market and the facilities.

7. The MoH and its agencies should strengthen the existing partnership and collaboration with civil society organizations so that they can educate and empower their communities to be responsible and interested in their health and to also support the health system for improved outcomes.

8. It is essential for Ghana to prioritize the enhancement of its pharmaceutical supply chain system and address the inherent financial challenges.

9. The government for that matter the MoH should explore various funding options and grants to support the procurement of NCD medicines. By actively seeking financial resources through different avenues, the country can secure the necessary funds to ensure the availability of NCD medicines for those who need them most. Addressing these critical aspects will enable Ghana to enhance its pharmaceutical supply chain system, overcome financial bottlenecks, and ultimately improve the accessibility and availability of NCD medicines.

National Health Insurance Authority (NHIA)

1. The NHIA should conduct actuarial studies to ensure that the prices of medications are reflective of prices available on the market. This will serve as incentive to health facilities that have been credentialled (including even those that are yet) to avoid copayment and improve upon their availability.

2. The NHIA should consider credentialling services within health facilities other than wholesale credentialling the entire facilities. This will ensure that specialist services that are provided are adequately paid for.

3. Streamline the NHIS reimbursement process and explore further funding options and grants will provide healthcare facilities with the necessary resources to procure and supply NCD medicines in a timely manner, ensuring their availability for individuals in need.

Ghana Health Service (GHS)/CHAG/Teaching Hospitals

1. These agencies should scale up the implementation of Network of Practice across the country to make it possible for patients to get their drug (medicine) refills and prescriptions at the primary healthcare level (including health centers).

2. The agencies should strengthen collaboration and partnership with NGOs in health and civil society organizations, empower and educate them to understand and appreciate their role especially in the communities.

3. These agencies should leverage on some of the best practices already available, for example in reproductive health and adopt similar for noncommunicable diseases. For instance, the same midwife seeing pregnant women at the ANC can be sufficiently equipped, empowered, and given the opportunity to do visual inspection of the cervix for cervical cancers.

Regulatory Authorities

1. The various regulatory authorities i.e., FDA, Pharmacy Council, and the Customs division of the Ghana Revenue Authority (GRA) should work together and strengthen their collaboration to ensure availability and access to quality medicines. This should be facilitated by the MoH

2. FDA should increase its level of awareness and training of providers, patients, and relatives on where and how to report all medication safety-related events both in their facilities and homes.

3. The FDA should strengthen the regulatory and control mechanisms that ensure that manufacturing companies where generics are produced are routinely monitored and checked to ensure they are complying to Good Manufacturing Practices (GMP).

4. The Pharmacy Council should strengthen its regulation of community pharmacies, especially OTCMs, and ensure that they are stocking and selling medicines that they are required to sell per regulatory approval.

5. The Customs division of the GRA should increase the level of awareness and education of importers of pharmaceutical products.

6. The Customs division of the GRA should strengthen existing regulatory and control mechanisms so as to increase their presence, especially at the land borders, to reduce the prevalence of smuggling activities and the influx of substandard medicines onto the market.

Healthcare Providers

1. Health care providers should employ measures to enhance and encourage frontline healthcare providers and patients to report all medicine-related adverse events.

5.0 References

Abegunde, D., 2011. Essential Medicines for Non-Communicable Diseases (NCDs) 1–31.

Adeniji, F.I.P., Obembe, T.A., 2023. Cardiovascular Disease and Its Implication for Higher Catastrophic Health Expenditures Among Households in Sub-Saharan Africa. J Health Econ Outcomes Res 10, 59–67. https://doi.org/10.36469/001c.70252

Akumiah, F.K., Yakubu, A.-S., Ahadzi, D., Tuglo, L.S., Mishra, S., Mohapatra, R.K., Doku, A., 2023. Cardiovascular Care in Africa - Cost Crisis and the Urgent Need for Contextual Health Service Solutions. Glob Heart 18, 47. https://doi.org/10.5334/gh.1259

Antignac, M., Diop, B.I., Macquart de Terline, D., Bernard, M., Do, B., Ikama, S.M., N'Guetta, R., Balde, D.M., Tchabi, Y., Sidi Aly, A., Ali Toure, I., Zabsonre, P., Damorou, J.M.F., Takombe, J.L., Fernandez, C., Tafflet, M., Empana, J.P., Plouin, P.F., Narayanan, K., Marijon, E., Jouven, X., 2017. Fighting fake medicines: First quality evaluation of cardiac drugs in Africa. International Journal of Cardiology 243, 523–528. https://doi.org/10.1016/j.ijcard.2017.04.099

Armstrong-Hough, M., Sharma, S., Kishore, S.P., Akiteng, A.R., Schwartz, J.I., 2020. Variation in the availability and cost of essential medicines for non-communicable diseases in Uganda: A descriptive time series analysis. PLoS One 15, e0241555. https://doi.org/10.1371/journal.pone.0241555

Agyei-Mensah, S., De-Graft Aikins, A., 2010. Epidemiological transition and the double burden of disease in Accra, Ghana. Journal of Urban Health 87, 879–897. https://doi.org/10.1007/s11524-010-9492-y

Ahluwalia, I.B., Arrazola, R.A., Zhao, L., Shi, J., Dean, A., Rainey, E., Palipudi, K., Twentyman, E., Armour, B.S., 2019. Tobacco Use and Tobacco-Related Behaviors - 11 Countries, 2008-2017. MMWR. Morbidity and mortality weekly report 68, 928–933. https://doi.org/10.15585/mmwr.mm6841a1

Aikins, A., Boynton, P., Atanga, L.L., 2010. Developing effective chronic disease interventions in Africa : insights from Ghana and Cameroon 6–8.

Aikins, D.-G.A., 2007. Ghana's neglected chronic disease epidemic: a developmental challenge 41.

Akseer, N., Mehta, S., Wigle, J., Chera, R., Brickman, Z.J., Al-Gashm, S., Sorichetti, B., Vandermorris, A., Hipgrave, D.B., Schwalbe, N., Bhutta, Z.A., 2020. Non-communicable diseases

among adolescents: current status, determinants, interventions and policies. BMC Public Health 20, 1–20. https://doi.org/10.1186/s12889-020-09988-5

Alkabban, F.M., Ferguson, T., 2022. Breast Cancer. Treasure Island (FL).

Amoah, A.S., Forson, A.G., Boakye, D.A., 2012. A review of epidemiological studies of asthma in Ghana. Ghana Med J 46, 23–28.

Anand, S.S., Hawkes, C., de Souza, R.J., Mente, A., Dehghan, M., Nugent, R., Zulyniak, M.A., Weis, T., Bernstein, A.M., Krauss, R.M., Kromhout, D., Jenkins, D.J.A., Malik, V., Martinez-Gonzalez, M.A., Mozaffarian, D., Yusuf, S., Willett, W.C., Popkin, B.M., 2015. Food Consumption and its Impact on Cardiovascular Disease: Importance of Solutions Focused on the Globalized Food System: A Report From the Workshop Convened by the World Heart Federation. Journal of the American College of Cardiology 66, 1590–1614. https://doi.org/10.1016/j.jacc.2015.07.050

Anderson, I., 2013. The Economic costs of non-communicable diseases in the Pacific Islands: A rapid stocktake of the situation in Samoa, Tonga and Vanuatu. The World Bank.

Ashigbie, P.G., Rockers, P.C., Laing, R.O., Cabral, H.J., Onyango, M.A., Buleti, J.P.L., Wirtz, V.J., 2020. Availability and prices of medicines for non-communicable diseases at health facilities and retail drug outlets in Kenya: A cross-sectional survey in eight counties. BMJ Open 10, 1–10. https://doi.org/10.1136/bmjopen-2019-035132

Atinga, R.A., Yarney, L., Gavu, N.M., 2018. Factors influencing long-term medication non-adherence among diabetes and hypertensive patients in Ghana: A qualitative investigation. PLoS ONE 13, 1–15. https://doi.org/10.1371/journal.pone.0193995

Azevedo, M., Alla, S., 2008. Diabetes in Sub-Saharan Africa Kenya, Mali, Mozambique, Nigeria, South Africa and Zambia.

Bagonza, J., Rutebemberwa, E., Bazeyo, W., 2015. Adherence to anti diabetic medication among patients with diabetes in eastern Uganda; A cross sectional study Health systems and services in low- and middle-income settings. BMC Health Services Research 15, 1–7. https://doi.org/10.1186/s12913-015-0820-5

Bakdash, A., 2017. Shammah (Smokeless Tobacco) and Public Health. Asian Pacific journal of cancer prevention : APJCP 18, 1183–1190. https://doi.org/10.22034/APJCP.2017.18.5.1183

Balsarkar, G., 2022. Non-Communicable Diseases: Agenda for Today's Gynaecologist in India. Journal of obstetrics and gynaecology of India. https://doi.org/10.1007/s13224-022-01733-9

Beran, D., Pedersen, H.B., Robertson, J., 2019. Noncommunicable diseases, access to essential medicines and universal health coverage. Global Health Action 12. https://doi.org/10.1080/16549716.2019.1670014

Beran, D., Yudkin, J.S., 2010. Looking beyond the issue of access to insulin: What is needed for proper diabetes care in resource poor settings. Diabetes Research and Clinical Practice. https://doi.org/10.1016/j.diabres.2010.03.029

Boakye, H., Atabila, A., Hinneh, T., Ackah, M., Ojo-Benys, F., Bello, A.I., 2023. The prevalence and determinants of noncommunicable diseases among Ghanaian adults: A survey at a secondary healthcare level. PLoS ONE 18, 1–14. https://doi.org/10.1371/journal.pone.0281310

Bygbjerg, I.C., 2012. Double burden of noncommunicable and infectious diseases in developing countries. Science. https://doi.org/10.1126/science.1223466

Cameron, A., Ewen, M., Ross-Degnan, D., Ball, D., Laing, R., 2009. Medicine prices, availability, and affordability in 36 developing and middle-income countries: a secondary analysis. Lancet (London, England) 373, 240–249. https://doi.org/10.1016/S0140-6736(08)61762-6

Cameron, A., Roubos, I., Ewen, M., Mantel-Teeuwisse, A.K., Leufkens, H.G.M., Laing, R.O., 2011. Differences in the availability of medicines for chronic and acute conditions in the public and private sectors of developing countries. Bulletin of the World Health Organization 89, 412–421. https://doi.org/10.2471/BLT.10.084327

Cappuccio, F.P., 2013. Cardiovascular and other effects of salt consumption. Kidney international supplements 3, 312–315. https://doi.org/10.1038/kisup.2013.65

CDC, 2013. Overview of non-communicable diseases and related factors 1–96.

Cena, H., Calder, P.C., 2020. Defining a Healthy Diet: Evidence for The Role of Contemporary Dietary Patterns in Health and Disease. Nutrients 12. https://doi.org/10.3390/nu12020334

Chow, C.K., Nguyen, T.N., Marschner, S., Diaz, R., Rahman, O., Avezum, A., Lear, S.A., Teo, K., Yeates, K.E., Lanas, F., Li, W., Hu, B., Lopez-Jaramillo, P., Gupta, R., Kumar, R., Mony, P.K., Bahonar, A., Yusoff, K., Khatib, R., Kazmi, K., Dans, A.L., Zatonska, K., Alhabib, K.F., Kruger, I.M., Rosengren, A., Gulec, S., Yusufali, A., Chifamba, J., Rangarajan, S., McKee, M., Yusuf, S., 2020. Availability and affordability of medicines and cardiovascular outcomes in 21 high-income, middle-income and low-income countries. BMJ global health 5. https://doi.org/10.1136/bmjgh-2020-002640

Chow, C.K., Ramasundarahettige, C., Hu, W., AlHabib, K.F., Avezum Jr, A., Cheng, X., Chifamba, J., Dagenais, G., Dans, A., Egbujie, B.A., Gupta, R., Iqbal, R., Ismail, N., Keskinler, M. V, Khatib, R., Kruger, L., Kumar, R., Lanas, F., Lear, S., Lopez-Jaramillo, P., McKee, M., Mohammadifard, N., Mohan, V., Mony, P., Orlandini, A., Rosengren, A., Vijayakumar, K., Wei, L., Yeates, K., Yusoff, K., Yusuf, R., Yusufali, A., Zatonska, K., Zhou, Y., Islam, S., Corsi, D., Rangarajan, S., Teo, K., Gerstein, H.C., Yusuf, S., 2018. Availability and affordability of essential medicines for diabetes across high-income, middle-income, and low-income countries: a prospective epidemiological study. The Lancet Diabetes & Endocrinology 6, 798–808. https://doi.org/10.1016/S2213-8587(18)30233-X

Dal Maso, L., Torelli, N., Biancotto, E., Di Maso, M., Gini, A., Franchin, G., Levi, F., La Vecchia, C., Serraino, D., Polesel, J., 2016. Combined effect of tobacco smoking and alcohol drinking in the risk of head and neck cancers: a re-analysis of case-control studies using bi-dimensional spline models. European journal of epidemiology 31, 385–393. https://doi.org/10.1007/s10654-015-0028-3

Doherty, M.L., Owusu-Dabo, E., Kantanka, O.S., Brawer, R.O., Plumb, J.D., 2014. Type 2 diabetes in a rapidly urbanizing region of Ghana, West Africa: a qualitative study of dietary preferences, knowledge and practices. BMC Public Health 14, 1069. https://doi.org/10.1186/1471-2458-14-1069

Downing, K.L., Hesketh, K.D., Timperio, A., Salmon, J., Moss, K., Mishra, G., 2020. Family history of non-communicable diseases and associations with weight and movement behaviours in Australian school-aged children: a prospective study. BMJ open 10, e038789. https://doi.org/10.1136/bmjopen-2020-038789

Dussault, G., Buchan, J., 2018. Noncommunicable diseases and human resources for health: a workforce fit for purpos. Health systems respond to noncommunicable diseases: time for ambition 182–198.

Ewen, M., Zweekhorst, M., Regeer, B., Laing, R., 2017. Baseline assessment of WHO's target for both availability and affordability of essential medicines to treat non-communicable diseases. PLoS ONE 12, 1–13. https://doi.org/10.1371/journal.pone.0171284

Ferlay, J., Soerjomataram, I., Dikshit, R., Eser, S., Mathers, C., Rebelo, M., Parkin, D.M., Forman, D., Bray, F., 2015. Cancer incidence and mortality worldwide: sources, methods and major

patterns in GLOBOCAN 2012. International journal of cancer 136, E359-86. https://doi.org/10.1002/ijc.29210

FIP, 2022. Chronic respiratory diseases A handbook for pharmacists Colophon.

Gad, M., Kazibwe, J., Abassah-Konadu, E., Amankwah, I., Owusu, R., Gulbi, G., Torres-Rueda, S., Asare, B., Vassall, A., Ruiz, F., 2023. The Epidemiological and Economic Burden of Diabetes in Ghana: A Scoping Review to Inform Health Technology Assessment (preprint). Endocrinology (including Diabetes Mellitus and Metabolic Disease). https://doi.org/10.1101/2023.04.19.23288806

Gbadamosi, M.A., Tlou, B., 2020. Modifiable risk factors associated with non-communicable diseases among adult outpatients in Manzini, Swaziland: A cross-sectional study. BMC Public Health 20, 1–12. https://doi.org/10.1186/s12889-020-08816-0

GBD Chronic Respiratory Disease Collaborators, 2020. Prevalence and attributable health burden of chronic respiratory diseases, 1990-2017: a systematic analysis for the Global Burden of Disease Study 2017. Lancet Respir Med 8, 585–596. https://doi.org/10.1016/S2213-2600(20)30105-3

GBDCoD, C., 2017. Global, regional, and national age-sex specifc mortality for 264 causes of death, 1980-2016: A systematic analysis for the Global Burden of Disease Study 2016. The Lancet 390, 1151–1210. https://doi.org/10.1016/S0140-6736(17)32152-9

Geidl, W., Semrau, J., Pfeifer, K., 2014. Health behaviour change theories: Contributions to an ICF-based behavioural exercise therapy for individuals with chronic diseases. Disability and Rehabilitation 36, 2091–2100. https://doi.org/10.3109/09638288.2014.891056

Gerteis, J., Izrael, D., Deitz, D., LeRoy, L., Ricciardi, R., Miller, T., Basu, J., 2014. Multiple Chronic Conditions Chartbook. Agency for Healthcare Research and Quality.

Grundy, S.M., Cleeman, J.I., Daniels, S.R., Donato, K.A., Eckel, R.H., Franklin, B.A., Gordon, D.J., Krauss, R.M., Savage, P.J., Smith, S.C.J., Spertus, J.A., Costa, F., 2005. Diagnosis and management of the metabolic syndrome: an American Heart Association/National Heart, Lung, and Blood Institute Scientific Statement. Circulation 112, 2735–2752. https://doi.org/10.1161/CIRCULATIONAHA.105.169404

Gupta, N., Coates, M.M., Bekele, A., Dupuy, R., Fénelon, D.L., Gage, A.D., Getachew, T., Karmacharya, B.M., Kwan, G.F., Lulebo, A.M., Masiye, J.K., Mayige, M.T., Ndour Mbaye, M., Mridha, M.K., Park, P.H., Dagnaw, W.W., Wroe, E.B., Bukhman, G., 2020. Availability of equipment and medications for non-communicable diseases and injuries at public first-referral

level hospitals: A cross-sectional analysis of service provision assessments in eight low-income countries. BMJ Open 10. https://doi.org/10.1136/bmjopen-2020-038842

Hamill, H., Hampshire, K., Mariwah, S., Amoako-Sakyi, D., Kyei, A., Castelli, M., 2019. Managing uncertainty in medicine quality in Ghana: The cognitive and affective basis of trust in a high-risk, low-regulation context. Soc Sci Med 234, 112369. https://doi.org/10.1016/j.socscimed.2019.112369

Haileamlak, A., 2019. Physical Inactivity: The Major Risk Factor for Non-Communicable Diseases. Ethiopian journal of health sciences 29, 810. https://doi.org/10.4314/ejhs.v29i1.1

HENNIS, A., 2017. Essential Medicines for NCD Management.

Hou, X., Anderson, I., Burton-Mckenzie, E.-J., 2016. Health & non-communicable diseases. World Bank.

Hu, F.B., 2011. Globalization of diabetes: the role of diet, lifestyle, and genes. Diabetes Care 34, 1249–1257. https://doi.org/10.2337/dc11-0442

IFMSA, 2018. Noncommunicable diseases and the most common shared risk factors. Medical Students Worldwide.

Islands, S., 2021. Healthy Village Facilitator ' s Guide Non-Communicable Diseases (NCDs) and Nutrition.

Kapur, A., Hod, M., 2020. Maternal health and non-communicable disease prevention: An investment case for the post COVID-19 world and need for better health economic data. International journal of gynaecology and obstetrics: the official organ of the International Federation of Gynaecology and Obstetrics 150, 151–158. https://doi.org/10.1002/ijgo.13198

Katzmarzyk, P.T., Friedenreich, C., Shiroma, E.J., Lee, I.M., 2022. Physical inactivity and non-communicable disease burden in low-income, middle-income and high-income countries. British Journal of Sports Medicine 56, 101–106. https://doi.org/10.1136/bjsports-2020-103640

Kelly, B.B., Koehlmoos, T.P., Nugent, R., 2012. Exploring country-level decision making for the control of chronic diseases: reflections from an institute of medicine workshop. Global heart. https://doi.org/10.1016/j.gheart.2012.02.004

Kokkinos, P., 2012. Physical activity, health benefits, and mortality risk. ISRN cardiology 2012, 718789. https://doi.org/10.5402/2012/718789

Kotwani, A., 2013. Where are we: assessing prices, availability & affordability of essential medicines in Delhi. BMC Health Service Research 13, 285.

KRAUT, A., WALLD, R., TATE, R., MUSTARD, C., 2001. Impact of Diabetes on Employment and Income in Manitoba , Canada 24.

Kruk, M.E., Goldmann, E., Galea, S., 2009. Borrowing And Selling To Pay For Health Care In Low- And Middle-Income Countries 1056–1066. https://doi.org/10.1377/hlthaff.28.4.1056

Laryea, D.O., Awuah, B., Amoako, Y.A., Osei-Bonsu, E., Dogbe, J., Larsen-Reindorf, R., Ansong, D., Yeboah-Awudzi, K., Oppong, J.K., Konney, T.O., Boadu, K.O., Nguah, S.B., Titiloye, N.A., Frimpong, N.O., Awittor, F.K., Martin, I.K., 2014. Cancer incidence in Ghana, 2012: evidence from a population-based cancer registry. BMC Cancer 14, 362. https://doi.org/10.1186/1471-2407-14-362

Levison, L., Laing, R., 2003. The hidden costs of essential medicines. World Health 20–21.

Lopez, A.D., Mathers, C.D., Ezzati, M., Jamison, D.T., Murray, C.J.L., 2006. Chapter 1 Measuring the Global Burden of Disease and Risk Factors , 1990 – 2001 1990–2001.

Lu, C.-C., Wang, C.-P., Liu, C.-Y., Hsu, C.-P., 2016. The Efficiency and Reliability Improvement by Utilizing Quartz Airtight Packaging of UVC LEDs. IEEE Trans. Electron Devices 63, 3143–3146. https://doi.org/10.1109/TED.2016.2580707

Magnusson, R.S., Patterson, D., 2014. The role of law and governance reform in the global response to non-communicable diseases. Globalization and Health 10, 1–18. https://doi.org/10.1186/1744-8603-10-44

Mahal, A., Karan, A., Engelgau, M., 2010. The Economic Implications of Non-Communicable Disease for India.

Mattiuzzi, C., Lippi, G., 2019. Current Cancer Epidemiology. Journal of epidemiology and global health 9, 217–222. https://doi.org/10.2991/jegh.k.191008.001

McKee, M., Haines, A., Ebrahim, S., Lamptey, P., Barreto, L., Matheson, D., Walls, H.L., Foliaki, S., Jaime Miranda, J., Chimeddamba, O., Garcia-Marcos, L., Vineis, P., Pearce, N., 2014. Towards a comprehensive global approach to prevention and control of NCDs. Globalization and Health 10, 1–7. https://doi.org/10.1186/s12992-014-0074-8

Mendis, S., Fukino, K., Cameron, A., Laing, R., Filipe, A.J., Khatib, O., Leowski, J., Ewen, M., 2007. The availability and affordability of selected essential medicines for chronic diseases in six low- and middle-income countries. Bulletin of the World Health Organization 85, 279–288. https://doi.org/10.2471/blt.06.033647

Mensah, K.B., Mensah, A.B.B., 2020. Cancer control in Ghana: A narrative review in global context. Heliyon 6, e04564. https://doi.org/10.1016/j.heliyon.2020.e04564

Mikkelsen, 2023. COVID Highlighted Problems In Accessing Medicine For Non-Communicable Diseases – But They Can Be Fixed - Health Policy Watch. URL https://healthpolicy-watch.news/covid-highlighted-problems-accessing-noncommunicable-disease-medicine/ (accessed 10.17.23).

Ministry of Health, G., WHO, Health Action International, 2009. Ghana Medicines Price and Availability Report [WWW Document]. URL https://www.moh.gov.gh/wp-content/uploads/2016/02/Ghana-medicines-price-and-availability-report-april-2009.pdf (accessed 10.12.23)

Ministry of Health, 2022. National Policy: Non-communicable Diseases. Ministry of Health, Ghana.

Ministry of Health, G., 2011. Cancer Plan Ghana 2012-2016 [WWW Document]. URL https://www.iccp-portal.org/sites/default/files/plans/Cancer%20Plan%20Ghana%202012-2016.pdf (accessed 9.27.23).

MoH Ghana, 2012. REPUBLIC OF GHANA National Policy for the Prevention and Control of Chronic Non-Communicable Diseases in Ghana.

Mokdad, A.H., Mensah, G.A., Posner, S.F., Reed, E., Simoes, E.J., Engelgau, M.M., 2005. When chronic conditions become acute: prevention and control of chronic diseases and adverse health outcomes during natural disasters. Preventing chronic disease.

Mozaffarian, D., 2016. Dietary and Policy Priorities for Cardiovascular Disease, Diabetes, and Obesity: A Comprehensive Review. Circulation 133, 187–225. https://doi.org/10.1161/CIRCULATIONAHA.115.018585

Mukundiyukuri, J.P., Irakiza, J.J., Nyirahabimana, N., Ng'ang'a, L., Park, P.H., Ngoga, G., El-Khatib, Z., Nditunze, L., Dusengeyezu, E., Rusangwa, C., Mpunga, T., Mubiligi, J., Hedt-Gauthier, B., 2020. Availability, costs and stock-outs of essential ncd drugs in three rural rwandan districts. Annals of Global Health 86, 1–15. https://doi.org/10.5334/aogh.2729

Naatogmah, A.-K., 2023. NHIS Saving Lives of Children with Childhood Cancers [WWW Document]. URL https://www.nhis.gov.gh/News/nhis-saving-lives-of-children-with-childhood-cancers--5524 (accessed 10.12.23).

NCD Countdown 2030 collaborators, 2018. NCD Countdown 2030: worldwide trends in non-communicable disease mortality and progress towards Sustainable Development Goal target 3.4. Lancet (London, England) 392, 1072–1088. https://doi.org/10.1016/S0140-6736(18)31992-5

(NCD-RisC), N.R.F.C., 2017. Worldwide trends in blood pressure from 1975 to 2015: a pooled analysis of 1479 population-based measurement studies with 19·1 million participants. The Lancet 389, 37–55. https://doi.org/10.1016/S0140-6736(16)31919-5

Ndubuisi, N.E., 2021. Noncommunicable Diseases Prevention In Low- and Middle-Income Countries: An Overview of Health in All Policies (HiAP). Inquiry : a journal of medical care organization, provision and financing 58, 46958020927885. https://doi.org/10.1177/0046958020927885

Ng, G., Raskin, E., Wirtz, V.J., Banks, K.P., Laing, R.O., Kiragu, Z.W., Rockers, P.C., Onyango, M.A., 2021. Coping with access barriers to non-communicable disease medicines: qualitative patient interviews in eight counties in Kenya. BMC Health Services Research 21, 1–10. https://doi.org/10.1186/s12913-021-06433-0

Niëns, L.M., Cameron, A., Van de Poel, E., Ewen, M., Brouwer, W.B.F., Laing, R., 2010. Quantifying the impoverishing effects of purchasing medicines: a cross-country comparison of the affordability of medicines in the developing world. PLoS medicine 7. https://doi.org/10.1371/journal.pmed.1000333

NHIS, G., 2017. WHAT YOU NEED TO KNOW ABOUT NHIS MEDICINES LIST [WWW Document]. URL https://www.nhis.gov.gh/News/what-you-need-to-know-about-nhis-medicines-list-4130 (accessed 10.12.23).

Noordman, J., Van Dijk, L., Friele, R., 2010. Patient organisations and the reimbursement process for medicines: an exploratory study in eight European countries. BMC Health Serv Res 10, 45. https://doi.org/10.1186/1472-6963-10-45

Nugent, R., Bertram, M., Jan, S., Niessen, L., Sassi, F., Jamison, D., González Pier, E., Beaglehole, R., 2018. Investing in NCDs to Advance the SDGs.

Ocran Mattila, P., Biritwum, R.B., Babar, Z.U.-D., 2023. A comprehensive survey of cancer medicines prices, availability and affordability in Ghana. PLoS ONE 18, e0279817. https://doi.org/10.1371/journal.pone.0279817

OECD/EU, 2016. Health at a Glance : Europe 2016: State of Health in the EU cycle.

Ofori-Asenso, R., Garcia, D., 2016. Cardiovascular diseases in Ghana within the context of globalization. Cardiovasc Diagn Ther 6, 67–77. https://doi.org/10.3978/j.issn.2223-3652.2015.09.02

Olatona, F.A., Onabanjo, O.O., Ugbaja, R.N., Nnoaham, K.E., Adelekan, D.A., 2018. Dietary habits and metabolic risk factors for non-communicable diseases in a university undergraduate population. Journal of Health, Population and Nutrition 37, 1–9. https://doi.org/10.1186/s41043-018-0152-2

Orians, C., Rose, S., Hubbard, B., Sarisky, J., Reason, L., Bernichon, T., Liebow, E., Skarpness, B., Buchanan, S., 2009. Strengthening the Capacity of Local Health Agencies through Community-Based Assessment and Planning. Public Health Rep 124, 875–882. https://doi.org/10.1177/003335490912400616

PATH, 2020. The Journey of the Pill; Findings of the NCD Commodity Supply Chain Assessment in Ghana [WWW Document]. URL https://media.path.org/documents/Ghana_Journey_of_the_Pill_2020.pdf?_gl=1*1ht2w2r*_gcl_au*NDUyNTQ2MDIxLjE2OTc1MDA2Njc.*_ga*ODUwNDAwNDgyLjE2OTc1MDA2Njc.*_ga_YBSE7ZKDQM*MTY5NzUwMDY2Ny4xLjAuMTY5NzUwMDY2Ny42MC4wLjA. (accessed 10.16.23)

Peters, D.H., Garg, A., Bloom, G., Walker, D.G., Brieger, W.R., Rahman, M.H., 2008. Poverty and Access to Health Care in Developing Countries 171, 161–171. https://doi.org/10.1196/annals.1425.011

Petrie, J.R., Guzik, T.J., Touyz, R.M., 2018. Diabetes, Hypertension, and Cardiovascular Disease: Clinical Insights and Vascular Mechanisms. The Canadian journal of cardiology 34, 575–584. https://doi.org/10.1016/j.cjca.2017.12.005

Pourraz, J., 2022. Making medicines in post-colonial Ghana: State policies, technology transfer and pharmaceuticals market. Social Science & Medicine 311, 115360. https://doi.org/10.1016/j.socscimed.2022.115360

Rehm, J., 2011. The risks associated with alcohol use and alcoholism. Alcohol research & health : the journal of the National Institute on Alcohol Abuse and Alcoholism 34, 135–143.

Robertson, J., Macé, C., Forte, G., de Joncheere, K., Beran, D., 2015. Medicines availability for non-communicable diseases: The case for standardized monitoring. Globalization and Health 11, 1–6. https://doi.org/10.1186/s12992-015-0105-0

Rock, C.L., Doyle, C., Demark-Wahnefried, W., Meyerhardt, J., Courneya, K.S., Schwartz, A.L., Bandera, E. V, Hamilton, K.K., Grant, B., McCullough, M., Byers, T., Gansler, T., 2012. Nutrition and physical activity guidelines for cancer survivors. CA: a cancer journal for clinicians 62, 243–274. https://doi.org/10.3322/caac.21142

Roth, G.A., Forouzanfar, M.H., Moran, A.E., Barber, R., Nguyen, G., Feigin, V.L., Naghavi, M., Mensah, G.A., Murray, C.J.L., 2015. Demographic and epidemiologic drivers of global cardiovascular mortality. N Engl J Med 372, 1333–1341. https://doi.org/10.1056/NEJMoa1406656

Rumgay, H., Shield, K., Charvat, H., Ferrari, P., Sornpaisarn, B., Obot, I., Islami, F., Lemmens, V.E.P.P., Rehm, J., Soerjomataram, I., 2021. Global burden of cancer in 2020 attributable to alcohol consumption: a population-based study. The Lancet Oncology 22, 1071–1080. https://doi.org/10.1016/S1470-2045(21)00279-5

Ruthsatz, M., Candeias, V., 2020. Non-communicable disease prevention, nutrition and aging. Acta bio-medica : Atenei Parmensis 91, 379–388. https://doi.org/10.23750/abm.v91i2.9721

Sarfo, F.S., Mobula, L.M., Arthur, L., Plange-Rhule, J., Burnham, G., Sablah, J., Gavor, E., Ansong, D., Sarfo-Kantanka, O., Gyamfi, R.A., Duah, J., Abraham, B., Ofori-Adjei, D., 2019. Differential pricing of medicines to improve access to medicines for hypertension and diabetes control in Ghana: The Ghana Access and Affordability Program, a multi-center prospective trial. https://doi.org/10.12688/gatesopenres.13044.1

Salvador, E., Vincent, S., Kitts, S., Rica, C., Republic, D., Lucia, S., States, U., 2010. Non-communicable diseases and gender. Interntional Diabetes Federation 0–1.

Seiter, A., Yadav, P., Davis, 2021. How to improve medication access for chronic illnesses [WWW Document]. URL https://blogs.worldbank.org/health/how-improve-medication-access-chronic-illnesses (accessed 10.16.23).

Stolbrink, M., Thomson, H., Hadfield, R.M., Ozoh, O.B., Nantanda, R., Jayasooriya, S., Allwood, B., Halpin, D.M.G., Salvi, S., de Oca, M.M., Mortimer, K., Rylance, S., 2022. The availability, cost, and affordability of essential medicines for asthma and COPD in low-income and middle-income countries: a systematic review. The Lancet Global Health 10, e1423–e1442. https://doi.org/10.1016/S2214-109X(22)00330-8

Suhrcke, M., Rocco, L., McKee, M., Mazzuco, S., Urban, D., Steinherr, A., 2007. of Noncommunicable Diseases and Injuries in. World Health Organization.

Thandra, K.C., Barsouk, Adam, Saginala, K., Aluru, J.S., Barsouk, Alexander, 2021. Epidemiology of lung cancer. Contemporary oncology (Poznan, Poland) 25, 45–52. https://doi.org/10.5114/wo.2021.103829

Tobias, M., Blakely, T., Matheson, D., Rasanathan, K., Atkinson, J., 2009. Changing trends in indigenous inequalities in mortality: Lessons from New Zealand. International Journal of Epidemiology 38, 1711–1722. https://doi.org/10.1093/ije/dyp156

Tomlinson, P.C., Moyo, H., Rizvi, Z., Waterhouse, C., Meyer, S., 2017. EXPLORING PATENT BARRIERS TO CANCER TREATMENT ACCESS IN SOUTH AFRICA: 24 MEDICINE CASE STUDIES.

Twagirumukiza, M., Cosijns, A., Pringels, E., Remon, J.P., Vervaet, C., Van Bortel, L., 2009. Influence of tropical climate conditions on the quality of antihypertensive drugs from Rwandan pharmacies. The American journal of tropical medicine and hygiene 81, 776–781. https://doi.org/10.4269/ajtmh.2009.09-0109

United Nations, 2022. 17 Goals to Transform Our World. United Nations Climate Action.

United Nations, 2011. Resolution adopted by the General Assembly. Political Declaration of the High-level Meeting of the General Assembly on the Prevention and Control of Non-communicable Diseases, 2011 49777, 1–13.

van Mourik, M.S.M., Cameron, A., Ewen, M., Laing, R.O., 2010. Availability, price and affordability of cardiovascular medicines: A comparison across 36 countries using WHO/HAI data. BMC Cardiovascular Disorders 10. https://doi.org/10.1186/1471-2261-10-25

Wagenaar, B.H., Stergachis, A., Rao, D., Hoek, R., Cumbe, V., Napúa, M., Sherr, K., 2015. The availability of essential medicines for mental healthcare in Sofala, Mozambique. Glob Health Action 8, 27942. https://doi.org/10.3402/gha.v8.27942

Wagner, M.R., 2018. Robust Inventory Management: An Optimal Control Approach. Operations Research 66, 426–447. https://doi.org/10.1287/opre.2017.1669

Wang, S., Maquez, P., Langenbrunner, J., 2011. Toward a Healthy and Harmonious Life in China : Stemming the Rising Tide of Non-Communicable Diseases. The World Bank.

Wang, Y., Zhang, D., Liu, Y., Dai, B., Lee, L.H., 2019. Enhancing transportation systems via deep learning: A survey. Transportation Research Part C: Emerging Technologies 99, 144–163. https://doi.org/10.1016/j.trc.2018.12.004

WHO, 2023. Diabetes [WWW Document]. URL https://www.who.int/health-topics/diabetes (accessed 9.27.23).
WHO, 2013. The selection and use of essential medicines. World Health Organization - Technical Report Series 2013.
WHO, 2010. Monitoring the Building Blocks of Health Systems : a Handbook of Indicators and 110.
WHO, Ghana, 2023. Ghana on the offensive against diabetes [WWW Document]. WHO | Regional Office for Africa. URL https://www.afro.who.int/countries/ghana/news/ghana-offensive-against-diabetes (accessed 9.27.23).
World Health Organisation, 2014. Global status report on alcohol and health 2014 1–392. https://doi.org//entity/substance_abuse/publications/global_alcohol_report/en/index.html
World Health Organisation., 2011. Disaster Risk Management for Health NON-COMMUNICABLE DISEASES.
World Health Organization, 2019. WHO's Leadership Priorities.
World Health Organization, 2018a. Noncommunicable Disease, Heart of Africa: Clinical Profile of an Evolving Burden of Heart Disease in Africa. https://doi.org/10.1002/9781119097136.part5
World Health Organization, 2018b. NONCOMMUNICABLE DISEASES.
World Health Organization, 2017. Noncommunicable diseases: fact sheets on Sustainable Development Goals: health targets. World Health Organization. Regional Office for Europe 1–8.
World Health Organization, 2013. 2008-2013 Action Plan for the Global Strategy for the Prevention and Control of Noncommunicable Diseases The six objectives of the 2008-2013 Action Plan are : World Health Organization.
World Health Organization, 2008. Global Chronic Respiratory Chronic Respiratory. Chronic Respiratory Disease 12–36.
World Health Organization, 2007. Global surveillance, prevention and control of chronic respiratory diseases: a comprehensive approach 12–36.
World Health Organization (WHO), 2021. Physical Activity Fact Sheet. WHO, World Health Organization 1–8.
Wirtz, V.J., Moucheraud, C., 2017. Beyond availability and affordability: how access to medicines affects non-communicable disease outcomes. The Lancet Public Health 2, e390–e391. https://doi.org/10.1016/S2468-2667(17)30168-8

Xu, K., Evans, D.B., Carrin, G., Aguilar-rivera, A.M., Musgrove, P., Evans, T., 2007. Protecting Households From Catastrophic Health Spending. https://doi.org/10.1377/hlthaff.26.4.972

Zahangir, M.S., Hasan, M.M., Richardson, A., Tabassum, S., 2017. Malnutrition and non-communicable diseases among Bangladeshi women: an urban-rural comparison. Nutrition & diabetes 7, e250. https://doi.org/10.1038/nutd.2017.2

Appendix 1: List of Tables of further analysis

Table 11: Availability and type of medication

Drug	Do you stock this medicine? Yes (%)	Available (if in stock)? Yes (%)	Type of medicine			Medication on NHIS? Yes (%)
			Generic	Brand	Both	
BETA BLOCKER						
Atenolol	380 (64.3)	356 (93.7)	196 (55.4)	40 (11.3)	118 (33.3)	125 (32.9)
Bisoprolol	259 (43.8)	240 (92.7)	133 (55.9)	33 (13.9)	72 (30.3)	54 (20.9)
Metoprolol	95 (16.1)	71 (74.7)	20 (28.9)	22 (31.9)	27 (39.2)	17 (17.9)
Carvedilol	258 (43.7)	223 (86.4)	94 (42.5)	36 (16.3)	91 (41.2)	49 (18.9)
Labetalol tab	105 (17.8)	76 (72.4)	39 (52.7)	11 (14.8)	24 (32.4)	21 (20.0)
Labetalol IV	109 (18.5)	84 (77.1)	59 (70.2)	12 (14.3)	13 (15.5)	29 (26.4)
CALCIUM CHANNEL BLOCKERS						
Verapamil	50 (8.5)	39 (78.0)	21 (55.3)	4 (10.5)	13 (34.2)	6 (12.2)
Diltiazem	27 (4.6)	16 (59.3)	7 (43.8)	6 (37.5)	3 (18.8)	3 (10.3)
Amlodipine	471 (79.7)	452 (96.0)	186 (41.3)	76 (16.9)	188 (41.8)	150 (31.9)
Nifedipine	461 (78.0)	451 (97.8)	164 (36.5)	97 (21.6)	188 (41.9)	141 (30.7)
Felodipine	66 (11.2)	54 (81.8)	11 (20.4)	26 (48.2)	17 (31.5)	7 (10.3)
ACE INHIBITORS						
Lisinopril	415 (70.2)	394 (94.9)	177 (45.2)	65 (16.6)	150 (38.3)	275 (66.6)
Enalapril	27 (4.6)	17 (62.9)	8 (47.1)	2 (11.8)	7 (41.2)	4 (14.3)
Ramipril	104 (17.6)	80 (76.9)	42 (53.2)	6 (7.6)	31 (39.2)	23 (22.3)
Captopril	19 (3.2)	9 (47.4)	4 (44.4)	2 (22.2)	3 (33.4)	3 (15.8)
Fosinopril	6 (1.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (25.0)
ANGIOTENSIN RECEPTOR BLOCKERS						
Losartan	404 (68.4)	386 (95.5)	187 (48.7)	57 (14.8)	140 (36.5)	125 (30.9)
Candesartan	160 (27.1)	144 (37.3)	40 (28.2)	46 (32.4)	56 (39.4)	10 (6.3)
Valsartan	65 (11.1)	43 (66.2)	8 (19.1)	22 (52.4)	12 (28.5)	12 (18.2)
STATINS						
Rosuvastatin	199 (33.7)	177 (88.9)	46 (26.3)	64 (36.6)	65 (37.1)	23 (11.6)
Atorvastatin	366 (61.9)	346 (94.5)	145 (42.2)	56 (16.3)	143 (41.6)	114 (31.2)
Simvastatin	104 (17.6)	76 (73.1)	34 (45.3)	15 (20.0)	26 (34.7)	16 (15.2)
DIURETICS						
Bendroflumethiazide	430 (72.8)	412 (95.8)	208 (50.7)	62 (15.1)	140 (34.2)	148 (34.6)
Hydrochlorothiazide	74 (12.5)	53 (71.6)	22 (41.5)	12 (22.6)	19 (35.9)	21 (27.6)

Indapamide	145 (24.5)	113 (77.9)	32 (28.8)	43 (38.7)	36 (32.4)	21 (14.5)
Spironolactone	237 (40.1)	197 (83.1)	102 (52.3)	35 (17.9)	58 (29.8)	69 (29.1)
Spironolactone IV	9 (1.5)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (9.09)
Furosemide	424 (71.7)	391 (92.2)	195 (50.1)	71 (18.3)	123 (31.6)	143 (33.7)
Furosemide IV	203 (34.5)	177 (87.2)	113 (63.8)	30 (16.9)	34 (19.2)	97 (47.6)
ANTICOAGULANTS/ ANTIPLATELETS						
Aspirin	420 (71.1)	366 (87.1)	197 (54.1)	58 (15.9)	109 (30.0)	134 (32.1)
Clopidogrel	272 (46.0)	246 (90.4)	116 (47.5)	47 (19.3)	81 (33.2)	38 (14.0)
Low molecular weight heparin (enoxaparin)	96 (16.2)	79 (82.3)	33 (42.3)	24 (30.8)	21 (26.9)	37 (38.5)
Low molecular weight heparin (Dalteparin)	21 (3.6)	14 (66.7)	2 (14.2)	6 (42.9)	6 (42.9)	6 (28.6)
Unfractionated heparin	17 (2.9)	11 (64.7)	6 (54.6)	4 (36.4)	1 (9.0)	1 (5.6)
Warfarin	144 (24.4)	97 (67.4)	60 (62.5)	16 (16.7)	20 (20.8)	26 (17.9)
Rivaroxaban	82 (13.9)	68 (82.1)	13 (19.4)	37 (55.2)	17 (25.4)	3 (3.7)
ALPHA BLOCKERS						
Prazosin	15 (2.5)	7 (46.7)	3 (42.9)	1 (14.2)	3 (42.9)	3 (17.7)
Terazosin	20 (3.4)	14 (70.0)	3 (21.4)	5 (35.7)	6 (42.9)	3 (15.0)
ALPHA AGONISTS						
Methyldopa	355 (60.1)	327 (92.1)	151 (46.5)	49 (15.1)	125 (38.5)	121 (34.3)
Clonidine	17 (2.9)	12 (70.6)	3 (25.0)	6 (50.0)	3 (25.0)	4 (21.1)
CORTICOSTEROIDS						
Hydrocortisone (IV)	279 (47.2)	247 (88.5)	151 (61.6)	37 (15.1)	57 (23.3)	115 (41.2)
Hydrocortisone (Oral)	62 (10.5)	44 (70.9)	19 (44.2)	7 (16.3)	17 (39.5)	14 (22.2)
Methylprednisolone (IV)	36 (6.1)	23 (63.9)	5 (21.7)	13 (56.6)	5 (21.7)	2 (5.3)
Prednisolone (Oral)	412 (69.7)	393 (95.4)	218 (55.8)	65 (16.6)	108 (27.6)	133 (32.4)
Dexamethasone	278 (47.0)	243 (87.4)	120 (49.8)	47 (19.5)	74 (30.7)	53 (19.1)
Dexamethasone IV	150 (25.4)	127 (85.2)	89 (67.9)	19 (14.5)	23 (17.6)	75 (48.1)
ANALGESICS						
Paracetamol (IV)	311 (52.6)	277 (89.1)	143 (51.1)	63 (22.5)	74 (26.4)	40 (12.7)

Paracetamol (Oral)	585 (99.0)	579 (99.0)	214 (37.2)	109 (19.0)	252 (43.8)	188 (32.2)
Paracetamol (Supp)	547 (92.6)	526 (96.2)	219 (41.9)	109 (20.8)	195 (37.3)	180 (33.0)
NSAIDS						
Diclofenac (IV)	319 (54.0)	292 (91.5)	153 (52.2)	65 (22.2)	75 (25.6)	128 (39.8)
Diclofenac (Oral)	570 (96.5)	553 (97.0)	233 (42.4)	111 (20.2)	206 (37.4)	175 (30.9)

Diclofenac (Supp)	510 (86.3)	481 (94.3)	191 (39.9)	113 (23.4)	175 (36.5)	171 (33.5)
Ibuprofen	557 (94.3)	533 (95.7)	208 (39.2)	124 (23.4)	199 (37.5)	178 (32.1)
Celocoxib	333 (56.4)	301 (90.4)	111 (37.1)	72 (24.1)	116 (38.8)	82 (24.8)
Naproxen	248 (41.9)	220 (88.7)	90 (42.1)	44 (20.6)	80 (37.4)	32 (13.0)
OPIOIDS						
Morphine (Oral)	87 (14.7)	44 (50.6)	26 (57.8)	10 (22.2)	9 (20.0)	12 (13.5)
Morphine (IV/IM)	155 (26.2)	132 (85.2)	87 (67.4)	23 (17.8)	19 (14.7)	71 (47.0)
Fentanyl	43 (7.3)	32 (74.4)	20 (64.5)	4 (12.9)	7 (22.6)	6 (14.0)
Oxycodone	7 (1.2)	4 (57.1)	1 (12.5)	6 (75.0)	1 (12.5)	2 (16.7)
Tramadol (IV)	227 (38.4)	186 (81.9)	105 (56.2)	44 (23.5)	38 (20.3)	25 (11.0)
Tramadol (Oral)	324 (54.8)	295 (91.1)	127 (43.8)	67 (23.1)	96 (33.1)	38 (11.8)
ISCHEMIC HEART DISEASE (ANGINA PECTORIS, ACS)						
Glyceryl Trinitrate	49 (8.3)	35 (71.4)	19 (57.6)	10 (30.3)	4 (12.1)	10 (20.8)
Isosorbide Dinitrate	85 (14.4)	59 (69.4)	33 (53.2)	16 (25.8)	13 (21.0)	13 (14.9)
STROKE						
Piracetam	174 (29.4)	159 (91.4)	52 (33.6)	59 (38.1)	44 (28.3)	31 (17.8)
IV mannitol	102 (17.3)	82 (80.4)	63 (75.9)	13 (15.7)	7 (8.4)	46 (45.5)
VASODILATOR						
Hydralazine (IV)	144 (24.4)	115 (79.9)	73 (66.9)	17 (15.6)	19 (17.5)	66 (47.5)
ANTIARRHYTHMICS						
Dobutamine	34 (5.8)	24 (70.6)	17 (63.0)	9 (33.3)	1 (3.70)	5 (12.5)
Amiodarone tab	35 (5.9)	26 (74.3)	10 (45.5)	3 (13.6)	9 (40.91	5 (15.6)
Amiodarone IV	12 (2.0)	7 (58.3)	7 (53.9)	4 (30.8)	2 (15.4)	3 (18.8)
Digoxin	130 (22.0)	100 (76.9)	61 (66.3)	10 (10.9)	21 (22.8)	28 (23.0)
Flecainide	2 (0.3)	1 (50.0)	2 (50.0)	2 (50.0)	0 (0.0)	0 (0.0)
ASTHMA						
Salbutamol (Nebulized)	285 (48.2)	217 (76.1)	107 (49.1)	50 (22.9)	61 (28.0)	106 (37.3)

Salbutamol (Pressurized metered dose inhaler)	312 (52.8)	283 (90.7)	97 (34.8)	76 (27.2)	106 (38.0)	88 (28.3)
Ipratropium bromide (nebulized)	61 (10.3)	45 (73.8)	24 (55.8)	11 (25.6)	8 (18.6)	12 (20.7)
Aminophylline (IV)	82 (13.9)	55 (67.1)	39 (70.9)	5 (9.1)	11 (20.0)	40 (48.8)
Budesonide (Inhaled)	39 (6.6)	26 (66.7)	10 (37.0)	12 (44.4)	5 (18.5)	11 (27.5)
Fluticasone (metered dose inhaler)	56 (9.5)	43 (76.8)	12 (28.6)	25 (59.5)	5 (11.9)	3 (5.3)
Beclomethasone (inhaled)	14 (2.4)	8 (57.1)	5 (50.0)	3 (30.0)	2 (20.0)	1 (6.7)
Montelukast (oral)	95 (16.1)	71 (74.7)	31 (47.0)	21 (31.8)	14 (21.2)	5 (5.4)
Combination Inhaled and Long-Acting Beta-Agonist						
Budesonide/Formoterol	75 (12.7)	59 (78.7)	16 (26.2)	39 (63.9)	6 (9.8)	27 (34.2)
Fluticasone/Salmeterol	68 (11.5)	59 (86.8)	19 (32.8)	31 (53.5)	8 (13.8)	10 (14.5)
CHRONIC OBSTRUCTIVE PULMONARY DISEASE						
Tiotropium (Inhaled)	4 (0.7)	2 (50.0)	3 (75.0)	1 (25.0)	0 (0.0)	1 (14.3)
Carbocysteine (Syrup)	416 (70.4)	388 (93.3)	162 (42.2)	93 (24.2)	129 (33.6)	136 (32.9)
Acetylcysteine (Syrup/powder)	11 (1.9)	5 (45.5)	8 (61.5)	3 (23.1)	2 (15.4)	4 (19.1)
ANTIBIOTICS						
Amoxicillin tab	501 (84.8)	480 (95.8)	211 (44.9)	92 (19.6)	167 (35.5)	150 (30.4)
Amoxicillin IV	40 (6.8)	30 (75.0)	15 (41.7)	6 (16.6)	15 (41.7)	15 (32.6)
Co-amoxiclav	417 (70.6)	388 (93.1)	135 (34.7)	90 (23.1)	164 (42.2)	128 (30.6)
Azithromycin	461 (78.0)	430 (93.3)	151 (35.8)	84 (19.9)	187 (44.3)	129 (28.5)
Erythromycin	320 (54.2)	275 (85.9)	154 (55.4)	51 (18.4)	73 (26.3)	112 (34.6)
Doxycycline	478 (80.9)	461 (96.4)	221 (48.0)	89 (19.4)	150 (32.6)	144 (30.4)
Clarithromycin	289 (48.9)	249 (86.2)	114 (46.2)	51 (20.7)	82 (33.2)	83 (28.6)
DIABETES						
Metformin	445 (75.3)	428 (96.2)	164 (39.2)	80 (19.1)	174 (41.6)	148 (34.0)
Glucagon	8 (1.4)	1 (12.5)	0 (0.0)	4 (100.0)	0 (0.0)	1 (8.3)

Insulin						
Rapid acting (e.g., insulin as part, insulin lispro, insulin Glulisine)	86 (14.6)	57 (66.3)	24 (44.4)	18 (33.3)	12 (22.2)	30 (36.1)
Short acting (regular insulin/soluble insulin)	120 (20.3)	80 (66.7)	41 (51.3)	23 (28.8)	16 (20.0)	60 (50.0)
Intermediate acting (Human isophane insulin/NPH)	48 (8.1)	34 (70.8)	22 (64.7)	8 (23.5)	4 (11.8)	25 (52.1)
Long acting (insulin determir, insulin glargine)	37 (6.3)	25 (67.6)	16 (66.7)	7 (29.2)	1 (4.1)	16 (44.4)
Mixed insulins						
Rapid acting and intermediate acting (e.g., Novomix 30)	52 (8.8)	37 (71.2)	17 (46.0)	15 (40.5)	5 (13.5)	25 (46.3)
Rapid acting and long acting	27 (4.6)	17 (63.0)	11 (64.7)	5 (29.4)	1 (5.9)	10 (35.7)
Short acting and intermediate acting (e.g., Mixtard)	131 (22.2)	106 (80.9)	42 (39.6)	49 (46.2)	15 (14.2)	53 (40.2)
Sulfonylureas						
Glibenclamide	328 (55.5)	306 (93.3)	128 (41.8)	66 (21.6)	112 (36.6)	124 (37.7)
Gliclazide	206 (34.9)	180 (87.4)	85 (47.2)	41 (22.8)	54 (30.0)	61 (29.6)
Tolbutamide	9 (1.5)	5 (55.6)	2 (40.0)	1 (20.0)	2 (40.0)	3 (33.3)
DPP-4 Inhibitors						
Saxagliptin	11 (1.9)	10 (90.9)	2 (25.0)	4 (50.0)	2 (25.0)	0 (0.0)
Sitagliptin	10 (1.7)	7 (70.0)	2 (33.3)	3 (50.0)	1 (16.7)	1 (10.0)
Vildagliptin	40 (6.8)	35 (87.5)	7 (20.6)	20 (58.8)	7 (20.6)	0 (0.0)
Thiazolidinediones						
Pioglitazone	141 (23.9)	113 (80.1)	61 (54.5)	23 (20.5)	28 (25.0)	50 (35.7)
Rosiglitazone	4 (0.7)	1 (25.0)	0 (0.0)	1 (100.0)	0 (0.0)	0 (0.0)
SGLT2 Inhibitors						
Canagliflozin	1 (0.1)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Dapagliflozin	30 (5.1)	29 (96.7)	7 (43.8)	6 (37.5)	3 (18.8)	1 (3.5)
Empagliflozin	14 (2.4)	10 (71.4)	2 (22.2)	7 (77.8)	0 (0.0)	0 (0.0)
GLP1 agonists						
Semaglutide	1 (0.2)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Dulaglutide	3 (0.5)	1 (33.3)	1 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)
Combination OHA						

Galvus-Met	209 (35.4)	191 (91.4)	53 (28.0)	92 (48.7)	44 (23.3)	16 (7.7)
Metaglip	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Dextrose 5%	249 (42.1)	220 (88.4)	140 (63.9)	37 (16.9)	42 (19.2)	108 (43.6)
Dextrose 10%	154 (26.1)	134 (87.0)	99 (73.9)	17 (12.7)	18 (13.4)	82 (52.6)
Dextrose 50%	104 (17.6)	75 (72.1)	58 (77.3)	5 (6.7)	12 (16.0)	60 (57.1)
Cancer						
Cancer chemotherapy agents	10 (1.7)	7 (70.0)	2 (28.6)	3 (42.8)	2(28.6)	1 (10.0)
Hormonal therapy agents	31 (5.3)	26 (83.9)	11 (42.3)	9 (34.6)	6 (23.1)	3 (9.7)
Immunotherapy agents (Biologic therapy agents)	5 (0.9)	3 (60.0)	2 (66.7)	0 (0.0)	1 (33.3)	2 (28.6)
ANTIEMETICS						
Granisetron	32 (5.4)	26 (81.3)	14 (53.9)	7 (26.9)	5 (19.2)	2 (6.3)
Metoclopramide	338 (57.2)	302 (89.4)	164 (54.7)	41 (13.7)	95 (31.6)	107 (31.8)
Domperidone	218 (36.9)	204 (93.6)	74 (36.5)	68 (33.5)	61 (30.1)	42 (19.3)
GENETIC DISEASES (SICKLE CELL)						
Hydroxyurea (Hydroxycarbamide)	58 (9.8)	38 (65.5)	25 (65.8)	8 (21.1)	5 (13.2)	8 (13.3)
Blood	37 (6.3)	33 (89.2)	22 (66.7)	4 (12.1)	7 (21.2)	2 (5.3)
Folic acid	574 (97.1)	563 (98.1)	266 (47.4)	102 (18.2)	193 (34.4)	173 (30.2)
Iron chelators	34 (5.8)	28 (82.4)	7 (25.0)	7 (25.0)	15 (50.0)	10 (29.4)
IV fluids						
Dextrose saline	294 (49.8)	272 (92.5)	176 (64.9)	43 (15.9)	52 (19.2)	123 (41.8)
Ringer's lactate	278 (47.0)	257 (92.5)	169 (66.0)	43 (16.8)	44 (17.2)	125 (44.8)
Antibiotics						
Cefuroxime	460 (77.8)	429 (93.3)	155 (36.2)	92 (21.5)	181 (42.3)	121 (26.3)
Ceftriaxone	331 (56.0)	304 (91.8)	138 (45.5)	66 (21.8)	99 (32.7)	108 (32.6)
Cefpodoxime	116 (19.6)	107 (92.2)	29 (27.4)	48 (45.3)	29 (27.4)	7 (6.0)
Cefotaxime	56 (9.5)	40 (71.4)	26 (65.0)	7 (17.5)	7 (17.5)	14 (24.6)

Mental health disorders						
Sodium valproate	115 (19.5)	93 (80.9)	33 (35.9)	39 (42.4)	20 (21.7)	34 (29.6)
Carbamazepine	273 (46.2)	237 (86.8)	109 (46.4)	57 (24.6)	69 (29.4)	78 (28.7)
Levetiracetam	54 (9.1)	47 (87.0)	15 (33.3)	13 (28.9)	17 (37.8)	3 (5.7)
Benzodiazepines						
Midazolam	74 (12.5)	55 (74.3)	34 (63.0)	12 (22.2)	8 (14.8)	24 (32.4)
Diazepam	440 (74.5)	418 (95.0)	233 (56.0)	70 (16.8)	113 (27.2)	144 (32.9)
Lorazepam	143 (24.2)	120 (83.9)	69 (58.0)	21 (17.7)	29 (24.4)	17 (12.0)
Clonazepam	24 (4.1)	14 (58.3)	1 (7.7)	10 (76.9)	2 (15.4)	2 (8.3)
Alprazolam	7 (1.2)	4 (57.1)	1 (25.0)	2 (50.0)	1 (25.0)	0 (0.0)
Antipsychotics						
Haloperidol	115 (19.5)	93 (80.9)	59 (63.4)	19 (20.4)	15 (16.1)	34 (29.8)
Olanzapine	217 (36.7)	179 (82.5)	96 (53.9)	32 (18.0)	50 (28.1)	35 (16.1)
Risperidone	156 (26.4)	124 (79.5)	71 (57.3)	23 (18.6)	30 (24.2)	36 (23.1)
Chlorpromazine	102 (17.3)	69 (67.7)	46 (66.7)	12 (17.4)	11 (15.9)	42 (41.2)
Antidepressants: TCAs						
Amitriptyline	356 (60.2)	320 (89.9)	182 (57.1)	49 (15.4)	88 (27.6)	101 (28.5)
Imipramine	84 (14.2)	62 (73.8)	45 (72.6)	8 (12.9)	9 (14.5)	9 (10.7)
Nortriptyline	7 (1.2)	4 (57.1)	2 (50.0)	0 (0.0)	2 (50.0)	0 (0.0)
Antidepressants: SSRIs						
Fluoxetine	107 (18.1)	84 (78.5)	53 (63.9)	16 (19.3)	14 (16.9)	21 (19.8)
Sertraline	55 (9.3)	48 (87.3)	26 (54.2)	16 (33.3)	6 (12.5)	6 (10.9)
Citalopram	31 (5.3)	28 (90.3)	15 (53.6)	7 (25.0)	6 (21.4)	2 (6.5)
Anticholinergics						
Artane	89 (15.1)	64 (71.9)	41 (64.1)	12 (18.8)	11 (17.2)	24 (27.0)
Benztropine	2 (0.3)	2 (100.0)	2 (100.0)	0 (0.0)	0 (0.0)	2 (100.0)
Biperidine	3 (0.5)	1 (33.3)	1 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)

Table 12: Cross-tabulation between stocks of medication and type of facility

Drug	Stock, n (%)				
	CHAG	Community Pharmacy	Private Hospitals	Public Hospitals	Total
BETA BLOCKER					
Atenolol	8 (2.1)	316 (83.1)	4 (1.1)	52 (13.6)	380
Bisoprolol	4 (1.2)	241 (93.1)	2 (0.8)	12 (4.6)	259
Metoprolol	0 (0.0)	92 (96.8)	3 (3.2)	0 (0.0)	95
Carvedilol	4 (1.6)	241 (93.4)	1 (0.4)	12 (4.6)	258
Labetalol tab	1 (0.9)	99 (94.3)	1 (0.9)	4 (3.8)	105
Labetalol IV	6 (5.5)	67 (61.5)	2 (1.8)	34 (31.2)	109
CALCIUM CHANNEL BLOCKERS					
Verapamil	1 (2.0)	48 (96.0)	1 (2.0)	0 (0.0)	50
Diltiazem	0 (0.0)	26 (96.3)	1 (3.7)	0 (0.0)	27
Amlodipine	8 (1.7)	389 (82.5)	8 (1.7)	66 (14.0)	471
Nifedipine	8 (1.7)	381 (82.6)	8 (1.7)	64 (13.9)	461
Felodipine	0 (0.0)	66 (100.0)	0 (0.0)	0 (0.0)	66
ACE INHIBITORS					
Lisinopril	8 (1.9)	344 (82.9)	4 (0.9)	59 (14.2)	415
Enalapril	0 (0.0)	27 (100.0)	0 (0.0)	0 (0.0)	27
Ramipril	0 (0.0)	100 (96.2)	3 (2.9)	1 (0.9)	104
Captopril	1 (5.3)	18 (94.7)	0 (0.0)	0 (0.0)	19
Fosinopril	0 (0.0)	6 (100.0)	0 (0.0)	0 (0.0)	6
ANGIOTENSIN RECEPTOR BLOCKERS					
Losartan	8 (1.9)	340 (84.2)	4 (0.9)	52 (12.8)	404
Candesartan	0 (0.0)	153 (95.6)	2 (1.3)	5 (3.1)	160
Valsartan	0 (0.0)	63 (96.9)	1 (1.5)	1 (1.5)	65
STATINS					
Rosuvastatin	2 (1.0)	186 93.5)	1 (0.5)	10 (5.0)	199
Atorvastatin	8 (2.2)	307 (83.8)	4 (1.1)	47 (12.8)	366
Simvastatin	0 (0.0)	100 (96.1)	2 (1.9)	2 (1.9)	104
DIURETICS					
Bendroflumethiazide	8 (1.8)	352 (81.8)	7 (1.6)	63 (14.6)	430
Hydrochlorothiazide	2 (2.7)	70 (94.4)	1 (1.4)	1 (1.4)	74
Indapamide	0 (0.0)	141 (97.2)	2 (1.4)	2 (1.4)	145
Spironolactone	6 (2.5)	209 (88.2)	2 (0.8)	20 (8.4)	237
Spironolactone IV	0 (0.0)	9 (100.0)	0 (0.0)	0 (0.0)	9
Furosemide	8 (1.8)	353 (83.2)	3 (0.7)	60 (14.2)	424
Furosemide IV	8 (3.9)	140 (68.9)	4 (1.9)	51 (25.1)	203

ANTICOAGULANTS/ ANTIPLATELETS					
Aspirin	8 (1.9)	355 (84.5)	5 (1.2)	52 (12.4)	420
Clopidogrel	5 (1.8)	248 (91.2)	2 (0.7)	17 (6.2)	272
Low molecular weight heparin (enoxaparin)	6 (6.2)	58 (60.4)	2 (2.0)	30 (31.2)	96
Low molecular weight heparin (dalteparin)	0 (0.0)	14 (66.7)	1 (4.7)	6 (28.6)	21
Unfractionated heparin	1 (5.8)	12 (70.6)	0 (0.0)	4 (23.5)	17
Warfarin	1 (0.6)	140 (97.2)	1 (0.6)	2 (1.4)	144
Rivaroxaban	2 (2.4)	74 (90.2)	1 (1.2)	5 (6.1)	82
ALPHA BLOCKERS					
Prazosin	1 (6.6)	14 (93.3)	0 (0.0)	0 (0.0)	15
Terazosin	0 (0.0)	19 (95.0)	1 (5.0)	0 (0.0)	20
ALPHA AGONISTS					
Methyldopa	8 (2.2)	287 (80.8)	6 (1.6)	54 (15.2)	355
Clonidine	0 (0.0)	17 (100.0)	0 (0.0)	0 (0.0)	17
CORTICOSTEROIDS					
Hydrocortisone (IV)	8 (2.8)	205 (73.5)	5 (1.8)	61 (21.8)	279
Hydrocortisone (Oral)	0 (0.0)	57 (91.9)	0 (0.0)	5 (8.1)	62
Methylprednisolone (IV)	0 (0.0)	31 (86.1)	36	4 (11.1)	36
Prednisolone (Oral)	6 (1.4)	342 (83.0)	5 (1.2)	59 (14.3)	412
Dexamethasone	1 (0.4)	267 (96.0)	1 (0.4)	9 (3.2)	278
Dexamethasone IV	8 (5.3)	98 (65.3)	4 (2.6)	40 (26.6)	150
ANALGESICS					
Paracetamol (IV)	8 (2.6)	252 (81.0)	3 (0.9)	48 (15.4)	311
Paracetamol (Oral)	8 (1.4)	499 (85.3)	8 (1.4)	70 (11.9)	585
Paracetamol (Supp)	8 (1.4)	462 (84.4)	7 (1.2)	70 (12.8)	547
NSAIDS					
Diclofenac (IV)	7 (2.2)	254 (79.6)	3 (0.9)	55 (17.2)	319
Diclofenac (Oral)	7 (1.2)	485 (85.1)	8 (1.4)	70 (12.2)	570
Diclofenac (Supp)	8 (1.6)	429 (84.1)	8 (1.6)	65 (12.8)	510
Ibuprofen	8 (1.4)	475 (85.3)	7 (1.3)	67 (12.0)	557
Celocoxib	5 (1.5)	289 (86.8)	3 (0.9)	36 (10.8)	333
Naproxen	2 (1.8)	239 (96.4)	0 (0.0)	7 (2.8)	248
OPIOIDS					
Morphine (Oral)	1 (1.2)	83 (95.4)	0 (0.0)	3 (3.4)	87
Morphine (IV/IM)	8 (5.2)	103 (66.4)	2 (1.2)	42 (27.1)	155
Fentanyl	6 (13.9)	18 (41.8)	0 (0.0)	19 (44.2)	43
Oxycodone	0 (0.0)	6 (85.7)	0 (0.0)	1 (14.3)	7
Tramadol (IV)	8 (3.5)	165 (72.6)	3 (1.3)	51 (22.4)	227
Tramadol (Oral)	7 (2.2)	269 (83.0)	3 (0.9)	45 (13.9)	324

ISCHEMIC HEART DISEASE (ANGINA PECTORIS, ACS)					
Glyceryl Trinitrate	2 (4.0)	43 (87.8)	0 (0.0)	4 (8.2)	49
Isosorbide Dinitrate	1 (1.2)	79 (92.9)	2 (2.4)	3 (3.5)	85
STROKE					
Piracetam	3 (1.7)	160 (91.9)	3 (1.7)	8 (4.6)	174
IV mannitol	6 (5.8)	59 (57.8)	2 (1.9)	35 (34.3)	102
VASODILATOR					
Hydralazine (IV)	8 (5.6)	87 (60.4)	3 (2.1)	46 (31.9)	144
ANTIARRHYTHMICS					
Dobutamine	4 (11.8)	22 (64.7)	1 (2.9)	7 (20.6)	34
Amiodarone tab	1 (2.8)	32 (91.4)	1 (2.8)	1 (2.8)	35
Amiodarone IV	1 (8.3)	9 (75.0)	0 (0.0)	2 (16.6)	12
Digoxin	2 (1.5)	125 (96.2)	1 (0.8)	2 (1.5)	130
Flecainide	0 (0.0)	2 (100.0)	0 (0.0)	0 (0.0)	2
ASTHMA					
Salbutamol (Nebulized)	8 (2.8)	212 (74.4)	6 (2.1)	59 (20.7)	285
Salbutamol (Pressurized metered dose inhaler)	4 (1.2)	264 (84.6)	5 (1.6)	39 (12.5)	312
Ipratropium bromide (nebulized)	3 (4.9)	49 (80.3)	1 (1.6)	8 (13.1)	61
Aminophylline (IV)	8 (9.8)	46 (56.1)	0 (0.0)	28 (34.2)	82
Budesonide (Inhaled)	1 (2.6)	28 (71.8)	0 (0.0)	10 (26.5)	39
Fluticasone (metered dose inhaler)	0 (0.0)	52 (92.8)	2 (3.6)	2 (3.6)	56
Beclomethasone (inhaled)	1 (7.1)	12 (85.7)	1 (7.1)	0 (0.0)	14
Montelukast (oral)	1 (1.1)	94 (98.9)	0 (0.0)	0 (0.0)	95
Combination Inhaled and Long-Acting Beta-Agonist					
Budesonide/Formoterol	3 (4.0)	54 (72.0)	1 (1.3)	17 (22.7)	75
Fluticasone/Salmeterol	0 (0.0)	64 (94.1)	0 (0.0)	4 (5.8)	68
CHRONIC OBSTRUCTIVE PULMONARY DISEASE					
Tiotropium (Inhaled)	0 (0.0)	3 (75.0)	0 (0.0)	1 (25.0)	4
Carbocysteine (Syrup)	6 (1.4)	348 (83.6)	7 (1.6)	55 (13.2)	416
Acetylcysteine (Syrup/powder)	0 (0.0)	10 (90.9)	0 (0.0)	1 (9.1)	11
ANTIBIOTICS					
Amoxicillin tab	7 (1.4)	421 (84.0)	8 (1.6)	65 (13.0)	501
Amoxicillin IV	0 (0.0)	28 (70.0)	2 (5.0)	10 (25.0)	40
Co-amoxiclav	8 (1.9)	345 (82.7)	7 (1.6)	57 (13.8)	417

Azithromycin	8 (1.7)	390 (84.6)	4 (0.8)	59 (12.8)	461
Erythromycin	7 (2.2)	266 (83.1)	4 (1.3)	43 (13.4)	320
Doxycycline	8 (1.6)	399 (83.4)	8 (1.6)	63 (13.2)	478
Clarithromycin	7 (2.4)	246 (85.1)	4 (1.4)	32 (11.1)	289
DIABETES					
Metformin	8 (1.8)	369 (82.9)	4 (0.9)	64 (14.4)	445
Glucagon	0 (0.0)	8 (100.0)	0 (0.0)	0 (0.0)	8
Insulin					
Rapid acting (e.g., insulin as part, insulin lispro, insulin Glulisine)	5 (5.8)	62 (72.1)	2 (2.3)	17 (19.8)	86
Short acting (regular insulin/soluble insulin)	7 (5.8)	73 (60.8)	3 (2.5)	37 (30.8)	120
Intermediate acting (Human isophane insulin/NPH)	7 (14.6)	26 (54.2)	0 (0.0)	15 (31.3)	48
Long acting (insulin determir, insulin glargine)	3 (8.1)	25 (67.6)	1 (2.7)	8 (21.6)	37
Mixed insulins					
Rapid acting and intermediate acting (e.g., Novomix 30)	5 (9.6)	31 (59.6)	2 (3.8)	14 (26.9)	52
Rapid acting and long acting	1 (3.7)	17 (63.0)	0 (0.0)	9 (33.3)	27
Short acting and intermediate acting (e.g., Mixtard)	6 (4.6)	98 (74.8)	2 (1.5)	25 (19.1)	131
Sulfonylureas					
Glibenclamide	6 (1.8)	272 (82.9)	4 (1.2)	46 (14.0)	328
Gliclazide	4 (1.9)	175 (85.0)	3 (1.5)	24 (11.6)	206
Tolbutamide	0 (0.0)	6 (66.7)	3 (33.3)	0 (0.0)	9
DPP-4 Inhibitors					
Saxagliptin	0 (0.0)	11 (100.0)	0 (0.0)	0 (0.0)	11
Sitagliptin	1 (10.0)	9 (90.0)	0 (0.0)	0 (0.0)	10
Vildagliptin	0 (0.0)	40 (100.0)	0 (0.0)	0 (0.0)	40
Thiazolidinediones					
Pioglitazone	5 (3.6)	115 (81.5)	1 (0.7)	20 (14.2)	141
Rosiglitazone	0 (0.0)	4 (100.0)	0 (0.0)	0 (0.0)	4
SGLT2 Inhibitors					
Canagliflozin	0 (0.0)	1 (100.0)	0 (0.0)	0 (0.0)	1
Dapagliflozin	0 (0.0)	30 (100.0)	0 (0.0)	0 (0.0)	30
Empagliflozin	0 (0.0)	13 (92.9)	0 (0.0)	1 (7.1)	14
GLP1 agonists					
Semaglutide	0 (0.0)	1 (100.0)	0 (0.0)	0 (0.0)	1
Dulaglutide	0 (0.0)	2 (66.7)	0 (0.0)	1 (33.3)	3

Combination OHA					
Galvus-Met	1 (0.4)	203 (97.1)	1 (0.4)	4 (1.9)	209
Metaglip	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0
Dextrose 5%	8 (3.2)	170 (68.3)	5 (2.0)	66 (26.5)	249
Dextrose 10%	8 (5.2)	94 (61.0)	4 (2.6)	48 (31.2)	154
Dextrose 50%	7 (6.7)	53 (51.0)	4 (3.8)	40 (38.5)	104
Cancer					
Cancer chemotherapy agents	0 (0.0)	10 10(0.0)	0 (0.0)	0 (0.0)	10
Hormonal therapy agents	0 (0.0)	28 (90.3)	0 (0.0)	3 (9.7)	31
Immunotherapy agents (Biologic therapy agents)	0 (0.0)	4 (80.0)	0 (0.0)	1 (20.0)	5
ANTIEMETICS					
Granisetron	0 (0.0)	29 (90.6)	1 (3.1)	2 (6.3)	32
Metoclopramide	8 (2.4)	282 (83.4)	4 (1.2)	44 (13.0)	338
Domperidone	1 (0.5)	204 (93.6)	1 (0.5)	12 (5.5)	218
GENETIC DISEASES (SICKLE CELL)					
Hydroxyurea (Hydroxycarbamide)	1 (1.7)	52 (89.7)	1 (1.7)	4 (6.9)	58
Blood	5 (13.5)	13 (35.1)	0 (0.0)	19 (51.3)	37
Folic acid	8 (1.4)	491 (85.5)	8 (1.4)	67 (11.7)	574
Iron chelators	1 (2.9)	28 (82.4)	0 (0.0)	5 (14.7)	34
IV fluids					
Dextrose saline	8 (2.7)	219 (74.5)	5 (1.7)	62 (21.1)	294
Ringer's lactate	8 (2.8)	200 (71.9)	5 (1.8)	65 (23.4)	278
Antibiotics					
Cefuroxime	8 (1.7)	387 (84.1)	6 (1.3)	59 (12.8)	460
Ceftriaxone	8 (2.4)	265 (80.1)	3 (0.9)	55 (16.6)	331
Cefpodoxime	0 (0.0)	114 (98.3)	1 (0.8)	1 (0.8)	116
Cefotaxime	2 (3.6)	44 (78.6)	0 (0.0)	10 (17.9)	56
Mental health disorders					
Sodium valproate	4 (3.4)	87 (75.7)	0 (0.0)	24 (20.9)	115
Carbamazepine	7 (2.6)	219 (80.2)	3 (1.1)	44 (16.1)	273
Levetiracetam	0 (0.0)	53 (98.2)	0 (0.0)	1 (1.8)	54
Benzodiazepines					
Midazolam	5 (6.8)	48 (64.8)	0 (0.0)	21 (28.4)	74
Diazepam	8 (1.8)	359 (81.6)	8 (1.8)	65 (14.8)	440
Lorazepam	0 (0.0)	136 (95.1)	0 (0.0)	7 (4.9)	143
Clonazepam	0 (0.0)	23 (95.8)	0 (0.0)	1 (4.2)	24
Alprazolam	0 (0.0)	7 (100.0)	0 (0.0)	0 (0.0)	7
Antipsychotics					
Haloperidol	7 (6.1)	78 (67.8)	2 (1.7)	28 (24.4)	115

Olanzapine	7 (3.2)	179 (82.5)	0 (0.0)	31 (14.3)	217
Risperidone	5 (3.2)	124 (79.5)	0 (0.0)	27 (17.3)	156
Chlorpromazine	7 (6.9)	63 (61.8)	1 (0.9)	31 (30.4)	102
Antidepressants: TCAs					
Amitriptyline	8 (2.2)	296 (83.2)	1 (0.2)	51 (14.3)	356
Imipramine	1 (1.2)	78 (92.8)	0 (0.0)	5 (6.0)	84
Nortriptyline	0 (0.0)	7 (100.0)	0 (0.0)	0 (0.0)	7
Antidepressants: SSRIs					
Fluoxetine	3 (2.8)	91 (85.1)	1 (0.9)	12 (11.2)	107
Sertraline	0 (0.0)	52 (94.6)	0 (0.0)	3 (5.4)	55
Citalopram	0 (0.0)	29 (93.6)	0 (0.0)	2 (6.4)	31
Anticholinergics					
Artane	7 (7.9)	65 (73.0)	0 (0.0)	17 (19.1)	89
Benztropine	2 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	2
Biperidine	0 (0.0)	3 (100.0)	0 (0.0)	0 (0.0)	3

Table 13:Cross-tabulation between the availability of medications and the type of facility

Drug	**Availability, n (%)**				
	CHAG	**Community Pharmacy**	**Private Hospitals**	**Public Hospitals**	**Total**
BETA BLOCKER					
Atenolol	8 (2.2)	297 (83.4)	4 (1.1)	47 (13.2)	356
Bisoprolol	4 (1.7)	226 (94.2)	2 (0.8)	8 (3.3)	240
Metoprolol	0 (0.0)	69 (97.2)	2 (2.8)	0 (0.0)	71
Carvedilol	2 (0.9)	208 (93.3)	1 (0.5)	12 (5.4)	223
Labetalol tab	0 (0.0)	72 (94.7)	1 (1.3)	3 (4.0)	76
Labetalol IV	5 (6.0)	50 (59.5)	1 (1.2)	28 (33.3)	84
CALCIUM CHANNEL BLOCKERS					
Verapamil	1 (2.6)	37 (94.9)	1 (2.6)		39
Diltiazem	0 (0.0)	16 (100.0)	0 (0.0)	0 (0.0)	16
Amlodipine	8 (1.8)	372 (82.3)	8 (1.8)	64 (14.2)	452
Nifedipine	8 (1.8)	373 (82.7)	7 (1.6)	63 (14.0)	451
Felodipine	0 (0.0)	54 (100.0)	0 (0.0)	0 (0.0)	54
ACE INHIBITORS					
Lisinopril	8 (2.0)	331 (84.0)	4 (1.0)	51 (12.9)	394
Enalapril	0 (0.0)	17 (100.0)	0 (0.0)	0 (0.0)	17
Ramipril	0 (0.0)	78 (97.5)	2 (2.5)	0 (0.0)	80
Captopril	1 (11.1)	8 (88.9)	0 (0.0)	0 (0.0)	9
Fosinopril	0 (0.0)	6(100.0)	0 (0.0)	0 (0.0)	6

ANGIOTENSIN RECEPTOR BLOCKERS					
Losartan	6 (1.6)	326 (84.5)	4 (1.0)	50 (13.0)	386
Candesartan	0 (0.0)	140 (97.2)	0 (0.0)	4 (2.8)	144
Valsartan	0 (0.0)	41 (95.4)	1 (2.3)	1 (2.3)	43
STATINS					
Rosuvastatin	2 (1.1)	168 (94.9)	1 (0.6)	6 (3.4)	177
Atorvastatin	6 (1.7)	295 (85.3)	4 (1.2)	41 (11.9)	346
Simvastatin	0 (0.0)	74 (97.4)	2 (2.6)	0 (0.0)	76
DIURETICS					
Bendroflumethiazide	8 (1.9)	337 (81.8)	7 (1.7)	60 (14.6)	412
Hydrochlorothiazide	2 (3.8)	50 (94.3)	0 (0.0)	1 (1.9)	53
Indapamide	0 (0.0)	111 (98.2)	0 (0.0)	2 (1.8)	113
Spironolactone	5 (2.5)	180 (91.4)	2 (1.0)	10 (5.1)	197
Spironolactone IV	0 (0.0)	9 (100.0)	0 (0.0)	0 (0.0)	9
Furosemide	8 (2.1)	327 (83.6)	3 (0.8)	53 (13.6)	391
Furosemide IV	8 (4.5)	118 (66.7)	4 (2.3)	47 (26.6)	177
ANTICOAGULANTS/ ANTIPLATELETS					
Aspirin	5 (1.4)	321 (87.7)	3 (0.8)	37 (10.1)	366
Clopidogrel	3 (1.2)	229 (93.1)	2 (0.8)	12 (4.9)	246
Low molecular weight heparin (enoxaparin)	6 (7.6)	46 (58.2)	2 (2.5)	25 (31.7)	79
Low molecular weight heparin (dalteparin)	0 (0.0)	10 (71.4)	1 (7.1)	3 (21.4)	14
Unfractionated heparin	1 (9.1)	9 (81.8)	0 (0.0)	1 (9.1)	11
Warfarin	0 (0.0)	97 (100.0)	0 (0.0)	0 (0.0)	97
Rivaroxaban	1 (1.5)	65 (95.6)	0 (0.0)	2 (2.9)	68
ALPHA BLOCKERS					
Prazosin	1 (14.3)	6 (85.7)	0 (0.0)	0 (0.0)	7
Terazosin	0 (0.0)	13 (92.9)	1 (7.1)	0 (0.0)	14
ALPHA AGONISTS					
Methyldopa	6 (1.8)	268 (82.0)	6 (1.8)	47 (14.4)	327
Clonidine	0 (0.0)	12 (100.0)	0 (0.0)	0 (0.0)	12
CORTICOSTEROIDS					
Hydrocortisone (IV)	8 (3.2)	177 (71.7)	5 (2.0)	57 (23.1)	247
Hydrocortisone (Oral)	0 (0.0)	40 (90.9)	0 (0.0)	4 (9.1)	44
Methylprednisolone (IV)	0 (0.0)	21 (91.3)	1 (4.4)	1 (4.4)	23
Prednisolone (Oral)	4 (1.0)	335 (85.2)	4 (1.0)	50 (12.7)	393
Dexamethasone	1 (0.4)	237 (97.5)	1 (0.4)	4 (1.7)	243
Dexamethasone IV	8 (6.3)	84 (66.1)	4 (3.2)	31 (24.4)	127

ANALGESICS					
Paracetamol (IV)	0 (0.0)	6 (100.0)	0 (0.0)	0 (0.0)	6
Paracetamol (Oral)	8 (1.4)	499 (86.2)	8 (1.4)	64 (11.1)	579
Paracetamol (Supp)	8 (1.5)	442 (84.0)	7 (1.3)	69 (13.1)	526
NSAIDS					
Diclofenac (IV)	7 (2.4)	229 (78.4)	3 (1.0)	53 (18.2)	292
Diclofenac (Oral)	7 (1.3)	476 (86.1)	8 (1.5)	62 (11.2)	553
Diclofenac (Supp)	8 (1.7)	412 (85.7)	8 (1.8)	53 (11.0)	481
Ibuprofen	7 (1.3)	463 (86.9)	7 (1.3)	56 (10.5)	533
Celocoxib	4 (1.3)	266 (88.4)	3 (1.0)	28 (9.3)	301
Naproxen	2 (0.9)	214 (97.3)	0 (0.0)	4 (1.8)	220
OPIOIDS					
Morphine (Oral)	1 (2.3)	42 (95.5)	0 (0.0)	1 (2.3)	44
Morphine (IV/IM)	8 (6.1)	83 (62.9)	2 (1.5)	39 (29.6)	132
Fentanyl	6 (18.8)	11 (34.4)	0 (0.0)	15 (46.9)	32
Oxycodone	0 (0.0)	3 (75.0)	0 (0.0)	1 (25.0)	4
Tramadol (IV)	8 (4.3)	130 (69.9)	3 (1.6)	45 (24.2)	186
Tramadol (Oral)	5 (1.6)	246 (83.4)	3 (1.0)	41 (13.9)	295
ISCHEMIC HEART DISEASE (ANGINA PECTORIS, ACS)					
Glyceryl Trinitrate	1 (2.8)	31 (88.6)	0 (0.0)	3 (8.6)	35
Isosorbide Dinitrate	1 (1.6)	55 (93.2)	1 (1.6)	2 (3.4)	59
STROKE					
Piracetam	3 (1.8)	147 (92.5)	2 (1.2)	7 (4.4)	159
IV mannitol	5 (6.1)	45 (54.9)	2 (2.4)	30 (36.6)	82
VASODILATOR					
Hydralazine (IV)	8 (7.0)	66 (57.4)	3 (2.6)	38 (33.0)	115
ANTIARRHYTHMICS					
Dobutamine	4 (16.6)	14 (58.3)	0 (0.0)	6 (25.0)	24
Amiodarone tab	1 (3.8)	24 (92.3)	1 (3.8)	0 (0.0)	26
Amiodarone IV	1 (14.2)	5 (71.4)	0 (0.0)	1 (14.2)	7
Digoxin	2 (2.0)	95 (95.0)	1 (1.0)	2 (2.0)	100
Flecainide	0 (0.0)	1 (100.0)	0 (0.0)	0 (0.0)	1
ASTHMA					
Salbutamol (Nebulized)	7 (3.2)	158 (72.8)	6 (2.7)	46 (21.2)	217
Salbutamol (Pressurized metered dose inhaler)	4 (1.4)	244 (86.2)	5 (1.8)	30 (10.6)	283
Ipratropium bromide (nebulized)	3 (6.6)	36 (80.0)	0 (0.0)	6 (13.3)	45
Aminophylline (IV)	6 (10.9)	33 (60.0)	0 (0.0)	16 (29.1)	55
Budesonide (Inhaled)	1 (3.8)	18 (69.2)	0 (0.0)	7 (26.9)	26

Fluticasone (metered dose inhaler)	0 (0.0)	42 (97.6)	0 (0.0)	1 (2.3)	43
Beclomethasone (inhaled)	1 (12.5)	7 (87.5)	0 (0.0)	0 (0.0)	8
Montelukast (oral)	0 (0.0)	71 (100.0)	0 (0.0)	0 (0.0)	71
Combination Inhaled and Long-Acting Beta-Agonist					
Budesonide/Formoterol	3 (5.1)	41 (69.5)	1 (1.7)	14 (23.7)	59
Fluticasone/Salmeterol	0 (0.0)	57 (96.6)	0 (0.0)	2 (3.4)	59
CHRONIC OBSTRUCTIVE PULMONARY DISEASE					
Tiotropium (Inhaled)	0 (0.0)	2 (100.0)	0 (0.0)	0 (0.0)	2
Carbocysteine (Syrup)	6 (1.6)	327 (84.3)	7 (1.8)	48 (12.4)	388
Acetylcysteine (Syrup/powder)	0 (0.0)	5 (100.0)	0 (0.0)	0 (0.0)	5
ANTIBIOTICS					
Amoxicillin tab	6 (1.2)	411 (85.6)	8 (1.7)	55 (11.5)	480
Amoxicillin IV	0 (0.0)	22 (73.3)	2 (6.7)	6 (20.0)	30
Co-amoxiclav	7 (1.8)	326 (84.0)	7 (1.8)	48 (12.4)	388
Azithromycin	7 (1.6)	373 (86.7)	4 (0.9)	46 (10.7)	430
Erythromycin	5 (1.8)	233 (84.7)	4 (1.5)	33 (12.0)	275
Doxycycline	7 (1.5)	387 (84.0)	8 (1.7)	59 (12.8)	461
Clarithromycin	5 (2.0)	215 (86.4)	4 (1.6)	25 (10.0)	249
DIABETES					
Metformin	8 (1.8)	354 (82.7)	4 (0.9)	62 (14.5)	428
Glucagon	0 (0.0)	1 (100.0)	0 (0.0)	0 (0.0)	1
Insulin					
Rapid acting (e.g., insulin aspart, insulin lispro, insulin Glulisine)	3 (5.2)	44 (77.2)	1 (1.8)	9 (15.8)	57
Short acting (regular insulin/soluble insulin)	4 (5.0)	48 (60.0)	3 (3.8)	25 (31.2)	80
Intermediate acting (Human isophane insulin/NPH)	4 (11.8)	20 (58.8)	0 (0.0)	10 (29.4)	34
Long acting (insulin determir, insulin glargine)	2 (8.0)	18 (72.0)	1 (4.0)	4 (16.0)	25
Mixed insulins					

Rapid acting and intermediate acting (e.g., Novomix 30)	2 (5.4)	25 (67.5)	2 (5.4)	8 (21.6)	37
Rapid acting and long acting	1 (5.8)	10 (58.8)	0 (0.0)	6 (35.3)	17
Short acting and intermediate acting (e.g., Mixtard)	5 (4.7)	81 (76.4)	2 (1.8)	18 (16.9)	106
Sulfonylureas					
Glibenclamide	4 (1.3)	256 (83.6)	4 (1.3)	42 (13.7)	306
Gliclazide	3 (1.6)	153 (85.0)	3 (1.6)	21 (11.6)	180
Tolbutamide	0 (0.0)	2 (40.0)	3 (60.0)	0 (0.0)	5
DPP-4 Inhibitors					
Saxagliptin	0 (0.0)	10 (100.0)	0 (0.0)	0 (0.0)	10
Sitagliptin	0 (0.0)	7 (100.0)	0 (0.0)	0 (0.0)	7
Vildagliptin	0 (0.0)	35 (100.0)	0 (0.0)	0 (0.0)	35
Thiazolidinediones					
Pioglitazone	5 (4.4)	90 (79.6)	1 (0.8)	17 (15.0)	113
Rosiglitazone	0 (0.0)	1 (100.0)	0 (0.0)	0 (0.0)	1
SGLT2 Inhibitors					
Canagliflozin	0 (0.0)	1 (100.0)	0 (0.0)	0 (0.0)	1
Dapagliflozin	0 (0.0)	29 (100.0)	0 (0.0)	0 (0.0)	29
Empagliflozin	0 (0.0)	10 (100.0)	0 (0.0)	0 (0.0)	10
GLP1 agonists					
Semaglutide	0 (0.0)	1 (100.0)	0 (0.0)	0 (0.0)	1
Dulaglutide	0 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)	1
Combination OHA					
Galvus-Met	0 (0.0)	187 (97.9)	1 (0.5)	3 (1.6)	191
Metaglip	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0
Dextrose 5%	8 (3.6)	143 (65.0)	5 (2.2)	64 (29.1)	220
Dextrose 10%	7 (5.2)	78 (58.2)	4 (3.0)	45 (33.5)	134
Dextrose 50%	6 (8.0)	33 (44.0)	3 (4.0)	33 (44.0)	75
Cancer					
Cancer chemotherapy agents	0 (0.0)	7 (100.0)	0 (0.0)	0 (0.0)	7
Hormonal therapy agents	0 (0.0)	24 (92.3)	0 (0.0)	2 (7.7)	26
Immunotherapy agents (Biologic therapy agents)	0 (0.0)	3 (100.0)	0 (0.0)	0 (0.0)	3
ANTIEMETICS					
Granisetron	0 (0.0)	23 (88.5)	1 (3.8)	2 (7.7)	26
Metoclopramide	8 (2.6)	250 (82.8)	3 (1.0)	41 (13.6)	302
Domperidone	1 (0.4)	191 (93.6)	1 (0.4)	11 (5.4)	204

GENETIC DISEASES (SICKLE CELL)					
Hydroxyurea (Hydroxycarbamide)	1 (2.6)	33 (86.8)	1 (2.6)	3 (7.8)	38
Blood	5 (15.1)	12 (36.4)	0 (0.0)	16 (48.5)	33
Folic acid	8 (1.4)	486 (86.3)	8 (1.4)	61 (10.8)	563
Iron chelators	0 (0.0)	24 (85.7)	0 (0.0)	4 (14.3)	28
IV fluids					
Dextrose saline	8 (2.9)	199 (73.2)	5 (1.8)	60 (22.1)	272
Ringer's lactate	8 (3.1)	182 (70.8)	5 (1.9)	62 (24.1)	257
Antibiotics					
Cefuroxime	8 (1.8)	362 (84.4)	6 (1.4)	53 (12.4)	429
Ceftriaxone	8 (2.6)	241 (79.3)	2 (0.7)	53 (17.4)	304
Cefpodoxime	0 (0.0)	105 (98.1)	1 (0.9)	1 (0.9)	107
Cefotaxime	2 (5.0)	31 (77.5)	0 (0.0)	7 (17.5)	40
Mental health disorders					
Sodium valproate	1 (1.0)	75 (80.7)	0 (0.0)	17 (18.3)	93
Carbamazepine	5 (2.1)	197 (83.1)	3 (1.3)	32 (13.5)	237
Levetiracetam	0 (0.0)	46 (97.8)	0 (0.0)	1 (2.1)	47
Benzodiazepines					
Midazolam	5 (9.1)	33 (60.0)	0 (0.0)	17 (30.9)	55
Diazepam	8 (1.9)	341 (81.6)	7 (1.6)	62 (14.8)	418
Lorazepam	0 (0.0)	114 (95.0)	0 (0.0)	6 (5.0)	120
Clonazepam	0 (0.0)	14 (100.0)	0 (0.0)	0 (0.0)	14
Alprazolam	0 (0.0)	4 (100.0)	0 (0.0)	0 (0.0)	4
Antipsychotics					
Haloperidol	6 (6.5)	63 (67.7)	1 (1.1)	23 (24.7)	93
Olanzapine	3 (1.7)	154 (86.0)	0 (0.0)	22 (12.3)	179
Risperidone	3 (2.4)	106 (85.5)	0 (0.0)	15 (12.1)	124
Chlorpromazine	6 (8.7)	38 (55.1)	0 (0.0)	25 (36.2)	69
Antidepressants: TCAs					
Amitriptyline	7 (2.1)	267 (83.4)	1 (0.3)	45 (14.1)	320
Imipramine	1 (1.6)	59 (95.2)	0 (0.0)	2 (3.2)	62
Nortriptyline	0 (0.0)	4 (100.0)	0 (0.0)	0 (0.0)	4
Antidepressants: SSRIs					
Fluoxetine	2 (2.4)	74 (88.1)	1 (1.2)	7 (8.3)	84
Sertraline	0 (0.0)	46 (95.8)	0 (0.0)	2 (4.2)	48
Citalopram	0 (0.0)	27 (96.4)	0 (0.0)	1 (3.6)	29
Anticholinergics					
Artane	5 (7.8)	49 (76.6)	0 (0.0)	10 (15.6)	64
Benztropine	2 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	2
Biperidine	0 (0.0)	1 (100.0)	0 (0.0)	0 (0.0)	1

Table 14: Cross-tabulation of medication stock situation and the levels of facility

Drug	OTCM	Pharmacy shop	Primary	Secondary	Total
BETA BLOCKER					
Atenolol	26 (6.8)	292 (76.7)	55 (14.4)	7 (1.84)	380
Bisoprolol	1 (0.3)	241 (92.9)	15 (5.7)	2 (0.7)	259
Metoprolol	1 (1.0)	92 (96.8)	2 (2.1)	0 (0.0)	95
Carvedilol	3 (1.1)	238 (92.1)	15 (5.8)	2 (0.7)	258
Labetalol tab	2 (1.9)	97 (92.3)	4 (3.8)	2 (1.9)	105
Labetalol IV	0 (0.0)	68 (62.3)	36 (33.0)	5 (4.59)	109
CALCIUM CHANNEL BLOCKERS					
Verapamil	1 (2.0)	48 (96.0)	1 (2.0)	0 (0.0)	50
Diltiazem	2 (7.4)	24 (88.8)	1 (3.7)	0 (0.0)	27
Amlodipine	90 (19.1)	306 (64.9)	68 (14.4)	7 (1.4)	471
Nifedipine	94 (20.3)	294 (63.7)	66 (14.3)	7 (1.5)	461
Felodipine	2 (3.0)	64 (94.9)	0 (0.0)	0 (0.0)	66
ACE INHIBITORS					
Lisinopril	51 (12.2)	295 (71.0)	62 (14.9)	7 (1.6)	415
Enalapril	0 (0.0)	27 (100)	0 (0.0)	0 (0.0)	27
Ramipril	0 (0.0)	101 (97.1)	3 (2.8)	0 (0.0)	104
Captopril	1 (5.2)	17 (89.4)	1 (5.26)	0 (0.0)	19
Fosinopril	0 (0.0)	6 (100)	0 (0.0)	0 (0.0)	6
ANGIOTENSIN RECEPTOR BLOCKERS					
Losartan	44 (10.8)	299 (73.9)	54 (13.3)	7 (1.73)	404
Candesartan	2 (1.2)	152 (95.0)	5 (3.1)	1 (0.6)	160
Valsartan	2 (3.0)	62 (95.3)	1 (1.5)	0 (0.0)	65
STATINS					
Rosuvastatin	1 (0.5)	185 (92.9)	12 (6.0)	1 (0.5)	199
Atorvastatin	21 (5.7)	287 (78.3)	51 (13.9)	7 (1.9)	366
Simvastatin	1 (0.9)	100 (96.1)	3 (2.8)	0 (0.0)	104
DIURETICS					
Bendroflumethiazide	64 (14.8)	294 (68.3)	65 (15.1)	7 (1.6)	430
Hydrochlorothiazide	2 (2.7)	68 (91.8)	4 (5.4)	0 (0.0)	74
Indapamide	1 (0.6)	140 (96.4)	3 (2.0)	1 (0.69)	145
Spironolactone	5 (2.1)	204 (86.2)	25 (10.5)	3 (1.2)	237
Spironolactone IV	0 (0.0)	9 (100)	0 (0.0)	0 (0.0)	9
Furosemide	71 (16.7)	284 (66.9)	62 (14.6)	7 (1.6)	424
Furosemide IV	7 (3.4)	134 (66.0)	55 (27.0)	7 (3.4)	203

ANTICOAGULANTS/ ANTIPLATELETS					
Aspirin	77 (18.3)	282 (67.1)	54 (12.8)	7 (1.6)	420
Clopidogrel	9 (3.31)	239 (87.8)	20 (7.3)	4 (1.4)	272
Low molecular weight heparin (enoxaparin)	0 (0.0)	58 (60.4)	35 (36.4)	3 (3.1)	96
Low molecular weight heparin (dalteparin)	0 (0.0)	14 (66.6)	6 (28.5)	1 (4.7)	21
Unfractionated heparin	0 (0.0)	12 (70.5)	5 (29.4)	0 (0.0)	17
Warfarin	3 (2.0)	137 (9.5)	3 (2.0)	1 (0.6)	144
Rivaroxaban	0 (0.0)	74 (90.2)	6 (7.3)	2 (2.4)	82
ALPHA BLOCKERS					
Prazosin	0 (0.0)	14 (93.3)	1 (6.6)	0 (0.0)	15
Terazosin	0 (0.0)	19 (95.0)	1 (5.0)	0 (0.0)	20
ALPHA AGONISTS					
Methyldopa	18 (5.0)	271 (76.3)	59 (16.6)	6 (1.6)	355
Clonidine	0 (0.0)	17 (100)	0 (0.0)	0 (0.0)	17
CORTICOSTEROIDS					
Hydrocortisone (IV)	26 (9.3)	181 (64)	64 (22.9)	7 (2.5)	279
Hydrocortisone (Oral)	7 (11.2)	52 (83.8)	2 (3.2)	1 (1.6)	62
Methylprednisolone (IV)	1 (2.7)	30 (83.3)	4 (11.1)	1 (2.7)	36
Prednisolone (Oral)	88 (21.3)	259 (62.8)	59 (14.3)	6 (1.4)	412
Dexamethasone	53 (19.0)	215 (77.3)	10 (3.6)	0 (0.0)	591
Dexamethasone IV	4 (2.6)	95 (63.3)	46 (30.6)	5 (3.3)	150
ANALGESICS					
Paracetamol (IV)	25 (8.0)	227 (72.99)	53 (17.0)	6 (1.9)	311
Paracetamol (Oral)	197 (33.6)	311 (53.1)	70 (11.9)	7 (1.2)	585
Paracetamol (Supp)	172 (31.4)	297 (54.3)	71 (12.9)	7 (1.2)	547
NSAIDS					
Diclofenac (IV)	35 (10.9)	219 (68.6)	58 (18.8)	7 (2.1)	319
Diclofenac (Oral)	186 (32.6)	308 (54.0)	69 (12.1)	7 (1.2)	570
Diclofenac (Supp)	156 (30.5)	280 (54.9)	67 (13.1)	7 (1.37)	510
Ibuprofen	180 (32.3)	303 (54.4)	67 (12.0)	7 (1.2)	557
Celocoxib	25 (7.5)	264 (79.2)	39 (11.71)	5 (1.5)	333
Naproxen	11 (4.4)	228 (91.9)	8 (3.2)	1 (0.4)	248
OPIOIDS					
Morphine (Oral)	1 (1.1)	82 (94.2)	3 (3.4)	1 (1.1)	87
Morphine (IV/IM)	0 (0.0)	103 (66.4)	47 (30.3)	5 (3.2)	155
Fentanyl	0 (0.0)	18 (41.8)	21 (48.8)	4 (9.3)	43
Oxycodone	0 (0.0)	6 (85.7)	1 (14.2)	0 (0.0)	7
Tramadol (IV)	8 (3.5)	157 (69.1)	55 (24.2)	7 (3.0)	227
Tramadol (Oral)	20 (6.1)	250 (77.1)	48 (14.8)	6 (1.8)	324

ISCHEMIC HEART DISEASE (ANGINA PECTORIS, ACS)					
Glyceryl Trinitrate	0 (0.0)	43 (87.7)	6 (12.24)	0 (0.0)	49
Isosorbide Dinitrate	1 (1.1)	78 (91.7)	6 (7.0)	0 (0.0)	85
STROKE					
Piracetam	1 (0.5)	160 (91.9)	12 (6.9)	1 (1.5)	174
IV mannitol	0 (0.0)	59 (57.8)	40 (39.2)	3 (2.9)	102
VASODILATOR					
Hydralazine (IV)	2 (1.3)	86 (59.7)	50 (34.7)	6 (4.1)	144
ANTIARRHYTHMICS					
Dobutamine	0 (0.0)	22 (64.71)	10 (29.4)	2 (5.8)	34
Amiodarone tab	0 (0.0)	32 (91.4)	2 (5.7)	1 (2.8)	35
Amiodarone IV	0 (0.0)	9 (75)	3 (25)	0 (0.0)	12
Digoxin	2 (1.5)	123 (94.6)	5 (3.8)	0 (0.0)	130
Flecainide	0 (0.0)	2 (100)	0 (0.0)	0 (0.0)	2
ASTHMA					
Salbutamol (Nebulized)	24 (8.4)	193 (67.7)	63 (22.1)	5 (1.7)	285
Salbutamol (Pressurized metered dose inhaler)	50 (16.0)	218 (69.8)	40 (12.8)	4 (1.2)	312
Ipratropium bromide (nebulized)	0 (0.0)	49 (80.3)	11 (18.0)	1 (1.6)	61
Aminophylline (IV)	2 (2.2)	44 (53.6)	35 (42.6)	1 (1.2)	82
Budesonide (Inhaled)	0 (0.0)	28 (71.7)	10 (25.6)	1 (2.5)	39
Fluticasone (metered dose inhaler)	0 (0.0)	52 (92.8)	3 (5.3)	1 (1.7)	56
Beclomethasone (inhaled)	0 (0.0)	12 (85.7)	2 (14.2)	0 (0.0)	14
Montelukast (oral)	1 (1.0)	93 (97.8)	0 (0.0)	1 (1.0)	95
Combination Inhaled and Long-Acting Beta-Agonist					
Budesonide/Formoterol	0 (0.0)	54 (72.0)	18 (24.0)	3 (4.0)	75
Fluticasone/Salmeterol	0 (0.0)	64 (94.1)	4 (5.8)	0 (0.0)	68
CHRONIC OBSTRUCTIVE PULMONARY DISEASE					
Tiotropium (Inhaled)	0 (0.0)	3 (75.0)	1 (25.0)	0 (0.0)	4
Carbocysteine (Syrup)	104 (25)	248 (59.6)	58 (13.9)	6 (1.4)	416
Acetylcysteine (Syrup/powder)	2 (18.1)	8 (72.7)	1 (9.0)	0 (0.0)	11

ANTIBIOTICS					
Amoxicillin tab	127 (25.3)	302 (60.2)	65 (12.9)	7 (1.4)	501
Amoxicillin IV	1 (2.5)	27 (67.5)	10 (25.0)	2 (5.0)	40
Co-amoxiclav	76 (18.2)	274 (65.7)	60 (14.3)	7 (1.6)	417
Azithromycin	90 (19.5)	302 (65.1)	62 (13.4)	7 (1.5)	461
Erythromycin	41 (12.8)	226 (70.6)	48 (15.0)	5 (1.5)	320
Doxycycline	108 (22.59)	298 (62.3)	65 (13.0)	7 (1.4)	478
Clarithromycin	17 (5.8)	230 (79.5)	38 (13.1)	4 (1.3)	289
DIABETES					
Metformin	69 (15.5)	301 (67.64)	68 (15.28)	7 (1.5)	445
Glucagon	0 (0.0)	8 (100)	0 (0.0)	0 (0.0)	8
Insulin					
Rapid acting (e.g., insulin aspart, insulin lispro, insulin Glulisine)	0 (0.0)	62 (72.09)	20 (23.2)	4 (4.65)	86
Short acting (regular insulin/soluble insulin)	0 (0.0)	73 (60.8)	42 (35.0)	5 (4.1)	120
Intermediate acting (Human isophane insulin/NPH)	0 (0.0)	26 (54.1)	20 (41.6)	2 (4.1)	48
Long acting (insulin determir, insulin glargine)	0 (0.0)	25 (67.5)	10 (27.0)	2 (5.4)	37
Mixed insulins					
Rapid acting and intermediate acting (e.g., Novomix 30)	0 (0.0)	31 (59.6)	18 (34.6)	3 (5.7)	52
Rapid acting and long acting	0 (0.0)	17 (62.9)	9 (33.3)	1 (3.7)	27
Short acting and intermediate acting (e.g., Mixtard)	0 (0.0)	98 (74.8)	27 (20.6)	6 (4.58)	131
Sulfonylureas					
Glibenclamide	33 (10.0)	240 (73.1)	50 (15.2)	5 (1.5)	328
Gliclazide	4 (1.94)	172 (83.5)	26 (12.6)	4 (1.9)	206
Tolbutamide	1 (11.1)	6 (66.6)	2 (22.2)	0 (0.0)	9
DPP-4 Inhibitors					
Saxagliptin	0 (0.0)	11 (100)	0 (0.0)	0 (0.0)	11
Sitagliptin	0 (0.0)	9 (90.0)	1 (10.0)	0 (0.0)	10
Vildagliptin	0 (0.0)	40 (100)	0 (0.0)	0 (0.0)	40
Thiazolidinediones					
Pioglitazone	1 (0.7)	114 (80.8)	23 (16.3)	3 (2.1)	141
Rosiglitazone	0 (0.0)	4 (100)	0 (0.0)	0 (0.0)	4

SGLT2 Inhibitors					
Canagliflozin	0 (0.0)	1 (100)	0 (0.0)	0 (0.0)	1
Dapagliflozin	0 (0.0)	30 (100)	0 (0.0)	0 (0.0)	30
Empagliflozin	0 (0.0)	13 (92.8)	1 (7.1)	0 (0.0)	14
GLP1 agonists					
Semaglutide	0 (0.0)	1 (100)	0 (0.0)	0 (0.0)	1
Dulaglutide	0 (0.0)	2 (66.6)	1 (33.3)	0 (0.0)	3
Combination OHA					
Galvus-Met	3 (1.4)	200 (95.6)	5 (2.3)	1 (0.4)	209
Metaglip	198 (33.5)	315 (53.0)	71 (12.0)	7 (1.1)	591
Dextrose 5%	18 (7.2)	154 (61.8)	70 (28.1)	7 (2.8)	249
Dextrose 10%	3 (1.9)	92 (59.7)	53 (34.4)	6 (3.9)	154
Dextrose 50%	2 (1.9)	52 (50.0)	45 (43.2)	5 (4.8)	104
Cancer					
Cancer chemotherapy agents	0 (0.0)	10 (100)	0 (0.0)	0 (0.0)	10
Hormonal therapy agents	4 (12.9)	24 (77.4)	2 (6.4)	1 (3.2)	31
Immunotherapy agents (Biologic therapy agents)	1 (20.0)	3 (60.0)	1 (20.0)	0 (0.0)	5
ANTIEMETICS					
Granisetron	0 (0.0)	29 (90.6)	3 (9.3)	0 (0.0)	32
Metoclopramide	33 (9.7)	250 (73.9)	50 (14.7)	5 (1.4)	338
Domperidone	10 (4.5)	194 (88.9)	12 (5.5)	2 (0.9)	218
GENETIC DISEASES (SICKLE CELL)					
Hydroxyurea (Hydroxycarbamide)	0 (0.0)	52 (89.6)	6 (10.3)	0 (0.0)	58
Blood	0 (0.0)	13 (35.1)	23 (62.1)	1 (2.7)	37
Folic acid	187 (32.5)	312 (54.3)	68 (11.8)	7 (1.2)	574
Iron chelators	10 (29.4)	18 (52.9)	6 (17.6)	0 (0.0)	34
IV fluids					
Dextrose saline	19 (6.4)	202 (68.7)	68 (23.1)	5 (1.7)	294
Ringer's lactate	18 (6.4)	185 (66.5)	69 (24.8)	6 (2.1)	278
Antibiotics					
Cefuroxime	87 (18.9)	304 (66.0)	62 (13.4)	7 (1.5)	460
Ceftriaxone	38 (11.4)	229 (69.1)	58 (17.5)	6 (1.8)	331
Cefpodoxime	1 (0.8)	113 (97.4)	2 (1.7)	0 (0.0)	116
Cefotaxime	0 (0.0)	44 (78.5)	11 (19.6)	1 (1.7)	56
Mental health disorders					
Sodium valproate	0 (0.0)	87 (75.6)	26 (22.6)	2 (1.7)	115
Carbamazepine	11 (4.0)	209 (76.5)	49 (17.9)	4 (1.4)	273
Levetiracetam	0 (0.0)	53 (98.1)	1 (1.8)	0 (0.0)	54

Benzodiazepines					
Midazolam	1 (1.3)	47 (63.5)	24 (32.4)	2 (2.7)	74
Diazepam	81 (18.4)	284 (64.5)	68 (15.4)	7 (1.5)	440
Lorazepam	2 (1.4)	135 (94.4)	5 (3.5)	1 (0.7)	143
Clonazepam	0 (0.0)	23 (95.8)	1 (4.1)	0 (0.0)	24
Alprazolam	0 (0.0)	7 (100)	0 (0.0)	0 (0.0)	7
Antipsychotics					
Haloperidol	0 (0.0)	79 (68.7)	32 (27.8)	4 (3.4)	115
Olanzapine	1 (0.4)	178 (82.0)	34 (15.5)	4 (1.8)	217
Risperidone	0 (0.0)	124 (79.4)	29 (18.5)	3 (1.9)	156
Chlorpromazine	2 (1.9)	62 (60.7)	37 (36.2)	1 (0.9)	102
Antidepressants: TCAs					
Amitriptyline	52 (14.6)	246 (69.1)	52 (14.6)	6 (1.6)	356
Imipramine	1 (1.1)	77 (91.6)	6 (7.1)	0 (0.0)	84
Nortriptyline	2 (28.5)	5 (71.4)	0 (0.0)	0 (0.0)	7
Antidepressants: SSRIs					
Fluoxetine	0 (0.0)	91 (85.0)	15 (14.0)	1 (0.9)	107
Sertraline	0 (0.0)	52 (94.5)	3 (5.4)	0 (0.0)	55
Citalopram	0 (0.0)	29 (93.5)	2 (6.4)	0 (0.0)	31
Anticholinergics					
Artane	1 (1.1)	64 (71.9)	22 (24.7)	2 (2.2)	89
Benztropine	0 (0.0)	0 (0)	2 (100)	0 (0.0)	2
Biperidine	0 (0.0)	3 (100)	0 (0.0)	0 (0.0)	3

Table 15: Availability of medicines and the level of facility

Drug	OTC	Pharmacy shop	Primary	Secondary	Total
BETA BLOCKER					
Atenolol	16 (4.4)	283 (79.4)	50 (14.0)	7 (1.9)	356
Bisoprolol	1 (0.4)	226 (94.1)	12 (5.0)	1 (0.4)	240
Metoprolol	1 (1.4)	68 (95.7)	2 (2.8)	0 (0.0)	71
Carvedilol	3 (1.3)	205 (91.9)	13 (5.8)	2 (0.9)	223
Labetalol tab	1 (1.3)	71 (93.4)	4 (5.2)	0 (0.0)	76
Labetalol IV	0 (0.0)	50 (59.5)	30 (35.7)	4 (4.7)	84
CALCIUM CHANNEL BLOCKERS					
Verapamil	1 (2.5)	37 (94.8)	1 (2.5)	0 (0.0)	39
Diltiazem	2 (12.5)	14 (87.5)	0 (0.0)	0 (0.0)	16
Amlodipine	74 (16.3)	305 (67.4)	66 (14.6)	7 (1.5)	452
Nifedipine	89 (19.7)	290 (64.3)	65 (14.4)	7 (1.5)	451
Felodipine	0 (0.0)	54 (100)	0 (0.0)	0 (0.0)	54
ACE INHIBITORS					
Lisinopril	44 (11.1)	289 (73.3)	54 (13.7)	7 (1.7)	394
Enalapril	0 (0.0)	17 (100)	0 (0.0)	0 (0.0)	17
Ramipril	0 (0.0)	79 (98.7)	1 (1.2)	0 (0.0)	80
Captopril	1 (11.1)	7 (77.78)	1 (11.11)	0 (0.0)	9
Fosinopril	0 (0.0)	6 (100)	0 (0.0)	0 (0.0)	6
ANGIOTENSIN RECEPTOR BLOCKERS					
Losartan	33 (8.5)	296 (76.6)	50 (12.9)	7 (1.8)	386
Candesartan	2 (1.3)	138 (95.8)	4 (2.7)	0 (0.0)	144
Valsartan	2 (4.65)	40 (93.0)	1 (2.3)	0 (0.0)	43
STATINS					
Rosuvastatin	1 (0.5)	167 (94.3)	8 (4.5)	1 (0.5)	177
Atorvastatin	17 (4.7)	279 (80.6)	44 (12.7)	6 (1.7)	346
Simvastatin	1 (1.3)	74 (97.3)	1 (1.3)	0 (0.0)	76
DIURETICS					
Bendroflumethiazide	55 (13.3)	288 (69.9)	62 (15.0)	7 (1.7)	412
Hydrochlorothiazide	0 (0.0)	50 (94.3)	3 (5.6)	0 (0.0)	53
Indapamide	1 (0.8)	110 (97.3)	1 (0.8)	1 (0.8)	113
Spironolactone	3 (1.5)	177 (89.8)	16 (8.1)	1 (0.5)	197
Spironolactone IV	0 (0.0)	9 (100)	0 (0.0)	0 (0.0)	9
Furosemide	59 (15.0)	270 (69.0)	55 (14.0)	7 (1.7)	391
Furosemide IV	7 (3.9)	112 (63.2)	52 (29.3)	6 (3.3)	177
ANTICOAGULANTS/ ANTIPLATELETS					
Aspirin	58 (15.8)	266 (72.6)	37 (10.1)	5 (1.3)	366

Clopidogrel	6 (2.4)	223 (90.6)	14 (5.6)	3 (1.2)	246
Low molecular weight heparin (enoxaparin)	0 (0.0)	46 (58.2)	30 (37.9)	3 (3.8)	79
Low molecular weight heparin (dalteparin)	0 (0.0)	10 (71.4)	3 (21.4)	1 (7.1)	14
Unfractionated heparin	0 (0.0)	9 (81.8)	2 (18.1)	0 (0.0)	11
Warfarin	2 (2.0)	95 (97.9)	0 (0.0)	0 (0.0)	97
Rivaroxaban	0 (0.0)	65 (95.5)	3 (4.4)	0 (0.0)	68
ALPHA BLOCKERS					
Prazosin	0 (0.0)	6 (85.7)	1 (14.2)	0 (0.0)	7
Terazosin	0 (0.0)	13 (92.8)	1 (7.1)	0 (0.0)	14
ALPHA AGONISTS					
Methyldopa	15 (4.5)	256 (78.2)	51 (15.5)	5 (1.5)	327
Clonidine	0 (0.0)	12 (100)	0 (0.0)	0 (0.0)	12
CORTICOSTEROIDS					
Hydrocortisone (IV)	18 (7.2)	162 (65.5)	60 (24.2)	7 (2.8)	247
Hydrocortisone (Oral)	2 (4.5)	40 (90.9)	1 (2.2)	1 (2.2)	44
Methylprednisolone (IV)	0 (0.0)	21 (91.3)	2 (8.7)	0 (0.0)	23
Prednisolone (Oral)	85 (21.6)	255 (64.8)	49 (12.4)	4 (1.0)	393
Dexamethasone	46 (18.93)	192 (79.0)	5 (2.0)	0 (0.0)	243
Dexamethasone IV	4 (3.1)	81 (63.7)	39 (30.7)	3 (2.3)	127
ANALGESICS					
Paracetamol (IV)	18 (6.6)	200 (73.8)	47 (17.3)	6 (2.2)	271
Paracetamol (Oral)	197 (34.0)	311 (53.7)	65 (11.2)	6 (1.0)	579
Paracetamol (Supp)	159 (30.2)	290 (55.1)	79 (13.1)	7 (1.3)	526
NSAIDS					
Diclofenac (IV)	25 (8.5)	204 (69.8)	56 (19.1)	7 (2.4)	292
Diclofenac (Oral)	182 (32.9)	303 (54.7)	62 (11.2)	6 (1.0)	553
Diclofenac (Supp)	142 (29.5)	377 (57.5)	56 (11.6)	6 (1.2)	481
Ibuprofen	175 (32.8)	296 (55.5)	55 (10.3)	7 (1.3)	533
Celocoxib	20 (6.6)	246 (81.7)	31 (10.3)	4 (1.3)	301
Naproxen	7 (3.1)	207 (94.0)	5 (2.2)	1 (0.4)	220
OPIOIDS					
Morphine (Oral)	0 (0.0)	42 (95.4)	1 (2.2)	1 (2.2)	44
Morphine (IV/IM)	0 (0.0)	83 (62.8)	44 (33.3)	5 (3.7)	132
Fentanyl	0 (0.0)	11 (34.3)	18 (56.2)	3 (9.3)	32
Oxycodone	0 (0.0)	3 (75.0)	1 (25.0)	0 (0.0)	4
Tramadol (IV)	5 (2.6)	125 (67.2)	49 (26.3)	7 (3.7)	186
Tramadol (Oral)	18 (6.1)	229 (77.6)	43 (14.5)	5 (1.6)	295

ISCHEMIC HEART DISEASE (ANGINA PECTORIS, ACS)					
Glyceryl Trinitrate	0 (0.0)	31 (88.5)	4 (11.4)	0 (0.0)	35
Isosorbide Dinitrate	0 (0.0)	55 (93.2)	4 (6.7)	0 (0.0)	59
STROKE					
Piracetam	1 (0.6)	147 (92.4)	10 (6.2)	1 (0.6)	159
IV mannitol	0 (0.0)	45 (54.8)	34 (41.4)	3 (3.6)	82
VASODILATOR					
Hydralazine (IV)	0 (0.0)	67 (58.2)	43 (37.3)	5 (4.3)	115
ANTIARRHYTHMICS					
Dobutamine	0 (0.0)	14 (58.3)	8 (33.3)	2 (8.3)	24
Amiodarone tab	0 (0.0)	24 (92.3)	2 (7.6)	0 (0.0)	26
Amiodarone IV	0 (0.0)	5 (71.4)	2 (28.5)	0 (0.0)	7
Digoxin	1 (1.0)	94 (94.0)	5 (5.0)	0 (0.0)	100
Flecainide	0 (0.0)	1 (100)	0 (0.0)	0 (0.0)	1
ASTHMA					
Salbutamol (Nebulized)	18 (8.2)	145 (66.8)	49 (22.5)	5 (2.3)	217
Salbutamol (Pressurized metered dose inhaler)	42 (14.8)	205 (72.4)	33 (11.6)	3 (1.0)	283
Ipratropium bromide (nebulized)	0 (0.0)	36 (80)	8 (17.7)	1 (2.2)	45
Aminophylline (IV)	1 (1.8)	32 (58.1)	21 (38.1)	1 (1.8)	55
Budesonide (Inhaled)	0 (0.0)	18 (69.2)	7 (26.9)	1 (3.8)	26
Fluticasone (metered dose inhaler)	0 (0.0)	42 (97.6)	1 (2.3)	0 (0.0)	43
Beclomethasone (inhaled)	0 (0.0)	7 (87.5)	1 (12.5)	0 (0.0)	8
Montelukast (oral)	1 (1.4)	70 (98.5)	0 (0.0)	0 (0.0)	71
Combination Inhaled and Long-Acting Beta-Agonist					
Budesonide/Formoterol	0 (0.0)	41 (69.4)	16 (27.1)	2 (3.3)	59
Fluticasone/Salmeterol	0 (0.0)	57 (96.6)	2 (3.3)	0 (0.0)	59
CHRONIC OBSTRUCTIVE PULMONARY DISEASE					
Tiotropium (Inhaled)	0 (0.0)	2 (100)	0 (0.0)	0 (0.0)	2
Carbocysteine (Syrup)	91 (23.4)	240 (61.8)	54 (13.9)	3 (0.7)	388
Acetylcysteine (Syrup/powder)	1 (20.0)	4 (80.0)	0 (0.0)	0 (0.0)	5
ANTIBIOTICS					
Amoxicillin tab	121 (25.2)	298 (62.0)	54 (11.2)	7 (1.4)	480
Amoxicillin IV	1 (3.3)	21 (70.0)	8 (26.6)	0 (0.0)	30
Co-amoxiclav	68 (17.5)	263 (67.7)	51 (13.1)	6 (1.5)	388
Azithromycin	76 (17.6)	299 (69.5)	49 (11.4)	6 (1.4)	430
Erythromycin	28 (10.1)	206 (74.9)	37 (13.4)	4 (1.4)	275

Doxycycline	103 (22.3)	291 (63.1)	60 (13.0)	7 (1.5)	461
Clarithromycin	12 (4.8)	204 (81.9)	30 (12.0)	3 (1.2)	249
DIABETES					
Metformin	60 (14.0)	295 (68.9)	66 (15.4)	7 (1.6)	428
Glucagon	198 (33.9)	307 (52.6)	71 (12.1)	7 (1.2)	583
Insulin					
Rapid acting (e.g., insulin aspart, insulin lispro, insulin Mixtard)	0 (0.0)	44 (77.1)	11 (19.3)	2 (3.5)	57
Short acting (regular insulin/soluble insulin)	0 (0.0)	48 (60)	29 (36.2)	3 (3.7)	80
Intermediate acting (Human isophane insulin/NPH)	0 (0.0)	20 (58.8)	13 (38.2)	1 (2.9)	34
Long acting (insulin determir, insulin glargine)	0 (0.0)	18 (72.0)	7 (28.0)	0 (0.0)	25
Mixed insulins					
Rapid acting and intermediate acting (e.g., Novomix 30)	0 (0.0)	25 (67.5)	11 (29.7)	1 (2.7)	37
Rapid acting and long acting	0 (0.0)	10 (58.8)	7 (41.1)	0 (0.0)	17
Short acting and intermediate acting (e.g., Mixtard)	0 (0.0)	81 (76.4)	22 (20.7)	3 (2.8)	106
Sulfonylureas					
Glibenclamide	28 (9.1)	229 (74.8)	45 (14.7)	4 (1.3)	306
Gliclazide	3 (1.6)	151 (83.8)	24 (13.3)	2 (1.1)	180
Tolbutamide	0 (0.0)	3 (60)	2 (40)	0 (0.0)	5
DPP-4 Inhibitors					
Saxagliptin	0 (0.0)	10 (100)	0 (0.0)	0 (0.0)	10
Sitagliptin	0 (0.0)	7 (100)	0 (0.0)	0 (0.0)	7
Vildagliptin	0 (0.0)	35 (100)	0 (0.0)	0 (0.0)	35
Thiazolidinediones					
Pioglitazone	1 (0.8)	89 (78.7)	20 (17.7)	3 (2.6)	113
Rosiglitazone	0 (0.0)	1 (100)	0 (0.0)	0 (0.0)	1
SGLT2 Inhibitors					
Canagliflozin	0 (0.0)	1 (100)	0 (0.0)	0 (0.0)	1
Dapagliflozin	0 (0.0)	29 (100)	0 (0.0)	0 (0.0)	29
Empagliflozin	0 (0.0)	10 (100)	0 (0.0)	0 (0.0)	10
GLP1 agonists					
Semaglutide	0 (0.0)	1 (100)	0 (0.0)	0 (0.0)	1
Dulaglutide	0 (0.0)	0 (0.0)	1 (100)	0 (0.0)	
Combination OHA					
Galvus-Met	2 (1.0)	185 (96.8)	4 (2.0)	0 (0.0)	191
Metaglip	14 (6.3)	131 (59.5)	68 (30.9)	7 (3.1)	220
Dextrose 5%	1 (0.7)	78 (58.2)	49 (36.5)	6 (4.4)	134

Dextrose 10%					
Dextrose 50%	0 (0.0)	33 (44.0)	38 (50.6)	4 (5.5)	75
Cancer					
Cancer chemotherapy agents		7 (100)			7
Hormonal therapy agents	4 (15.3)	20 (76.9)	2 (7.6)	0 (0.0)	26
Immunotherapy agents (Biologic therapy agents)	1 (33.3)	2 (66.6)	0 (0.0)	0 (0.0)	3
ANTIEMETICS					
Granisetron	0 (0.0)	23 (88.46)	3 (11.5)	0 (0.0)	26
Metoclopramide	26 (8.6)	225 (74.5)	46 (15.2)	5 (1.6)	302
Domperidone	10 (4.9)	181 (88.7)	11 (5.3)	2 (0.9)	204
GENETIC DISEASES (SICKLE CELL)					
Hydroxyurea (Hydroxycarbamide)	0 (0.0)	33 (86.84)	5 (13.1)	0 (0.0)	38
Blood	0 (0.0)	12 (36.3)	21 (63.6)	0 (0.0)	33
Folic acid	184 (32.6)	310 (55.0)	63 (11.1)	6 (1.0)	563
Iron chelators	10 (35.7)	14 (50.0)	4 (14.2)		28
IV fluids					
Dextrose saline	15 (5.5)	186 (68.38)	66 (24.2)	5 (1.8)	272
Ringer's lactate	16 (6.2)	169 (65.7)	66 (25.6)	6 (2.3)	257
Antibiotics					
Cefuroxime	75 (17.4)	291 (67.8)	57 (13.2)	6 (1.4)	429
Ceftriaxone	33 (10.8)	209 (68.7)	56 (18.4)	6 (1.9)	304
Cefpodoxime	1 (0.9)	104 (97.2)	2 (1.8)	0 (0.0)	107
Cefotaxime	0 (0.0)	31 (77.5)	8 (20.0)	1 (2.5)	40
Mental health disorders					
Sodium valproate	0 (0.0)	75 (80.6)	16 (17.2)	2 (2.1)	93
Carbamazepine	9 (3.8)	189 (79.7)	37 (15.6)	2 (0.8)	237
Levetiracetam	0 (0.0)	46 (97.8)	1 (2.1)	0 (0.0)	47
Benzodiazepines					
Midazolam	0 (0.0)	33 (60.0)	20 (36.3)	2 (3.6)	55
Diazepam	71 (16.9)	275 (65.7)	65 (15.5)	7 (1.6)	418
Lorazepam	1 (0.8)	114 (95)	4 (3.3)	1 (0.8)	120
Clonazepam	0 (0.0)	14 (100)	0 (0.0)	0 (0.0)	14
Alprazolam	0 (0.0)	4 (100)	0 (0.0)	0 (0.0)	4
Antipsychotics					
Haloperidol	0 (0.0)	63 (67.74)	27 (29.0)	3 (3.2)	93
Olanzapine	1 (0.5)	153 (85.4)	23 (12.8)	2 (1.1)	179
Risperidone	0 (0.0)	106 (85.4)	15 (12.1)	3 (2.4)	124
Chlorpromazine	0 (0.0)	38 (55.0)	30 (43.4)	1 (1.4)	69
Antidepressants: TCAs					

Amitriptyline	41 (12.8)	228 (71.2)	47 (14.6)	4 (1.2)	320
Imipramine	1 (1.6)	58 (93.5)	3 (4.8)	0 (0.0)	62
Nortriptyline	2 (50.0)	2 (50.0)	0 (0.0)	0 (0.0)	4
Antidepressants: SSRIs					
Fluoxetine	0 (0.0)	74 (88.1)	9 (10.7)	1 (1.1)	84
Sertraline	0 (0.0)	46 (95.8)	2 (4.1)	0 (0.0)	48
Citalopram	0 (0.0)	7 (96.4)	1 (3.5)	0 (0.0)	28
Anticholinergics					
Artane	1 (1.5)	48 (75)	14 (21.8)	1 (1.5)	64
Benztropine	0 (0.0)	0 (0.0)	2 (100)	0 (0.0)	2
Biperidine	0 (0.0)	1 (100)	0 (0.0)	0 (0.0)	1

Appendix 2: Availability of drugs by Region, Type and Level of Facility

Table 16: Availability of Beta blockers

Variable	Unavailable, n(%)	Available, n(%)	Total	Chi-square	p-value
Regions					
Ashanti	48 (36.9)	82 (63.1)	130 (100.0)		
Bono East	26 (42.6)	35 (57.4)	61 (100.0)		
Central	49 (46.7)	56 (53.3)	105 (100.0)	5.3175	0.378
Eastern	23 (34.3)	44 (65.7)	67 (100.0)		
Greater Accra	79 (35.3)	145 (64.7)	224 (100.0)		
North East	1 (25.0)	3 (75.0)	4 (100.0)		
		391(66.1%)	591		
Type of facility					
CHAG	0 (0.0)	8 (100.0)	8 (100.0)		
Community Pharmacy	178 (35.3)	326 (64.7)	504 (100.0)	7.8010	0.050
Hospital	4 (50.0)	4 (50.0)	8 (100.0)		
Public	18 (25.4)	53 (74.6)	71 (100.0)		
Level of Pharmacy					
OTCMS	170 (85.9)	28 (14.1)	198 (100.0)		
Pharmacy Shop	15 (4.8)	300 (95.2)	315 (100.0)	366.9728	*0.000
Primary level	15 (21.1)	56 (78.9)	71 (100.0)		
Secondary	0 (0.0)	7 (100.0)	7 (100.0)		

Note: Percentages are calculated on a per-row basis. * Statistically significant (p<0.05)

Table 17: Availability of Calcium blockers

Variable	Unavailable, n(%)	Available, n(%)	Total	Chi-square	p-value
Regions					
Ashanti	33 (25.4)	97 (74.6)	130 (100.0)		
Bono East	12 (19.7)	49 (80.3)	61 (100.0)		
Central	22 (20.9)	83 (79.1)	105 (100.0)	4.9752	0.419
Eastern	9 (13.4)	58 (86.6)	67 (100.0)		
Greater Accra	48 (21.4)	176 (78.6)	224 (100.0)		
North East	0 (0.0)	4 (100.0)	4 (100.0)		
		494(83.6%)	591		
Type of facility					
CHAG	0 (0.0)	8 (100.0)	8 (100.0)		
Community Pharmacy	93 (18.5)	411 (81.5)	504 (100.0)	10.6829	0.014
Hospital	0 (0.0)	8 (100.0)	8 (100.0)		
Public	4 (5.6)	67 (94.4)	71 (100.0)		
Level of Pharmacy					
OTCMS	92 (46.5)	106 (53.5)	198 (100.0)	196.1647	*0.000
Pharmacy Shop	3 (0.9)	312 (99.1)	315 (100.0)		

Primary level	2 (2.8)	69 (97.2)	71 (100.0)		
Secondary	0 (0.0)	7 (100.0)	7 (100.0)		

Note: Percentages are calculated on a per-row basis. * Statistically significant (p<0.05)

Table 18: Availability of ACE Inhibitors

Variable	Unavailable, n(%)	Available, n(%)	Total	Chi-square	p-value
Regions					
Ashanti	44 (33.9)	86 (66.1)	130 (100.0)		
Bono East	23 (37.7)	38 (62.3)	61 (100.0)		
Central	40 (38.1)	65 (61.9)	105 (100.0)	4.5774	0.470
Eastern	16 (23.9)	51 (76.1)	67 (100.0)		
Greater Accra	72 (32.1)	152 (67.9)	224 (100.0)		
North East	1 (25.0)	3 (75.0)	4 (100.0)		
		420 (71.1%)			
Type of facility					
CHAG	0 (0.0)	8 (100.0)	8 (100.0)		
Community Pharmacy	155 (30.8)	349 (69.2)	504 (100.0)	10.7948	*0.013
Hospital	4 (50.0)	4 (50.0)	8 (100.0)		
Public	12 (16.9)	59 (83.1)	71 (100.0)		
Level of Pharmacy					
OTCMS	147 (74.2)	51 (25.8)	198 (100.0)		
Pharmacy Shop	15 (4.8)	300 (95.2)	315 (100.0)	299.1616	*0.000
Primary level	9 (12.7)	62 (87.3)	71 (100.0)		
Secondary	0 (0.0)	7 (100.0)	7 (100.0)		

Note: Percentages are calculated on a per-row basis. * Statistically significant (p<0.05)

Table 19: Availability of Angiotensin Receptor Blockers

Variable	Unavailable, n(%)	Available, n(%)	Total	Chi-square	p-value
Regions					
Ashanti	45 (34.6)	85 (65.4)	130 (100.0)		
Bono East	21 (34.4)	40 (65.6)	61 (100.0)		
Central	46 (43.8)	59 (56.2)	105 (100.0)	4.6127	0.465
Eastern	20 (29.8)	47 (70.2)	67 (100.0)		
Greater Accra	76 (33.9)	148 (66.1)	224 (100.0)		
North East	1 (25.0)	3 (75.0)	4 (100.0)		
Total		**382(64.6%)**	591		
Type of facility				5.7326	0.125
CHAG	0 (0.0)	8 (100.0)	8 (100.0)		

Community Pharmacy	161 (31.9)	343 (68.1)	504 (100.0)		
Hospital	4 (50.0)	4 (50.0)	8 (100.0)		
Public	19 (26.8)	52 (73.2)	71 (100.0)		
Level of Pharmacy					
OTCMS	154 (77.8)	44 (22.2)	198 (100.0)		
Pharmacy Shop	13 (4.1)	302 (95.9)	315 (100.0)	312.9516	*0.000
Primary level	17 (23.9)	54 (76.1)	71 (100.0)		
Secondary	0 (0.0)	7 (100.0)	7 (100.0)		

Note: Percentages are calculated on a per-row basis. * Statistically significant (p<0.05)

Table 20: Availability of Statins

Variable	Unavailable, n(%)	Available, n(%)	Total	Chi-square	p-value
Regions					
Ashanti	52 (40.0)	78 (60.0)	130 (100.0)		
Bono East	29 (47.5)	32 (52.5)	61 (100.0)		
Central	51 (48.6)	54 (51.4)	105 (100.0)	6.1887	0.288
Eastern	25 (37.3)	42 (62.7)	67 (100.0)		
Greater Accra	82 (36.6)	142 (63.4)	224 (100.0)		
North East	1 (25.0)	3 (75.0)	4 (100.0)		
		376 (63.6%)	591		
Type of facility					
CHAG	0 (0.0)	8 (100.0)	8 (100.0)		
Community Pharmacy	187 (37.1)	317 (62.9)	504 (100.0)	5.5335	0.137
Hospital	4 (50.0)	4 (50.0)	8 (100.0)		
Public	24 (33.8)	47 (66.2)	71 (100.0)		
Level of Pharmacy					
OTCMS	177 (89.4)	21 (10.6)	198 (100.0)		
Pharmacy Shop	18 (5.7)	297 (94.3)	315 (100.0)	374.4909	*0.000
Primary level	20 (28.2)	51 (71.8)	71 (100.0)		
Secondary	0 (0.0)	7 (100.0)	7 (100.0)		

Note: Percentages are calculated on a per-row basis. * Statistically significant (p<0.05)

Table 21: Availability of Diuretics

Variable	Unavailable, n(%)	Available, n(%)	Total	Chi-square	p-value
Regions					
Ashanti	32 (24.6)	98 (75.4)	130 (100.0)		
Bono East	13 (21.3)	48 (78.7)	61 (100.0)		
Central	29 (27.6)	76 (72.4)	105 (100.0)	5.7594	0.835
Eastern	10 (14.9)	57 (85.1)	67 (100.0)		
Greater Accra	55 (24.6)	169 (75.4)	224 (100.0)		
North East	1 (25.0)	3 (75.0)	4 (100.0)		

		477 (80.7)			
Type of facility					
CHAG	0 (0.0)	8 (100.0)	8 (100.0)		
Community Pharmacy	109 (21.6)	395 (78.4)	504 (100.0)	12.6580	*0.049
Hospital	1 (12.5)	7 (87.5)	8 (100.0)		
Public	4 (5.6)	67 (94.4)	71 (100.0)		
Level of Pharmacy					
OTCMS	105 (53.0)	93 (47.0)	198 (100.0)		
Pharmacy Shop	7 (2.2)	308 (97.8)	315 (100.0)	218.3139	*0.000
Primary level	2 (2.8)	69 (97.2)	71 (100.0)		
Secondary	0 (0.0)	7 (100.0)	7 (100.0)		

Note: Percentages are calculated on a per-row basis. * Statistically significant (p<0.05)

Table 22: Availability of Anticoagulants/Antiplatelets

Variable	**Unavailable, n(%)**	**Available, n(%)**	**Total**	**Chi-square**	**p-value**
Regions					
Ashanti	41 (31.5)	89 (68.5)	130 (100.0)		
Bono East	16 (26.2)	45 (73.8)	61 (100.0)		
Central	35 (33.3)	70 (66.7)	105 (100.0)	7.2741	0.699
Eastern	15 (22.4)	52 (77.6)	67 (100.0)		
Greater Accra	68 (30.4)	156 (69.6)	224 (100.0)		
North East	1 (25.0)	3 (75.0)	4 (100.0)		
		440 (74.5%)			
Type of facility					
CHAG	0 (0.0)	8 (100.0)	8 (100.0)		
Community Pharmacy	133 (26.4)	371 (73.6)	504 (100.0)	5.8731	0.438
Hospital	3 (37.5)	5 (62.5)	8 (100.0)		
Public	15 (21.1)	56 (78.9)	71 (100.0)		
Level of Pharmacy					
OTCMS	118 (59.6)	80 (40.4)	198 (100.0)		
Pharmacy Shop	20 (6.4)	295 (93.6)	315 (100.0)	189.8809	*0.000
Primary level	13 (18.3)	58 (81.7)	71 (100.0)		
Secondary	0 (0.0)	7 (100.0)	7 (100.0)		

Note: Percentages are calculated on a per-row basis. * Statistically significant (p<0.05)

Table 23: Availability of Alpha blockers

Variable	Unavailable, n(%)	Available, n(%)	Total	Chi-square	p-value
Regions					
Ashanti	123 (94.6)	7 (5.4)	130 (100.0)		
Bono East	55 (90.2)	6 (9.8)	61 (100.0)		
Central	105 (100.0)	0 (0.0)	105 (100.0)	11.9521	*0.035
Eastern	63 (94.0)	4 (6.0)	67 (100.0)		
Greater Accra	212 (94.6)	12 (5.4)	224 (100.0)		
North East	3 (75.0)	1 (25.0)	4 (100.0)		
		31(5.2%)			
Type of facility					
CHAG	7 (87.5)	1 (12.5)	8 (100.0)		
Community Pharmacy	475 (94.3)	29 (5.7)	504 (100.0)	5.8869	0.117
Hospital	7 (87.5)	1 (12.5)	8 (100.0)		
Public	71 (100.0)	0 (0.0)	71 (100.0)		
Level of Pharmacy					
OTCMS	198 (100.0)	0 (0.0)	198 (100.0)		
Pharmacy Shop	286 (90.8)	29 (9.2)	315 (100.0)	22.1343	*0.000
Primary level	69 (97.2)	2 (2.8)	71 (100.0)		
Secondary	7 (100.0)	0 (0.0)	7 (100.0)		

Note: Percentages are calculated on a per-row basis. * Statistically significant (p<0.05)

Table 24: Availability of Alpha agonists

Variable	Unavailable, n(%)	Available, n(%)	Total	Chi-square	p-value
Regions					
Ashanti	51 (39.2)	79 (60.8)	130 (100.0)		
Bono East	33 (54.1)	28 (45.9)	61 (100.0)		
Central	52 (49.5)	53 (50.5)	105 (100.0)	7.5742	0.181
Eastern	24 (35.8)	43 (64.2)	67 (100.0)		
Greater Accra	95 (42.4)	129 (57.6)	224 (100.0)		
North East	1 (25.0)	3 (75.0)	4 (100.0)		
		358 (60.6%)			
Type of facility					
CHAG	0 (0.0)	8 (100.0)	8 (100.0)		
Community Pharmacy	214 (42.5)	290 (57.5)	504 (100.0)	14.9736	*0.002
Hospital	2 (25.0)	6 (75.0)	8 (100.0)		
Public	17 (23.9)	54 (76.1)	71 (100.0)		
Level of Pharmacy					
OTCMS	180 (90.9)	18 (9.1)	198 (100.0)		
Pharmacy Shop	40 (12.7)	275 (87.3)	315 (100.0)	330.9120	*0.000
Primary level	12 (16.9)	59 (83.1)	71 (100.0)		

Secondary	1 (14.3)	6 (85.7)	7 (100.0)		

Note: Percentages are calculated on a per-row basis. * Statistically significant (p<0.05)

Table 25: Availability of Corticosteroids

Variable	Unavailable, n(%)	Available, n(%)	Total	Chi-square	P-value
Regions					
Ashanti	32 (24.6)	98 (75.4)	130 (100.0)		
Bono East	12 (19.7)	49 (80.3)	61 (100.0)		
Central	25 (23.8)	80 (76.2)	105 (100.0)	2.9476	0.708
Eastern	12 (17.9)	55 (82.1)	67 (100.0)		
Greater Accra	54 (24.1)	170 (75.9)	224 (100.0)		
North East	0 (0.0)	4 (100.0)	4 (100.0)		
		479 (81%)			
Type of facility					
CHAG	0 (0.0)	8 (100.0)	8 (100.0)		
Community Pharmacy	105 (20.8)	399 (79.2)	504 (100.0)	9.7794	*0.021
Hospital	2 (25.0)	6 (75.0)	8 (100.0)		
Public	5 (7.0)	66 (93.0)	71 (100.0)		
Level of Pharmacy					
OTCMS	92 (46.5)	106 (53.5)	198 (100.0)		
Pharmacy Shop	16 (5.1)	299 (94.9)	315 (100.0)	146.8824	*0.000
Primary level	4 (5.6)	67 (94.4)	71 (100.0)		
Secondary	0 (0.0)	7 (100.0)	7 (100.0)		

Note: Percentages are calculated on a per-row basis. * Statistically significant (p<0.05)

Table 26: Availability of paracetamol

Variable	Unavailable, n(%)	Available, n(%)	Total	Chi-square	p-value
Regions					
Ashanti	15 (11.5)	115 (88.5)	130 (100.0)		
Bono East	1 (1.6)	60 (98.4)	61 (100.0)		
Central	7 (6.7)	98 (93.3)	105 (100.0)	20.3922	*0.001
Eastern	0 (0.0)	67 (100.0)	67 (100.0)		
Greater Accra	6 (2.7)	218 (97.3)	224 (100.0)		
North East	0 (0.0)	4 (100.0)	4 (100.0)		
		589 (99.7%)			
Type of facility				0.3464	0.951
CHAG	0 (0.0)	8 (100.0)	8 (100.0)		

Community Pharmacy	2 (0.4)	502 (99.6)	504 (100.0)		
Hospital	0 (0.0)	8 (100.0)	8 (100.0)		
Public	0 (0.0)	71 (100.0)	71 (100.0)		
Level of Pharmacy					
OTCMS	1 (0.5)	197 (99.5)	198 (100.0)		
Pharmacy Shop	1 (0.3)	314 (99.7)	315 (100.0)	0.4320	0.934
Primary level	0 (0.0)	71 (100.0)	71 (100.0)		
Secondary	0 (0.0)	7 (100.0)	7 (100.0)		

Note: Percentages are calculated on a per-row basis. * Statistically significant (p<0.05)

Table 27: Availability of NSAIDS

Variable	Unavailable, n(%)	Available, n(%)	Total	Chi-square	p-value
Regions					
Ashanti	14 (10.8)	116 (89.2)	130 (100.0)		
Bono East	1 (1.6)	60 (98.4)	61 (100.0)		
Central	8 (7.6)	97 (92.4)	105 (100.0)	15.9604	*0.007
Eastern	0 (0.0)	67 (100.0)	67 (100.0)		
Greater Accra	8 (3.6)	216 (96.4)	224 (100.0)		
North East	0 (0.0)	4 (100.0)	4 (100.0)		
		586 (99.2%)			
Type of facility					
CHAG	0 (0.0)	8 (100.0)	8 (100.0)		
Community Pharmacy	5 (1.0)	499 (99.0)	504 (100.0)	0.8705	0.833
Hospital	0 (0.0)	8 (100.0)	8 (100.0)		
Public	0 (0.0)	71 (100.0)	71 (100.0)		
Level of Pharmacy					
OTCMS	4 (2.0)	194 (98.0)	198 (100.0)		
Pharmacy Shop	1 (0.3)	314 (99.7)	315 (100.0)	4.9688	0.174
Primary level	0 (0.0)	71 (100.0)	71 (100.0)		
Secondary	0 (0.0)	7 (100.0)	7 (100.0)		

Note: Percentages are calculated on a per-row basis. * Statistically significant (p<0.05)

Table 28: Availability of Opioids

Variable	Unavailable, n(%)	Available, n(%)	Total	Chi-square	p-value
Regions					
Ashanti	50 (38.5)	80 (61.5)	130 (100.0)		
Bono East	31 (50.8)	30 (49.2)	61 (100.0)		
Central	50 (47.6)	55 (52.4)	105 (100.0)	4.2398	0.515
Eastern	27 (40.3)	40 (59.7)	67 (100.0)		
Greater Accra	98 (43.8)	126 (56.2)	224 (100.0)		
North East	1 (25.0)	3 (75.0)	4 (100.0)		

		357 (60.4%)			
Type of facility					
CHAG	0 (0.0)	8 (100.0)	8 (100.0)		
Community Pharmacy	214 (42.5)	290 (57.5)	504 (100.0)	15.9759	0.001
Hospital	4 (50.0)	4 (50.0)	8 (100.0)		
Public	16 (22.5)	55 (77.5)	71 (100.0)		
Level of Pharmacy					
OTCMS	174 (87.9)	24 (12.1)	198 (100.0)		
Pharmacy Shop	48 (15.2)	267 (84.8)	315 (100.0)	291.0123	*0.000
Primary level	12 (16.9)	59 (83.1)	71 (100.0)		
Secondary	0 (0.0)	7 (100.0)	7 (100.0)		

Note: Percentages are calculated on a per-row basis. * Statistically significant (p<0.05)

Table 29: Availability of drugs for the management of ischemic heart disease (Angina Pectoris, ACS)

Variable	**Unavailable, n(%)**	**Available, n(%)**	**Total**	**Chi-square**	**p-value**
Regions					
Ashanti	105 (80.8)	25 (19.2)	130 (100.0)		
Bono East	54 (88.5)	7 (11.5)	61 (100.0)		
Central	93 (88.6)	12 (11.4)	105 (100.0)	5.8700	0.319
Eastern	59 (88.1)	8 (11.9)	67 (100.0)		
Greater Accra	182 (81.3)	42 (18.7)	224 (100.0)		
North East	3 (75.0)	1 (25.0)	4 (100.0)		
		105 (17.8%)			
Type of facility					
CHAG	5 (62.5)	3 (37.5)	8 (100.0)		
Community Pharmacy	410 (81.4)	94 (18.6)	504 (100.0)	6.9060	0.075
Hospital	6 (75.0)	2 (25.0)	8 (100.0)		
Public	65 (91.6)	6 (8.4)	71 (100.0)		
Level of Pharmacy					
OTCMS	197 (99.5)	1 (0.5)	198 (100.0)		
Pharmacy Shop	222 (70.5)	93 (29.5)	315 (100.0)	71.9479	*0.000
Primary level	60 (84.5)	11 (15.5)	71 (100.0)		
Secondary	7 (100.0)	0 (0.0)	7 (100.0)		

Note: Percentages are calculated on a per-row basis. * Statistically significant (p<0.05)

Table 30: Availability of drugs for the management of Stroke

Variable	**Unavailable, n(%)**	**Available, n(%)**	**Total**	**Chi-square**	**p-value**
Regions					
Ashanti	76 (58.5)	54 (41.5)	130 (100.0)	5.9352	0.313
Bono East	44 (72.1)	17 (27.9)	61 (100.0)		

Central	73 (69.5)	32 (30.5)	105 (100.0)		
Eastern	40 (59.7)	27 (40.3)	67 (100.0)		
Greater Accra	139 (62.1)	85 (37.9)	224 (100.0)		
North East	2 (50.0)	2 (50.0)	4 (100.0)		
		229 (38.7%)			
Type of facility					
CHAG	2 (25.0)	6 (75.0)	8 (100.0)		
Community Pharmacy	322 (63.9)	182 (36.1)	504 (100.0)	12.4404	*0.006
Hospital	5 (62.5)	3 (37.5)	8 (100.0)		
Public	33 (46.5)	38 (53.5)	71 (100.0)		
Level of Pharmacy					
OTCMS	197 (99.5)	1 (0.5)	198 (100.0)		
Pharmacy Shop	133 (42.2)	182 (57.8)	315 (100.0)	183.5296	*0.000
Primary level	29 (40.8)	42 (59.2)	71 (100.0)		
Secondary	3 (42.9)	4 (57.1)	7 (100.0)		

Note: Percentages are calculated on a per-row basis. * Statistically significant (p<0.05)

Table 31: Availability of Vasodilators

Variable	**Unavailable, n(%)**	**Available, n(%)**	**Total**	**Chi-square**	**p-value**
Regions					
Ashanti	88 (67.7)	42 (32.3)	130 (100.0)		
Bono East	51 (83.6)	10 (16.4)	61 (100.0)		
Central	81 (77.1)	24 (22.9)	105 (100.0)	9.9434	0.077
Eastern	51 (76.1)	16 (23.9)	67 (100.0)		
Greater Accra	178 (79.5)	46 (20.5)	224 (100.0)		
North East	2 (50.0)	2 (50.0)	4 (100.0)		
		144 (24.3)			
Type of facility					
CHAG	0 (0.0)	8 (100.0)	8 (100.0)		
Community Pharmacy	417 (82.7)	87 (17.3)	504 (100.0)	102.3369	*0.000
Hospital	5 (62.5)	3 (37.5)	8 (100.0)		
Public	25 (35.2)	46 (64.8)	71 (100.0)		
Level of Pharmacy					
OTCMS	196 (99.0)	2 (1.0)	198 (100.0)		
Pharmacy Shop	229 (72.7)	86 (27.3)	315 (100.0)	156.1009	*0.000
Primary level	21 (29.6)	50 (70.4)	71 (100.0)		
Secondary	1 (14.3)	6 (85.7)	7 (100.0)		

Note: Percentages are calculated on a per-row basis. * Statistically significant (p<0.05)

Table 32: Availability of Antiarrhythmics

Variable	Unavailable, n(%)	Available, n(%)	Total	Chi-square	p-value
Regions					
Ashanti	95 (73.1)	35 (26.9)	130 (100.0)		
Bono East	54 (88.5)	7 (11.5)	61 (100.0)		
Central	85 (81.0)	20 (19.0)	105 (100.0)	10.2345	0.069
Eastern	45 (67.2)	22 (32.8)	67 (100.0)		
Greater Accra	169 (75.5)	55 (24.5)	224 (100.0)		
North East	3 (75.0)	1 (25.0)	4 (100.0)		
		150 (25.3%)			
Type of facility					
CHAG	2 (25.0)	6 (75.0)	8 (100.0)		
Community Pharmacy	371 (73.6)	133 (26.4)	504 (100.0)	16.7222	*0.001
Hospital	6 (75.0)	2 (25.0)	8 (100.0)		
Public	62 (87.3)	9 (12.7)	71 (100.0)		
Level of Pharmacy					
OTCMS	196 (99.0)	2 (1.0)	198 (100.0)		
Pharmacy Shop	184 (58.4)	131 (41.6)	315 (100.0)	108.1096	*0.000
Primary level	57 (80.3)	14 (19.7)	71 (100.0)		
Secondary	4 (57.1)	3 (42.9)	7 (100.0)		

Note: Percentages are calculated on a per-row basis. * Statistically significant (p<0.05)

Table 33: Availability of drugs for the management of Asthma

Variable	Unavailable, n(%)	Available, n(%)	Total	Chi-square	p-value
Regions					
Ashanti	51 (39.2)	79 (60.8)	130 (100.0)		
Bono East	24 (39.3)	37 (60.7)	61 (100.0)		
Central	38 (36.2)	67 (63.8)	105 (100.0)	6.7661	0.964
Eastern	22 (32.8)	45 (67.2)	67 (100.0)		
Greater Accra	77 (34.8)	147 (65.2)	224 (100.0)		
North East	2 (50.0)	2 (50.0)	4 (100.0)		
		402 (68.0%)			
Type of facility					
CHAG	0 (0.0)	8 (100.0)	8 (100.0)		
Community Pharmacy	179 (35.5)	325 (64.5)	504 (100.0)	23.2327	*0.006
Hospital	2 (25.0)	6 (75.0)	8 (100.0)		
Public	8 (11.3)	63 (88.7)	71 (100.0)		
Level of Pharmacy					
OTCMS	136 (68.7)	62 (31.3)	198 (100.0)	190.3588	*0.000
Pharmacy Shop	47 (14.9)	268 (85.1)	315 (100.0)		

Primary level	5 (7.0)	66 (93.0)	71 (100.0)		
Secondary	1 (14.3)	6 (85.7)	7 (100.0)		

Note: Percentages are calculated on a per-row basis. * Statistically significant (p<0.05)

Table 34: Availability of drugs for the management of Chronic Obstructive Pulmonary Disease

Variable	Unavailable, n(%)	Available, n(%)	Total	Chi-square	p-value
Regions					
Ashanti	43 (33.1)	87 (66.9)	130 (100.0)		
Bono East	21 (34.4)	40 (65.6)	61 (100.0)		
Central	37 (35.2)	68 (64.8)	105 (100.0)	4.7664	0.445
Eastern	16 (23.9)	51 (76.1)	67 (100.0)		
Greater Accra	69 (30.8)	155 (69.2)	224 (100.0)		
North East	0 (0.0)	4 (100.0)	4 (100.0)		
Type of facility					
CHAG	2 (25.0)	6 (75.0)	8 (100.0)		
Community Pharmacy	152 (30.2)	352 (69.8)	504 (100.0)	2.8924	0.409
Hospital	1 (12.5)	7 (87.5)	8 (100.0)		
Public	16 (22.5)	55 (77.5)	71 (100.0)		
		420 (71.1)			
Level of Pharmacy					
OTCMS	94 (47.5)	104 (52.5)	198 (100.0)		
Pharmacy Shop	63 (20.0)	252 (80.0)	315 (100.0)	49.9568	*0.000
Primary level	13 (18.3)	58 (81.7)	71 (100.0)		
Secondary	1 (14.3)	6 (85.7)	7 (100.0)		

Note: Percentages are calculated on a per-row basis. * Statistically significant (p<0.05)

Table 35: Availability of Antibiotics

Variable	Unavailable, n(%)	Available, n(%)	Total	Chi-square	p-value
Regions					
Ashanti	24 (18.5)	106 (81.5)	130 (100.0)		
Bono East	8 (13.1)	53 (86.9)	61 (100.0)		
Central	13 (12.4)	92 (87.6)	105 (100.0)	12.7664	0.237
Eastern	6 (9.0)	61 (91.0)	67 (100.0)		
Greater Accra	32 (14.3)	192 (85.7)	224 (100.0)		
North East	0 (0.0)	4 (100.0)	4 (100.0)		
		534 (90.4)			
Type of facility					
CHAG	0 (0.0)	8 (100.0)	8 (100.0)		
Community Pharmacy	56 (11.1)	448 (88.9)	504 (100.0)	17.9060	*0.006
Hospital	0 (0.0)	8 (100.0)	8 (100.0)		
Public	1 (1.4)	70 (98.6)	71 (100.0)		

Level of Pharmacy					
OTCMS	56 (28.3)	142 (71.7)	198 (100.0)		
Pharmacy Shop	1 (0.3)	314 (99.7)	315 (100.0)	129.1734	*0.000
Primary level	0 (0.0)	71 (100.0)	71 (100.0)		
Secondary	0 (0.0)	7 (100.0)	7 (100.0)		

Note: Percentages are calculated on a per-row basis. * Statistically significant (p<0.05)

Table 36: Availability of Soluble Insulin

Variable	Unavailable, n(%)	Available, n(%)	Total	Chi-square	p-value
Regions					
Ashanti	84 (64.6)	46 (35.4)	130 (100.0)		
Bono East	49 (80.3)	12 (19.7)	61 (100.0)		
Central	80 (76.2)	25 (23.8)	105 (100.0)	8.4909	0.131
Eastern	50 (74.6)	17 (25.4)	67 (100.0)		
Greater Accra	168 (75.0)	56 (25.0)	224 (100.0)		
North East	2 (50.0)	2 (50.0)	4 (100.0)		
		165 (27.9)			
Type of facility					
CHAG	0 (0.0)	8 (100.0)	8 (100.0)		
Community Pharmacy	394 (78.2)	110 (21.8)	504 (100.0)	71.2304	*0.000
Hospital	5 (62.5)	3 (37.5)	8 (100.0)		
Public	27 (38.0)	44 (62.0)	71 (100.0)		
Level of Pharmacy					
OTCMS	198 (100.0)	0 (0.0)	198 (100.0)		
Pharmacy Shop	205 (65.1)	110 (34.9)	315 (100.0)	155.5663	*0.00
Primary level	22 (31.0)	49 (69.0)	71 (100.0)		
Secondary	1 (14.3)	6 (85.7)	7 (100.0)		

Note: Percentages are calculated on a per-row basis. * Statistically significant (p<0.05)

Table 37: Availability of Mixed Insulin

Variable	Unavailable, n(%)	Available, n(%)	Total	Chi-square	p-value
Regions					
Ashanti	84 (64.6)	46 (35.4)	130 (100.0)		
Bono East	50 (82.0)	11 (18.0)	61 (100.0)		
Central	83 (79.1)	22 (20.9)	105 (100.0)	13.1896	*0.022
Eastern	46 (68.7)	21 (31.3)	67 (100.0)		
Greater Accra	174 (77.7)	50 (22.3)	224 (100.0)		
North East	2 (50.0)	2 (50.0)	4 (100.0)		
		157 (26.6)			
Type of facility				39.0914	*0.000
CHAG	0 (0.0)	8 (100.0)	8 (100.0)		

Community Pharmacy	390 (77.4)	114 (22.6)	504 (100.0)		
Hospital	5 (62.5)	3 (37.5)	8 (100.0)		
Public	39 (54.9)	32 (45.1)	71 (100.0)		
Level of Pharmacy					
OTCMS	198 (100.0)	0 (0.0)	198 (100.0)		
Pharmacy Shop	201 (63.8)	114 (36.2)	315 (100.0)	122.8948	*0.000
Primary level	34 (47.9)	37 (52.1)	71 (100.0)		
Secondary	1 (14.3)	6 (85.7)	7 (100.0)		

Note: Percentages are calculated on a per-row basis. * Statistically significant (p<0.05)

Table 38: Availability of Sulfonylureas

Variable	Unavailable, n(%)	Available, n(%)	Total	Chi-square	p-value
Regions					
Ashanti	60 (46.2)	70 (53.8)	130 (100.0)		
Bono East	29 (47.5)	32 (52.5)	61 (100.0)		
Central	55 (52.4)	50 (47.6)	105 (100.0)	4.7136	0.452
Eastern	26 (38.8)	41 (61.2)	67 (100.0)		
Greater Accra	93 (41.5)	131 (58.5)	224 (100.0)		
North East	2 (50.0)	2 (50.0)	4 (100.0)		
Type of facility					
CHAG	1 (12.5)	7 (87.5)	8 (100.0)		
Community Pharmacy	223 (44.3)	281 (55.7)	504 (100.0)	8.5981	*0.035
Hospital	4 (50.0)	4 (50.0)	8 (100.0)		
Public	21 (29.6)	50 (70.4)	71 (100.0)		
		342 (57.9)			
Level of Pharmacy					
OTCMS	164 (82.8)	34 (17.2)	198 (100.0)		
Pharmacy Shop	67 (21.3)	248 (78.7)	315 (100.0)	202.5920	*0.000
Primary level	17 (23.9)	54 (76.1)	71 (100.0)		
Secondary	1 (14.3)	6 (85.7)	7 (100.0)		

Note: Percentages are calculated on a per-row basis. * Statistically significant (p<0.05)

Table 39: Availability of DPP-4 Inhibitors

Variable	Unavailable, n(%)	Available, n(%)	Total	Chi-square	p-value
Regions					
Ashanti	122 (93.9)	8 (6.1)	130 (100.0)		
Bono East	59 (96.7)	2 (3.3)	61 (100.0)		
Central	100 (95.2)	5 (4.8)	105 (100.0)	9.0928	0.105
Eastern	57 (85.1)	10 (14.9)	67 (100.0)		
Greater Accra	208 (92.9)	16 (7.1)	224 (100.0)		
North East	4 (100.0)	0 (0.0)	4 (100.0)		

Type of facility					
CHAG	7 (87.5)	1 (12.5)	8 (100.0)		
Community Pharmacy	457 (90.7)	47 (9.3)	504 (100.0)	8.1673	*0.043
Hospital	8 (100.0)	0 (0.0)	8 (100.0)		
Public	71 (100.0)	0 (0.0)	71 (100.0)		
Level of Pharmacy					
OTCMS	198 (100.0)	0 (0.0)	198 (100.0)		
Pharmacy Shop	268 (85.1)	47 (14.9)	315 (100.0)	41.9221	*0.000
Primary level	70 (98.6)	1 (1.4)	71 (100.0)		
Secondary	7 (100.0)	0 (0.0)	7 (100.0)		

Note: Percentages are calculated on a per-row basis.

Table 40: Availability of Thiazolidinediones

Variable	Unavailable, n(%)	Available, n(%)	Total	Chi-square	p-value
Regions					
Ashanti	88 (67.7)	42 (32.3)	130 (100.0)		
Bono East	50 (82.0)	11 (18.0)	61 (100.0)		
Central	85 (81.0)	20 (19.0)	105 (100.0)	8.9811	0.110
Eastern	54 (80.6)	13 (19.4)	67 (100.0)		
Greater Accra	176 (78.6)	48 (21.4)	224 (100.0)		
North East	3 (75.0)	1 (25.0)	4 (100.0)		
		142 (24.0)			
Type of facility					
CHAG	3 (37.5)	5 (62.5)	8 (100.0)		
Community Pharmacy	388 (77.0)	116 (23.0)	504 (100.0)	8.0189	*0.046
Hospital	7 (87.5)	1 (12.5)	8 (100.0)		
Public	51 (71.8)	20 (28.2)	71 (100.0)		
Level of Pharmacy					
OTCMS	197 (99.5)	1 (0.5)	198 (100.0)		
Pharmacy Shop	200 (63.5)	115 (36.5)	315 (100.0)	90.9778	*0.000
Primary level	48 (67.6)	23 (32.4)	71 (100.0)		
Secondary	4 (57.1)	3 (42.9)	7 (100.0)		

Note: Percentages are calculated on a per-row basis. * Statistically significant ($p<0.05$)

Table 41: Availability of SGLT2 Inhibitors

Variable	Unavailable, n(%)	Available, n(%)	Total	Chi-square	p-value
Regions					
Ashanti	130 (100.0)	0 (0.0)	130 (100.0)		
Bono East	56 (91.8)	5 (8.2)	61 (100.0)	19.4279	*0.002
Central	102 (97.1)	3 (2.9)	105 (100.0)		

Eastern	58 (86.6)	9 (13.4)	67 (100.0)		
Greater Accra	211 (94.2)	13 (5.8)	224 (100.0)		
North East	4 (100.0)	0 (0.0)	4 (100.0)		
		34 (5.8)			
Type of facility					
CHAG	8 (100.0)	0 (0.0)	8 (100.0)		
Community Pharmacy	471 (93.5)	33 (6.5)	504 (100.0)	4.0353	0.258
Hospital	8 (100.0)	0 (0.0)	8 (100.0)		
Public	70 (98.6)	1 (1.4)	71 (100.0)		
Level of Pharmacy					
OTCMS	198 (100.0)	0 (0.0)	198 (100.0)		
Pharmacy Shop	282 (89.5)	33 (10.5)	315 (100.0)	27.9458	*0.000
Primary level	70 (98.6)	1 (1.4)	71 (100.0)		
Secondary	7 (100.0)	0 (0.0)	7 (100.0)		

Note: Percentages are calculated on a per-row basis. * Statistically significant (p<0.05)

Table 42: Availability of GLP 1 agonists

Variable	Unavailable, n(%)	Available, n(%)	Total	Chi-square	p-value
Regions					
Ashanti	130 (100.0)	0 (0.0)	130 (100.0)		
Bono East	60 (98.4)	1 (1.6)	61 (100.0)		
Central	105 (100.0)	0 (0.0)	105 (100.0)	3.7665	0.584
Eastern	67 (100.0)	0 (0.0)	67 (100.0)		
Greater Accra	222 (99.1)	2 (0.9)	224 (100.0)		
North East	4 (100.0)	0 (0.0)	4 (100.0)		
		3 (0.5)			
Type of facility					
CHAG	8 (100.0)	0 (0.0)	8 (100.0)		
Community Pharmacy	502 (99.6)	2 (0.4)	504 (100.0)	1.3450	0.718
Hospital	8 (100.0)	0 (0.0)	8 (100.0)		
Public	70 (98.6)	1 (1.4)	71 (100.0)		
Level of Pharmacy					
OTCMS	198 (100.0)	0 (0.0)	198 (100.0)		
Pharmacy Shop	313 (99.4)	2 (0.6)	315 (100.0)	2.2878	0.515
Primary level	70 (98.6)	1 (1.4)	71 (100.0)		
Secondary	7 (100.0)	0 (0.0)	7 (100.0)		

Note: Percentages are calculated on a per-row basis.

Table 43: Availability of Combination OHA

Variable	Unavailable, n(%)	Available, n(%)	Total	Chi-square	p-value
Regions				22.5055	*0.000

Ashanti	96 (73.9)	34 (26.2)	130 (100.0)		
Bono East	42 (68.9)	19 (31.1)	61 (100.0)		
Central	84 (80.0)	21 (20.0)	105 (100.0)		
Eastern	35 (52.2)	32 (47.8)	67 (100.0)		
Greater Accra	138 (61.6)	86 (38.4)	224 (100.0)		
North East	4 (100.0)	0 (0.0)	4 (100.0)		
		209 (35.4)			
Type of facility					
CHAG	7 (87.5)	1 (12.5)	8 (100.0)		
Community Pharmacy	301 (59.7)	203 (40.3)	504 (100.0)	36.4380	*0.000
Hospital	7 (87.5)	1 (12.5)	8 (100.0)		
Public	67 (94.4)	4 (5.6)	71 (100.0)		
Level of Pharmacy					
OTCMS	195 (98.5)	3 (1.5)	198 (100.0)		
Pharmacy Shop	115 (36.5)	200 (63.5)	315 (100.0)	234.554	*0.000
Primary level	66 (93.0)	5 (7.0)	71 (100.0)		
Secondary	6 (85.7)	1 (14.3)	7 (100.0)		

Note: Percentages are calculated on a per-row basis. * Statistically significant (p<0.05)

Table 44: Availability of Cancer Chemotherapy agents

Variable	Unavailable, n(%)	Available, n(%)	Total	Chi-square	p-value
Regions					
Ashanti	123 (94.6)	7 (5.4)	130 (100.0)		
Bono East	57 (93.4)	4 (6.6)	61 (100.0)		
Central	100 (95.2)	5 (4.8)	105 (100.0)	0.8584	0.973
Eastern	63 (94.0)	4 (6.0)	67 (100.0)		
Greater Accra	209 (93.3)	15 (6.7)	224 (100.0)		
North East	4 (100.0)	0 (0.0)	4 (100.0)		
		38 (6.4)			
Type of facility					
CHAG	8 (100.0)	0 (0.0)	8 (100.0)		
Community Pharmacy	469 (93.1)	35 (6.9)	504 (100.0)	1.8948	0.595
Hospital	8 (100.0)	0 (0.0)	8 (100.0)		
Public	68 (95.8)	3 (4.2)	71 (100.0)		
Level of Pharmacy					
OTCMS	193 (97.5)	5 (2.5)	198 (100.0)		
Pharmacy Shop	285 (90.5)	30 (9.5)	315 (100.0)	12.2879	*0.006
Primary level	69 (97.2)	2 (2.8)	71 (100.0)		
Secondary	6 (85.7)	1 (14.3)	7 (100.0)		

Note: Percentages are calculated on a per-row basis. * Statistically significant (p<0.05)

Table 45: Availability of Antiemetics

Variable	Unavailable, n(%)	Available, n(%)	Total	Chi-square	p-value
Regions					
Ashanti	55 (42.3)	75 (57.7)	130 (100.0)		
Bono East	32 (52.5)	29 (47.5)	61 (100.0)		
Central	51 (48.6)	54 (51.4)	105 (100.0)	9.1382	0.104
Eastern	20 (29.9)	47 (70.1)	67 (100.0)		
Greater Accra	92 (41.1)	132 (58.9)	224 (100.0)		
North East	1 (25.0)	3 (75.0)	4 (100.0)		
		362 (61.3)			
Type of facility					
CHAG	0 (0.0)	8 (100.0)	8 (100.0)		
Community Pharmacy	199 (39.5)	305 (60.5)	504 (100.0)	5.7381	0.125
Hospital	4 (50.0)	4 (50.0)	8 (100.0)		
Public	26 (36.6)	45 (63.4)	71 (100.0)		
Level of Pharmacy					
OTCMS	161 (81.3)	37 (18.7)	198 (100.0)		
Pharmacy Shop	46 (14.6)	269 (85.4)	315 (100.0)	232.1750	*0.000
Primary level	20 (28.2)	51 (71.8)	71 (100.0)		
Secondary	2 (28.6)	5 (71.4)	7 (100.0)		

Note: Percentages are calculated on a per-row basis. * Statistically significant ($p<0.05$)

Table 46: Availability of medicines for the management of Genetic Diseases (Sickle cell)

Variable	Unavailable, n(%)	Available, n(%)	Total	Chi-square	p-value
Regions					
Ashanti	16 (12.3)	114 (87.7)	130 (100.0)		
Bono East	2 (3.3)	59 (96.7)	61 (100.0)		
Central	11 (10.5)	94 (89.5)	105 (100.0)	13.0302	*0.023
Eastern	1 (1.5)	66 (98.5)	67 (100.0)		
Greater Accra	12 (5.4)	212 (94.6)	224 (100.0)		
North East	0 (0.0)	4 (100.0)	4 (100.0)		
		575 (97.2)			
Type of facility					
CHAG	0 (0.0)	8 (100.0)	8 (100.0)		
Community Pharmacy	12 (2.4)	492 (97.6)	504 (100.0)	2.9576	0.398
Hospital	0 (0.0)	8 (100.0)	8 (100.0)		
Public	4 (5.6)	67 (94.4)	71 (100.0)		
Level of Pharmacy				12.0504	*0.007
OTCMS	11 (5.6)	187 (94.4)	198 (100.0)		

Pharmacy Shop	2 (0.6)	313 (99.4)	315 (100.0)		
Primary level	3 (4.2)	68 (95.8)	71 (100.0)		
Secondary	0 (0.0)	7 (100.0)	7 (100.0)		

Note: Percentages are calculated on a per-row basis. * Statistically significant (p<0.05)

Table 47: Availability of IV fluids

Variable	Unavailable, n(%)	Available, n(%)	Total	Chi-square	p-value
Regions					
Ashanti	35 (26.9)	95 (73.1)	130 (100.0)		
Bono East	12 (19.7)	49 (80.3)	61 (100.0)		
Central	28 (26.7)	77 (73.3)	105 (100.0)	3.8490	0.571
Eastern	13 (19.4)	54 (80.6)	67 (100.0)		
Greater Accra	51 (22.8)	173 (77.2)	224 (100.0)		
North East	0 (0.0)	4 (100.0)	4 (100.0)		
		478 (80.9)			
Type of facility					
CHAG	0 (0.0)	8 (100.0)	8 (100.0)		
Community Pharmacy	107 (21.2)	397 (78.8)	504 (100.0)	11.8716	*0.008
Hospital	2 (25.0)	6 (75.0)	8 (100.0)		
Public	4 (5.6)	67 (94.4)	71 (100.0)		
Level of Pharmacy					
OTCMS	105 (53.0)	93 (47.0)	198 (100.0)		
Pharmacy Shop	7 (2.2)	308 (97.8)	315 (100.0)	221.4495	*0.000
Primary level	1 (1.4)	70 (98.6)	71 (100.0)		
Secondary	0 (0.0)	7 (100.0)	7 (100.0)		

Note: Percentages are calculated on a per-row basis. * Statistically significant (p<0.05)

Table 48: Availability of Benzodiazepines

Variable	Unavailable, n(%)	Available, n(%)	Total	Chi-square	p-value
Regions					
Ashanti	37 (28.5)	93 (71.5)	130 (100.0)		
Bono East	17 (27.9)	44 (72.1)	61 (100.0)		
Central	31 (29.5)	74 (70.5)	105 (100.0)	3.4624	0.629
Eastern	15 (22.4)	52 (77.6)	67 (100.0)		
Greater Accra	69 (30.8)	155 (69.2)	224 (100.0)		
North East	0 (0.0)	4 (100.0)	4 (100.0)		
		446 (75.5)			
Type of facility					
CHAG	0 (0.0)	8 (100.0)	8 (100.0)		
Community Pharmacy	139 (27.6)	365 (72.4)	504 (100.0)	17.6453	*0.001

Hospital	0 (0.0)	8 (100.0)	8 (100.0)		
Public	6 (8.5)	65 (91.5)	71 (100.0)		
Level of Pharmacy					
OTCMS	116 (58.6)	82 (41.1)	198 (100.0)		
Pharmacy Shop	26 (8.3)	289 (91.7)	315 (100.0)	187.1821	*0.000
Primary level	3 (4.2)	68 (95.8)	71 (100.0)		
Secondary	0 (0.0)	7 (100.0)	7 (100.0)		

Note: Percentages are calculated on a per-row basis. * Statistically significant (p<0.05)

Table 49: Availability of Antipsychotics

Variable	Unavailable, n(%)	Available, n(%)	Total	Chi-square	p-value
Regions					
Ashanti	64 (49.2)	66 (50.8)	130 (100.0)		
Bono East	39 (63.9)	22 (36.1)	61 (100.0)		
Central	70 (66.7)	35 (33.3)	105 (100.0)	10.5208	0.062
Eastern	37 (55.2)	30 (44.8)	67 (100.0)		
Greater Accra	134 (59.8)	90 (40.2)	224 (100.0)		
North East	1 (25.0)	3 (75.0)	4 (100.0)		
		260 (44.0)			
Type of facility					
CHAG	0 (0.0)	8 (100.0)	8 (100.0)		
Community Pharmacy	295 (58.5)	209 (41.5)	504 (100.0)	18.1106	*0.000
Hospital	6 (75.0)	2 (25.0)	8 (100.0)		
Public	30 (42.3)	41 (57.7)	71 (100.0)		
Level of Pharmacy					
OTCMS	196 (99.0)	2 (1.0)	198 (100.0)		
Pharmacy Shop	107 (34.0)	208 (66.0)	315 (100.0)	223.5317	*0.000
Primary level	26 (36.6)	45 (63.4)	71 (100.0)		
Secondary	2 (28.6)	5 (71.4)	7 (100.0)		

Note: Percentages are calculated on a per-row basis. * Statistically significant (p<0.05)

Table 50: Availability of Antidepressants: TCAs

Variable	Unavailable, n(%)	Available, n(%)	Total	Chi-square	p-value
Regions					
Ashanti	58 (44.6)	72 (55.4)	130 (100.0)		
Bono East	23 (37.7)	38 (62.3)	61 (100.0)		
Central	50 (47.6)	55 (52.4)	105 (100.0)	2.5705	0.766
Eastern	27 (40.3)	40 (59.7)	67 (100.0)		
Greater Accra	94 (42.0)	130 (58.0)	224 (100.0)		
North East	1 (25.0)	3 (75.0)	4 (100.0)		
		359 (60.7)			
Type of facility				17.0639	*0.001
CHAG	0 (0.0)	8 (100.0)	8 (100.0)		

Community Pharmacy	205 (40.7)	299 (59.3)	504 (100.0)		
Hospital	7 (87.5)	1 (12.5)	8 (100.0)		
Public	20 (28.2)	51 (71.8)	71 (100.0)		
Level of Pharmacy					
OTCMS	146 (73.7)	52 (26.3)	198 (100.0)		
Pharmacy Shop	66 (21.0)	249 (79.1)	315 (100.0)	149.4607	*0.000
Primary level	19 (26.8)	52 (73.2)	71 (100.0)		
Secondary	1 (14.3)	6 (85.7)	7 (100.0)		

Note: Percentages are calculated on a per-row basis. * Statistically significant (p<0.05)

Table 51: Availability of Antidepressants: SSRIs

Variable	Unavailable, n(%)	Available, n(%)	Total	Chi-square	p-value
Regions					
Ashanti	105 (80.8)	25 (19.2)	130 (100.0)		
Bono East	50 (82.0)	11 (18.0)	61 (100.0)		
Central	88 (83.8)	17 (16.2)	105 (100.0)	5.2773	0.383
Eastern	50 (74.6)	17 (25.4)	67 (100.0)		
Greater Accra	173 (77.2)	51 (22.8)	224 (100.0)		
North East	2 (50.0)	2 (50.0)	4 (100.0)		
		132 (22.3)			
Type of facility					
CHAG	5 (62.5)	3 (37.5)	8 (100.0)		
Community Pharmacy	389 (77.2)	115 (22.8)	504 (100.0)	2.2375	0.525
Hospital	7 (87.5)	1 (12.5)	8 (100.0)		
Public	58 (81.7)	13 (18.3)	71 (100.0)		
Level of Pharmacy					
OTCMS	198 (100.0)	0 (0.0)	198 (100.0)		
Pharmacy Shop	200 (63.5)	115 (36.5)	315 (100.0)	93.6811	*0.000
Primary level	55 (77.5)	16 (22.5)	71 (100.0)		
Secondary	6 (85.7)	1 (14.3)	7 (100.0)		

Note: Percentages are calculated on a per-row basis. * Statistically significant (p<0.05)

Table 52: Availability of Anticholinergics

Variable	Unavailable, n(%)	Available, n(%)	Total	Chi-square	p-value
Regions					
Ashanti	96 (73.9)	34 (26.1)	130 (100.0)		
Bono East	52 (85.3)	9 (14.7)	61 (100.0)		
Central	94 (89.5)	11 (10.5)	105 (100.0)	16.6064	*0.005
Eastern	58 (86.6)	9 (13.4)	67 (100.0)		
Greater Accra	198 (88.4)	26 (11.6)	224 (100.0)		

North East	3 (75.0)	1 (25.0)	4 (100.0)		
		92 (15.6)			
Type of facility					
CHAG	1 (12.5)	7 (87.5)	8 (100.0)		
Community Pharmacy	436 (86.5)	68 (13.5)	504 (100.0)	38.4107	*0.000
Hospital	8 (100.0)	0 (0.0)	8 (100.0)		
Public	54 (76.1)	17 (23.9)	71 (100.0)		
Level of Pharmacy					
OTCMS	197 (99.5)	1 (0.5)	198 (100.0)		
Pharmacy Shop	248 (78.7)	67 (21.3)	315 (100.0)	55.7131	*0.000
Primary level	49 (69.0)	22 (31.0)	71 (100.0)		
Secondary	5 (71.4)	2 (28.6)	7 (100.0)		

Note: Percentages are calculated on a per-row basis. * Statistically significant ($p<0.05$)

Non-Communicable Disease Medicine Gap Study in Ghana

Submitted to:

Ghana Heart Initiative

Submitted by:

Dr. John Koku Awoonor-Williams

Date: 22nd May 2024

On behalf of:

Implemented by:

1.0 Introduction

A day's meeting was organized and attended by key stakeholders (list attached, Table 2) from the Ministry of Health (MoH), its agencies, civil society organizations (CSOs), and other sectors, whose activities impact on the availability and access to Non-Communicable Diseases (NCD) medicines in Ghana. The meeting was organized to provide an opportunity for selected key stakeholders to make input into the findings of the Medicine Gap study report, and to develop a roadmap towards any necessary changes identified. The meeting was held at the Accra City Hotel on 7th February 2024.

The objectives of the meeting were to:

1. Present the findings of the Non-Communicable Diseases (NCD) Medicine Gap study to the stakeholders.
2. Discuss the findings of the Non-Communicable Diseases (NCD) Medicine Gap study for the input of the stakeholders.
3. Develop a roadmap to address the Non-Communicable Diseases (NCD) Medicine's Gap in Ghana.

2.0 Process

The workshop started with an introduction to indicate which invited stakeholders were present. The Ghana Heart Initiative (GHI) provided a brief overview of its activities and results achieved so far, after which the consultant and his team presented highlights of the Non-Communicable Diseases (NCD) Medicines Gap study findings. Stakeholders sought clarifications through a question-and-answer session. Stakeholders affirmed that the findings were a true reflection of the existing situation in the country regarding the shortfalls of the availability of Non-Communicable Diseases medicines. A final group work session was organized to harness inputs of stakeholders and to develop a roadmap towards changes necessary to improve the Non-Communicable Diseases (NCD) medicine gap situation.

3.0 Development of the Roadmap

Stakeholders present were put into 3-broad groups representing policy/regulation, service delivery, and civil society organizations (CSOs). Details of the group composition are presented in Table 1 below. Each group was required to select a moderator and a rapporteur to undertake the assigned task. There was also a set of guided questions (Table 3) that was used to stimulate discussions in the groups. Each group was subsequently required to present their views at a plenary for discussions.

Table 1: Composition of Group

No	Group	Membership Composition
1	Policy/Regulation	1. Pharmaceutical Manufacturers Association of Ghana 2. Ghana Revenue Authority (GRA) Customs Division 3. National Health Insurance Authority (NHIA) 4. Pharmacy Council 5. Christian Health Association of Ghana (CHAG) 6. National Diabetes Management and Research Center
2	Service Delivery + Associations	1. Catholic Hospital, Battor 2. Eastern Regional Hospital, Koforidua 3. Ghana Hospital Pharmacists Association 4. Ghana Physician Assistants' Association 5. Community Practice Pharmacists Association 6. Diabetes Association of Ghana
3	Civil society organizations /Patient Support Groups + Partners	1. Ghana Coalition of Non-Governmental Organizations (NGOs) in Health (2) 2. Sickle Cell Association of Ghana 3. Pharmaceutical Society of Ghana 4. Non-Communicable Diseases (NCD) Control Program 5. Diabetes Endocrine and Metabolic Society of Ghana (DEMSOG)

Appendix 1: Key observations and action points

No	Health System Building Block	Theme	Observations	Action Points	Action by
1	Leadership & Governance	Accessibility of Community Pharmacists.	Community pharmacies are more accessible (financially and geographically) than hospitals/clinics. Patients don't always pay for consultation services. There is a need to deliberately integrate and bring them on board.	1. Pharmacists/Pharmacies should be integrated into the chronic care model. **2.** Develop and implement a policy that makes the community pharmacy an integral part of health service delivery in Ghana.	Ministry of Health (MoH)
		Over-the-Counter Medicines Sellers (OTCMS) - capacity, function and regulation.	Over-the-Counter Medicine Sellers (OTCMS) are not mandated to have pharmacists. Some of them are also manned by persons with the lowest level of education and this compromises patient safety.	1. Need to better integrate Over-the-Counter Medicine Sellers (OTCMS) into the care provision model by ensuring better training for these providers as they are more accessible in more rural areas while also improving their supervision.	Ministry of Health (MoH); Pharmacy Council; Pharmaceutical Society of Ghana; Over-the-Counter Medicine Sellers (OTCMS) Association.

				2. Train and build the capacity of the Over-the-Counter Medicine Sellers (OTCMS) to also play a minimum role because they are equally very accessible, especially in rural areas.	
			Regulatory weaknesses exist. Sale of certain medicines by Over-the-Counter Medicine Sellers (OTCMS) that they are not licensed to sell.	1. Improve on current monitoring and evaluating systems e.g., frequency of market monitoring, surveillance, etc.	Pharmacy Council; Pharmaceutical Society of Ghana; Community Pharmacists Practice Association (CPPA).
			Absence of Pharmacists at their practice points.	1. Enforce punitive sanctions for those who breach regulations by monitoring from the Pharmacy Council, through their digital platform.	
			There are unscrupulous persons who sell medicines in the streets and markets under poor storage and regulatory conditions. These are both in rural and urban areas.	1. Ensure collaboration of regulators to ensure policy uniformity (e.g., between Food and Drugs Authority (FDA) & Customs on	Pharmacy council; Food and Drugs Authority (FDA); Ghana Revenue Authority (GRA) -Customs Division; Ministry of Interior;

			Pharmacy council acknowledged this as a "big concern". Pharmacy council conducts periodic swoops in markets, but these unscrupulous persons often relocate.	classification of medicines, supplements, etc). 2. Swift action and feedback by regulators when medicine quality issues are reported. 3. Regulatory bodies need to be better resourced to carry out their mandate. 4. Pharmacy council should improve and increase the frequency of the swoops that are conducted with the police. They should also strengthen their relationship with the police.	Pharmaceutical Society of Ghana; Community Pharmacists Practice Association (CPPA).
			Limited collaboration among Regulatory bodies, sometimes they work in silos other than collaborating and working together. For instance, some products that are classified as medicines by the Food and Drugs	1. Need to improve collaboration in the work and function of the Regulatory bodies, promote information sharing rather than working in silos.	Pharmacy Council; Food and Drugs Authority (FDA); GRA-Customs Division.

			Authority (FDA) are classified differently by Ghana Revenue Authority (GRA) and hence attract different and higher taxes/tariffs.		
		Inadequate resources of the Regulator to deliver on the mandate.	Pharmacy council does not have the requisite and adequate human resources and logistics to fully implement its mandate. In some of their regional offices, there are only one or two pharmacists, and this is "woefully" inadequate to effectively perform their function as mandated.	1. Sufficiently resource the pharmacy council to effectively deliver on its mandate.	Ministry of Health (MoH); Pharmacy Council.
		Prescriptions, prescriber and levels of care.	There is presently a restriction on prescriptions according to the prescriber and health system levels. This policy ensures that, once a prescriber is practicing in (for instance) a health center or district hospital, there are certain	1. Review the policy on prescription level to enable better management of Non-Communicable Diseases (NCDs) at the lower levels. 2. National Health Insurance Authority (NHIA) credentialing should rather be about the provider other than a facility,	MoH); National Health Insurance Authority (NHIA).

			medicines that he/she cannot prescribe. Once the prescriber writes such a prescription, the patient will have to go and buy because National Health Insurance Authority (NHIA) assuming the facility is credentialled by the National Health Insurance Authority (NHIA) will not reimburse the facility even if it is stocked and supplied in the facility.	such that when a specialist goes to a district hospital for an outreach service, he/she will be able to prescribe any medication appropriate for the patient at the time and will not be restricted by the level of the facility.	
		Substandard medicines on the market.	Concerns about substandard medicines in the market.	1. Patients can serve as partners in the surveillance against substandard medicines.	Ghana Coalition of Non-Governmental Organizations (NGOs) in Health; Media, Food and Drugs Authority (FDA).

2	Health Financing	Medicine prices	Marked price differences of medicines available on the market. Prices vary in different locations, sometimes within the same city/ town.	1. Allow demand and supply (market forces) to operate within a framework of general pricing guidelines as well as a ceiling for pricing.	Ministry of Health (MoH); Pharmaceutical Manufacturers; Community Practice Pharmacists Association (CPPA).
				2. Remove middlemen from the value chain to optimize the supply chain.	Ministry of Health (MoH).
				3. Improve economies of scale-form association by medicines wholesalers to bulk buy and bargain for lower prices.	Pharmaceutical Society of Ghana.
			Tendency by community pharmacies to always sell the most expensive medicines first.	1. Study best practices on pricing for medicines.	Ministry of Health (MoH); Community Practice Pharmacists Association (CPPA).
		National Health Insurance Authority (NHIA)	Prices paid by the National Health Insurance Authority (NHIA) do not always reflect the prevailing	1. National Health Insurance Scheme (NHIS) pricing formula should reflect the prevailing market situation.	Ministry of Health (MoH); National Health Insurance Authority (NHIA);

		/National Health Insurance Scheme (NHIS).	market price. They are often too low and unrealistic.		Pharmaceutical Society of Ghana.
			Insufficient processes of the National Health Insurance Authority (NHIA) - delays in reimbursement, delays in price adjustment in relation to price changes on the market (currency depreciation).	1. Review all National Health Insurance Authority (NHIA) and National Health Insurance Scheme (NHIS) processes - National policy review.	Ministry of Health (MoH); National Health Insurance Authority (NHIA).
			Currently, 80% of Community Pharmacies do not accept National Health Insurance Card for service delivery.	1. Increase efforts at credentialling and accreditation of eligible Community Pharmacies by National Health Insurance Authority (NHIA) to improve access to medicines.	Ministry of Health (MoH); National Health Insurance Authority (NHIA).
			The Essential Health Services Package (EHSP) and the National Health Insurance (NHI) Benefits Package are currently not fully aligned and updated per national	1. National Health Insurance Authority (NHIA) should align its Benefit Package to the Essential Health Services Package (EHSP), which should be made up to date.	Ministry of Health (MoH); National Health Insurance Authority (NHIA).

			guidelines; this has implications on medicines access.	However, the National Health Insurance Authority (NHIA) has initiated the process and presently, 42% of their services are aligned to the Essential Health Service Package (EHSP).	
			The National Health Insurance Authority (NHIA) funds are capped and what is due them does not also get to them on time and this creates delays in reimbursement of health facilities.	1. Review the capping policy -the National Health Insurance Authority (NHIA) should not be capped and whatever is due it should be provided fully. 2. Advocate for a greater percentage of funds from National Health Insurance Levy (NHIL) to get to National Health Insurance Authority (NHIA).	Ministry of Health (MoH); Ministry of Finance (MoF); Parliamentary Select Committee on Health; National Health Insurance Authority (NHIA).
		Procurement processes.	Medicine procurement and tender process varies from one facility to another and from one region to another. The process is not	1. Facilitate the harmonization and standardization of medicine procurement processes.	Ministry of Health (MoH); Public Procurement Authority (PPA).

			harmonized, and this often affects availability and leads to stockouts.		
3	Human Resource	Inadequate numbers and availability of pharmacists in public health facilities.	There are inadequate numbers of pharmacists especially in public health facilities to provide quality pharmaceutical services for Non-Communicable Disease (NCD) patients. This compromises the quality of pharmaceutical services provided to patients.	1. The Ministry of Health (MoH) should facilitate the recruitment of more pharmacists and other healthcare workers to improve the quality of pharmaceutical services. 2. A relook at recruitment into the public sector as a national policy 3. Decongest facility pharmacies by collaborating with community pharmacies for refills.	Ministry of Finance (MoF); Ministry of Health (MoH); Service delivery agencies i.e., Teaching Hospitals, Ghana Health Service (GHS), Christian Health Association of Ghana (CHAG), GAQHI, Private self-financing facilities, GHOPSA, Community Practice Pharmacist's Association (CPPA).
		Access to Community Pharmacists.	Community pharmacists are not often accessible to provide the required pharmaceutical care services in their shops and this compromises the provision of quality and safe pharmaceutical services to the populace.	1. Need to strengthen innovations that are being implemented to improve the accessibility such as the partnership between the Community Pharmacy Practice Association (CPPA) and the National Health Insurance	Ministry of Health (MoH); Pharmacy Council; Pharmaceutical Society of Ghana; Community Pharmacists Practice Association (CPPA);

				Authority (NHIA) where about 1000 community pharmacies are being credentialed. 2. Strengthen the capacity of community pharmacies to provide comprehensive pharmaceutical care services. 3. Designate community pharmacies as patient care centers. 4. Strengthen the implementation of the electronic system that has in-built penalties that seeks to address the availability of community pharmacists at their points of practice.	National Health Insurance Authority (NHIA). Pharmacy Council
		Availability of specialists across the levels of care.	Concerns about where specialist practice is delivered - whether specialists should remain at the secondary and tertiary levels of care and receive referrals or provide care at the primary	1. Implementation of Universal Health Coverage (UHC) Roadmap and Network of Practice (NoP) Policy.	Ministry of Health (MoH); Ghana Health Service (GHS).

			healthcare level to avert complications and referrals.		
4	Health Technology	Local Pharmaceutical Manufacturers Challenges.	Concerns from manufacturers about the increasing cost of doing business in Ghana, such as the high taxes and exchange rates. ○ This affects the cost of the medicines on the shelves. ○ The escalating cost of doing business is resulting in some local manufacturers shutting down production.	1. Government should facilitate the enforcement of LI 2255, to improve tax exemptions (tax incentives). 2. Undertake a holistic review of all the processes that influence local manufacturing: research, cost of production (land, machinery, water, electricity), and how government can intervene at each level to create a more conducive environment for local pharmaceutical manufacturers. 3. Responsible Government Agencies should continuously explore answers to the question "what will it take for local manufacturers to succeed"?	Ministry of Finance (MoF); Ministry of Health (MoH); Pharmaceutical Manufacturers Association.

			Inherent challenges with the tax exemption system and the implementation thereof. ○ Though manufacturers were given tax exemptions on the import of certain active ingredients for the manufacture of medicines, they unfortunately did not pass this benefit on to the end users (by reducing the prices of their products). ○ The benchmark value has been taken away and this nullified the Value Added Tax (VAT) exemption that was being enjoyed. Some manufacturers were also not reducing the cost of their final products even when they have	1. Advocate for tax incentives for local manufacturers. 2. Manufacturers should be encouraged to ensure that any relief they enjoy from government by way of reduction in taxes should reflect in the cost of their final products.	Ministry of Health (MoH); Pharmaceutical Manufacturers Association.

			benefited from the various tax rebates available to them.		
		Promotion of foreign manufactured medicine brands over local manufactured medicine brands.	Some providers promote foreign brands and products at the expense of local ones.	1. Promote and patronize medicines produced locally by local manufacturers	Service provision agencies i.e., Teaching hospitals, Ghana Health Service (GHS), Christian Health Association of Ghana (CHAG), Quasi, Self-financing private facilities.
		Tempering with shelf life and expiry dates of medicines.	Some community pharmacies and Over-the-counter Medicine Sellers (OTCMS) tamper with the shelf life and expiry dates of medicines on their shelves.	1. Implement the medicine traceability program. Emulate best practices around the world e.g. Turkey is making a lot of savings on the implementation of pharmaceutical traceability.	Ministry of Health (MoH).
5	Service Delivery	Safety	Poor prescription practices including polypharmacy.	1. Involvement of pharmacists in patient care to always ensure rational use of medicines.	Service provider agencies i.e., Teaching hospitals, Ghana Health Service (GHS), Christian Health Association of Ghana (CHAG); Quasi, Self-

					financing private facilities; GHOSPA.
				2. Develop separate guidelines for each Non-Communicable Diseases (NCD) which should be more comprehensive, detailed, and aligned to the essential drug policy.	Ministry of Health (MoH); National Health Insurance Authority (NHIA); Service Provider Agencies i.e., Teaching Hospitals, Ghana Health Service (GHS), Christian Health Association of Ghana (CHAG); Quasi, Self-financing private facilities.
				3. Explore the use of e-pharmacies to improve access.	Pharmacy Council.
				4. Use pharmaceutical traceability to ensure the quality of drugs in the system.	Ministry of Health (MoH).
				5. Rationalize quantity limits of medications to check polypharmacy.	Ministry of Health (MoH); Pharmacy Council.

			Poor awareness and filling of Pharmacovigilance forms.	1. Educate practitioners on the availability of, and the need to complete the pharmacovigilance forms (for any medicines suspected to be compromised).	Food and Drugs Authority (FDA), Service provision agencies: Ghana Health Service (GHS), Christian Health Association of Ghana (CHAG), Teaching Hospitals, etc; Community Practice Pharmacist's Association (CPPA), Government and Hospital Pharmacists Association (GHOSPA).
		Effectiveness of Medicines	Poor quality of medications in health facilities. Difficulty in determining the quality of medicines at service delivery points.	1. Involve Pharmacists in receiving medicines at facilities before medicines are sent to the stores. 2. Develop Standard Operating Procedures (SOPs) for receiving medications at the facilities.	Service provision agencies i.e., Teaching hospitals, Ghana Health Service (GHS), Christian Health Association of Ghana (CHAG), Quasi, Self-financing private facilities; Government and Hospital

					Pharmacists Association (GHOSPA).
				3. Promote reporting of substandard medications and infractions.	Food and Drugs Authority (FDA).
			There is a general perception that branded/patented medicines are superior to generic medicines.	1. Educate and assure the general public on the quality of medicines approved by the Food and Drugs Authority (FDA).	Ministry of Health (MoH) Ghana Coalition of Non-Governmental Organizations (NGOs) in Health; Media; Service provision agencies i.e., Teaching hospitals, Ghana Health Service (GHS), Christian Health Association of Ghana (CHAG), Quasi, Self-financing private facilities.
				2. Appropriate messaging and language use i.e. referring to branded medicines as “original” which then implies the generics are fake.	Service provision agencies i.e., Teaching hospitals, Ghana Health Service (GHS), Christian Health Association of Ghana

				3. Providers should educate patients using generic names of medicines - this allows the patients to seek similar medications when needed.	(CHAG), Quasi, self-financing private facilities; Ghana Medical Association (GMA); Ghana Registered Nurses and Midwives Association (GRNMA); Pharmaceutical Society of Ghana (PSGh).
			Prescription of branded/patented medicines because of fear of substandard generics.	1. Encourage and educate providers to prescribe generics approved by the Food and Drugs Authority (FDA). This will also lessen the cost burden of medicines on patients.	Service provision agencies i.e., Teaching hospitals, Ghana Health Service (GHS); Christian Health Association of Ghana (CHAG); Quasi, self-financing private facilities; Ghana Medical Association (GMA); Ghana Registered Nurses and Midwives Association (GRNMA); Pharmaceutical Society of Ghana (PSGh).

		People-Centered Care (PCC).	Poor disclosure by patients on their ability or levels of affordability. As a result, they often procure only part of the medications required for their treatment hence they do not benefit wholly.	1. Patient education should be improved to enable them to understand their conditions, appreciate and know their medication options and take their medications according to the prescriptions	Service provider agencies i.e., Teaching hospitals, Ghana Health Service (GHS); Christian Health Association of Ghana (CHAG), Quasi, Self-financing private facilities; Ghana Medical Association (GMA); Ghana Registered Nurses and Midwives Association (GRNMA); Pharmaceutical Society of Ghana (PSGh); Ghana Coalition of Non-Governmental Organizations (NGOs) in Health; Media, Community Practice Pharmacist's Association, (GHOSPA).
				2. Patients must be encouraged to bring to the dispensaries or pharmacy shops their bags of medications for review to ensure continuity and consistency.	
				3. Use Patient Support Groups as a platform for education and source of information on generic drug quality.	
				4. Assign dedicated personnel for patient counselling on types and	Service provision agencies i.e., Teaching Hospitals,

				cost of medicines at health facilities.	Ghana Health Service (GHS); Christian Health Association of Ghana (CHAG), Quasi, Self-financing private facilities, Government and Hospital Pharmacists Association (GHOSPA).
			Patients are oftentimes not sufficiently empowered and knowledgeable about their condition. Some patients resort to herbal medicines as an alternative or option to the "cure" of their conditions. A key observation from the study was that sometimes patients could be taking three different brands of the same medicine without any idea. In addition, some patients	1. Develop educational leaflets for patients to include the following minimum information especially at the point of discharge as well as one on one discharge counselling/information: i. Condition of the patient. ii. Management plan and expectation. iii. How to prevent complications. iv. Lifestyle modification. v. Medication side effects.	Service provision agencies i.e., teaching hospitals, Ghana Health Service (GHS), Christian Health Association of Ghana (CHAG), Quasi, Self-financing private facilities, Government and Hospital Pharmacists Association (GHOSPA).

			might have achieved control on a particular brand of medication for a condition like hypertension, which should be maintained.	vi. What to do in the event of experiencing side effects.	
				1. Improve counselling of Non-Communicable Diseases (NCD) patients on the medicines they are given and how to monitor their conditions to assess the efficacy of these medicines. Community pharmacies can serve as easily accessible points for the provision of feedback on these medicines which can be solicited or received passively.	Service provision agencies i.e., Teaching Hospitals, Ghana Health Service (GHS), Christian Health Association of Ghana (CHAG), Quasi, self-financing private facilities, Government and Hospital Pharmacists Association (GHOSPA) Community Practice Pharmacists Association (CPPA).

6	Health Management Information Systems (HMIS)	Data from community pharmacists.	No existing national system to capture data from Community pharmacies. Thus, they do not submit any data on the results of testing, transactions, and other services to any identifiable component of the health system.	1. Data generated by community pharmacies and Over-the-Counter Medicines Sellers (OTCMS) should be integrated into the Logistics Health Information Management System (LHIMS) / District Health Information Management System (DHIMS).	Ministry of Health (MoH); Pharmacy Council; Health Facilities Regulatory Agency (HeFRA); Ghana Health Service (GHS).

Table 2: List of participants at the workshop

No.	Organization	Representative
1	Ministry of Health (MoH) - Pharmaceutical Services	Pharm Festus Korang
2	Pharmacy Council	Pharm Dr. Cynthia Yeboah Mintah
3	Pharmaceutical Society of Ghana (PSGh)	Pharm Dr. Ruby Anne Biaku
4	National Health Insurance Authority (NHIA)	Miss Yvonne Sedegah
5	Ghana Health Service - NCD Control Programme	Mr. Isaac Tandoh
6	Battor Catholic Hospital	Dr. Felicia Akuribiri
7	Eastern Regional Hospital, Koforidua	Dr. Ijeoma Aja
8	Government and Hospital Pharmacists Association (GHOSPA)	Pharm Emmanuel Owusu Owiafe
9	Customs Division (GRA)	Mr. Eric Koko
10	Christian Health Association of Ghana (CHAG)	Mr. Samuel Amponsah
11	National Diabetes Management and Research Centre	Dr. Yacoba Atiase
12	Pharmaceutical Manufacturers Association of Ghana (PMAG)	Pharm Lucia Addae
13	Community Practice Pharmacists Association (CPPA)	Pharm Dr. Emmanuel Ireland
14	Ghana Coalition of NGOs in Health	Mr. Oswald Owusu
15	Ghana Coalition of NGOs in Health	Miss Deborah Annang
16	Ghana Physician Assistants Association	Mr. Peter Akudugu Ayamba
17	Diabetes Association of Ghana	Prof. Ernest Yorke
18	Sickle Cell Association of Ghana	Mr. Peter Mensah
19	Diabetes Endocrine and Metabolic Society of Ghana (DEMSoG)	Dr. Josephine Akpalu
20	Consultant	Dr. Koku Awoonor-Williams
21	Consultant's team	Prof. Alfred Edwin Yawson
22	Consultant's team	Dr. Afua Owusu
23	Consultant's team	Dr. Elom Otchi
24	GHI Technical Director	Dr. Alfred Doku
25	GIZ/GHI	Pharm Juliette Edzeame
26	GIZ/GHI	Mr. David Mainoo Danso
27	GIZ/GHI	Pharm Kwatetso Honny
28	GIZ/GHI	Miss Alberta Ewuziwaa Acquah
29	GIZ/GHI	Pharm Marisa Nyarkoa Broni

Table 3: Guiding questions

Category	Guiding Questions
Policy/Regulators **Group 1**	1. How can we effectively implement comprehensive price regulations for essential medications? 2. What changes in prescription policies would best improve access and avoid inadvertent restrictions?
Service Delivery **Group 2**	1. How can we enhance post-market surveillance to promptly address concerns and assure the quality and efficacy of medicines? 2. What strategies can be employed to educate communities about the safety and efficacy of generic medicines?
Associations **Group 2**	1. How can associations contribute to incentivizing local pharmaceutical manufacturers? 2. What role can associations play in community education on generic medicines?
Manufacturers **Group 1**	1. What incentives would be most effective in promoting local pharmaceutical manufacturing? 2. How can manufacturers actively participate in strengthening post-market surveillance?
Partners **Group 3**	1. How can partnerships support the implementation of comprehensive price regulations for medicines? 2. In what ways can partners collaborate to enhance post-market surveillance?
Patient Support **Group 3**	1. How can patient support groups actively contribute to community education on generic medicines? 2. What specific support do patients need in understanding the safety and efficacy of generic alternatives?