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Improving Allocative Efficiency in Zimbabwe's Health Sector

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Acknowledgements

This analytical and advisory activity is one of the deliverables under the Zimbabwe Health Financing and HRH Reforms Technical Assistance.

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The team would like to sincerely acknowledge the Ministry of Health and Child Care for facilitating data collection and organizing two technical workshops in Harare. The team also thanks the Clinton Health Access Initiative and other development partners for their feedback.

Financial support for this work was received from the Bill and Melinda Gates Foundation, Japan Policy and Human Resources Development Fund, and the United Kingdom Department for International Development.

Executive Summary

The country of Zimbabwe has seen some important improvements in key health outcomes since 2009. However, despite progress in some areas of the health sector, the country did not meet its Millennium Development Goals (MDGs) and current progress falls short of the Sustainable Development Goals (SDGs) milestones.

As is often the case, the poor and rural populations in Zimbabwe bear a disproportionate burden of disease and health risks. The situation is compounded by national economic challenges and health sector spending inefficiencies that have resulted in households bearing an increasing share of health sector financing, mainly through out-of-pocket expenditures. Households provide approximately 25 percent of health sector financing in Zimbabwe. Again, the poor and rural populations are hardest hit by this economic reality.

Economic growth projections for Zimbabwe indicate a growth decrease in 2019, coupled with rising inflation. In addition, the health sector's 2019 budget falls significantly short of the high impact scenario. How can Zimbabwe protect and improve the health of its population in this constrained environment?

In recent years, several analyses on health financing in Zimbabwe were conducted. The results revealed that the most promising option to achieve better health outcomes in the current country context is to improve health sector spending efficiency. Accurately identifying areas or interventions that should be targeted is essential to increasing spending efficiency and improving population health outcomes in Zimbabwe.

Globally, the availability of disease burden data, cost-effectiveness of interventions, *Disease Control Priorities (DCP$_3$)*, and improvements to optimization algorithms used in allocative efficiency tools, as well as the analytic process itself, have enabled the development of the Health Interventions Prioritization Tool (HIPtool). HIPtool can help decision makers by informing stakeholder dialogues around which services should be prioritized to maximize a given set of objectives within a fixed budget. Therefore, the objective of this study was to apply HIPtool to the Zimbabwe context to improve resource allocation across health services.

Zimbabwe was one of the few countries in which HIPtool was piloted at the proof of concept stage. HIPtool enables the mathematical prioritization of interventions based on existing data and a set of criteria. It provides a technical foundation to further develop an essential health benefits package. However, HIPtool, at this stage in development, still has strong limitations, which are outlined along with results in this report.

HIPtool

Three main types of data are required to run an allocation efficiency analysis using HIPtool: (1) burden of disease, measured in disability-adjusted life years (DALYs); (2) intervention cost-effectiveness; and (3) intervention spending. Once populated with data, HIPtool can inform which of the 218 interventions in the DCP_3 Essential Universal Health Coverage (EUHC) package should be prioritized for a given context and what an optimised allocation of spending across prioritized interventions might look like. The three datasets are combined in HIPtool to conduct an optimization analysis with the option of user-assigned weights for up to three criteria: (1) health maximization, (2) equity, and (3) financial risk protection.

Data collection methods for the Zimbabwe exercise included a desk review of relevant national documents to provide the country context; details on existing health services; baseline and target coverage of existing services as well as intervention unit costs, budgets, and/or expenditures. Interviews were conducted with key officials from the pertinent ministries and with development partners.

The analysis was based on the 2016 fiscal year, which was used both for intervention data collection and inflation adjustment. Expenditure and budget data were extracted from the *2016 Resource Mapping Report*, the *National Health Accounts Report*, and the 2016 Ministry of Health and Child Care (MoHCC) expenditure and appropriation account. Expenditure and budget data were then used to compare and validate aggregated intervention expenditure estimated for the HIPtool analysis.

The availability and quality of some underlying unit costs and utilization data remain a significant challenge in the low- and middle-income country context. This data challenge is particularly severe for interventions falling into the non-communicable diseases and injury or crosscutting care categories. The analysis adjusted DCP_3 average unit costs to the Zimbabwe context, but it is far from being perfect. This exercise highlights the need for more investment in collecting and analyzing such data for broader use.

HIP Analysis Results

An estimated US$980 million was spent on health services in 2016. The largest share was spent on HIV-related interventions and, in particular, on ART care in health centers for people living with HIV (PLHIV). The 2016 total expenditure on health services is estimated to have averted 1.6 million DALYs. Interestingly, the primary health center interventions alone accounted for approximately 67.3 percent (1,102.6 thousand DALYs) of the total number of DALYs averted. Consistent with global literature, the most impactful interventions were delivered at lower platforms of care, such as Primary Health Centers (PHC).

The 2016 optimised scenario, created by HIPtool, continued to place important focus on HIV-related and tuberculosis (TB) interventions. Maternal and child health and NCD-related interventions received increases in the optimised scenario. An emphasis on integrated care emerged as an important step to improving spending efficiency, such as integrated community case management and basic emergency neonatal and obstetric care (BEmNOC) at PHCs. In addition, interventions for TB and pneumonia were also prioritized, particularly at lower platforms of care.

Policy Implications for Zimbabwe

The analysis indicated that a shift in spending from hospitals to community and PHC platforms of care could significantly increase the amount of DALYs averted by the NHS package in Zimbabwe. HIPtool does not analyze human resources for health however; the roles of community health workers and PHC staff are widely accepted as central to a more integrated approach at lower platforms of care, which will facilitate optimised resource allocation.

HIV/AIDS, TB, and malaria remain the highest portion of the disease burden for Zimbabwe. An integrated PHC and community approach is essential to making additional progress in reducing this part of the disease burden. Similarly, maternal and child health interventions, which have been identified as areas of focus by the government, and non-communicable diseases interventions, could be more broadly delivered at the PHC and community levels to improve cost-effectiveness.

The analysis provides evidence on high-level shifts in resource allocation that could save money and improve health outcomes. Zimbabwe recently identified strengthening budget formulation processes as a key and urgent reform. This is a first step toward actively utilizing HIPtool to appraise the cost and impact of the NHS package and improve health outcomes in Zimbabwe.

HIPtool is still in its nascent stage and has several limitations, which are outlined later in this report. However, while HIPtool is being further refined and improved, the current HIPtool outputs can inform high-level discussions on allocative efficiency and provide an entry point into more specific and comprehensive analyses in collaboration with other existing tools. HIPtool's power and value lies in its ability to nimbly adjust recommendations as updated input data becomes available. The key is to build the MoHCC staff's capacity to understand and use HIPtool. The gloomy fiscal situation in Zimbabwe necessitates improved efficiency in the allocation of health funds. HIPtool, combined with other technical analysis and with consideration for political and implementation realities, will provide the necessary evidence to help decision makers improve health fund allocations.

Abbreviations

ART	Assessment of antiretroviral treatment
BEmNoC	Basic Emergency Neonatal and Obstetric Care
CHAI	Clinton Health Access Initiative
DHS	Demographic health surveys
EUHC	Essential Universal Health Coverage
GBD	Global burden of disease
GDP	Gross Domestic Product
HFS	Health financing strategy
HIP	Health investment prioritization
IHME	Institute for Health Metrics and Evaluation
ICCM	Integrated Community Case Management
MCH	Maternal and child health
MNCH	Maternal, neonatal and child health
MICS	Multiple Indicator Cluster Surveys
MDG	Millennium Development Goal
MoFED	Ministry of Finance and Economic Development
MoHCC	Ministry of Health and Child Care
M&E	Monitoring and evaluation
MDR-TB	Multi-drug resistant tuberculosis
NCD	Non-communicable disease
NHA	National Health Accounts
NHS	National Health Service
PFM	Public financial management
SADC	South African Development Community
SRH	Sexual reproductive health
STI	Sexually transmitted infection
SDG	Sustainable Development Goal
TB	Tuberculosis
UNAIDS	Joint United Nations Programme on HIV/AIDS
UNICEF	United Nations Children's Fund
WHO	World Health Organization

1. Introduction

Despite improvements in key health outcomes since 2009, Zimbabwe's health sector did not meet its Millennium Development Goals (MDGs), and current progress falls short of the Sustainable Development Goals (SDGs) milestones. Zimbabwe's human capital index[1] is 0.44, which is on par with the Southern African Development Community (SADC) average.[2] In 2016, life expectancy reached 61 years of age. Maternal and infant mortality has decreased, as has HIV and tuberculosis (TB) prevalence. However, Zimbabwe's disease burden remains high and its maternal and child health (MCH) outcomes are among the worst in the SADC region. Sixty-five percent of annual deaths are attributed to communicable, maternal, perinatal, and nutritional illness, although the share of deaths attributed to non-communicable diseases has been increasing.[3] The poor and rural populations shoulder a disproportionate burden of disease and health risks.

Cycles of fragility and macroeconomic challenges coupled with health sector spending inefficiencies have increasingly shifted the burden of health care financing to households, which has affected service utilization. Zimbabwe's total health spending per capita compares favorably with the sub-Saharan average. However, due to limited fiscal space/public financing in health, absence of a prepayment mechanism offering financial protection to the population, and inefficiencies in the sector, households provide a significant share of health sector financing (25 percent), mainly through out-of-pocket expenditures.

The continued deterioration of the economic landscape has compounded existing supply- and demand-side constraints in the sector, further heightening the risk of limited access to quality health services in the immediate to short term. Economic growth was projected to decrease from four percent in 2018, to 3.1 percent in 2019, but increase to above seven percent in 2020; whilst annual average inflation was projected to increase from 8.3 percent in 2018, to 22.4 percent in 2019. Inflation was expected to increase significantly especially during the first half of 2019, with medical inflation being a major driver in recent months. Despite improvements in nominal allocation from previous years, the 2019 health sector budget allocation of US$694 million fell significantly short of the US$1.39 billion required for the NHS High Impact Scenario for 2019.[4]

In recent years, several analyses on health financing in Zimbabwe were conducted. The results strengthened the information base and revealed that the most promising option to achieve better results in the current country context is to improve spending efficiency. The analysis presented in this report was triggered by the conclusions and recommendations of these analyses and aim to provide tangible solutions to increase spending efficiency. The main conclusions of these reports are listed in section 2. Among all the possible options to improve the health sector's fiscal space in Zimbabwe, the most urgent and plausible option is to increase efficiency gains by maximizing the current level of resources allocated to the health sector.

Globally, the availability of disease burden data, information on the cost-effectiveness of health interventions, the outputs of the *Disease Control Priorities* (*DCP_3*) initiative, and progress in allocative efficiency research have enabled the development of the Health Investment Prioritization Tool (HIPtool)

1 The index measures the amount of human capital that a child born today can expect to attain by age 18, given the risks of poor health and poor education that prevail in the country where s/he lives.

2 SADC is a regional organization comprised of 14 member countries.

3 World Health Organization.

4 Zimbabwe National Health Strategy 2016-2020 Costing Report.

to help inform the prioritization of health resources. Using a mathematical algorithm, an optimised allocation of spending across health interventions is generated to maximize one or more of the following objectives: (a) health maximization (i.e., maximization of DALYs averted), (b) equity, and (3) financial risk protection.

The objective of the study is to apply HIPtool in Zimbabwe to improve resource allocation across health services.

2. Summary of Previous Health Sector Analysis

This section summarizes the main findings from the National Health Accounts, the annual resource mapping, the fiscal space analysis for health, and the health financing strategy.[5]

2.1 The National Health Accounts for 2015

The NHA revealed important inefficiencies in current public and private health spending and recommended measures such as allocating more resources for preventive care since current health financing allocations favor curative services. The increasing burden from non-communicable diseases (NCDs) requires prioritization of preventive care to avert the high costs of NCD treatment; developing strategic purchasing mechanisms to enhance the efficiency of available funding; and strengthening the integration of vertical and disease-specific programs, which are concentrated on HIV/AIDS, malaria, and tuberculosis, to leverage disease-specific donor funding.

2.2 The Resource Mapping Study by MOHCC

The resource mapping showed that the Government of Zimbabwe is the major funder of the health sector and that its contribution is heavily skewed towards health worker salaries. There is a significant cost-sharing imbalance between the government and partners as government funding goes mostly toward health systems costs while partner funding goes toward disease-specific activities (e.g., commodities). The reliance on external funding for key cost categories represents a challenge in terms of sustainability and predictability of health system funding. Funding from external partners is critical for drugs, and some important items (research and M&E or infrastructure and equipment-related expenses) are only paid for by external assistance. HIV, vaccines, malaria, reproductive and maternal, neonatal and child health (MNCH), and TB programs are highly donor dependent.

2.3 The Fiscal Space Analysis for Health in Zimbabwe

The 2017 fiscal space analysis[6] concluded that the current financial crisis and macroeconomic situation in Zimbabwe did not constitute an enabling environment for generating fiscal space for health. In this context, using the current level of resources allocated to the health sector in the most effective and efficient way is the most urgent and plausible option for increasing fiscal space for health. Looking at the disease profile and health seeking behaviours of the poorest, the fiscal space analysis recommended reallocating more resources to the lowest levels of care, where most of the vulnerable go and where most cases can be treated at a lower cost. Reassigning some resources from curative

5 http://www.mohcc.gov.zw/index.php?option=com_phocadownload&view=category&download=53:zimbabwe-health-financing-strategy&id=6:acts-policies&Itemid=552

6 The fiscal space analysis looked at opportunities for making additional resources available for government spending on health through: (i) establishing conducive macroeconomic and fiscal conditions; (ii) prioritizing health within the government budget; (iii) allocating health sector-specific financing from other sources; (iv) negotiating higher development assistance for health; and (v) improving efficiency of outlays for health.

to preventive services, focused on NCD prevention, could also alleviate the significant burden of NCD curative treatments on health systems and health financing. The analysis also suggested improvements in budget processes, from planning to execution and implementing PFM reforms to better turn allocated funds into inputs. It also acknowledged that the large wage bill represents a major constraint for the country and the health sector, and substantial efficiency gains could be achieved within the sector without implementing public sector wage reform.

2.4 The Health Financing Strategy (HFS)

The HFS recommends a significant focus on efficiency gains, which triggered the analysis presented in this paper. The HFS places emphasis on implementing reforms that prioritize low-cost, high-impact interventions; on improving allocative and implementation efficiencies; and on improving the integration of services at all levels of the health system. The HFS short- to medium-term interventions focus on efficiency; notably, the importance of increasing efficiency gains from existing resources and improving efficiency of external assistance on health.

3. Methods and Data

3.1 Introduction of the Health Interventions Prioritization Tool

The Health Interventions Prioritization Tool (HIPtool) is a cloud-based, open-access, user-friendly, high-impact resource to assist with the design of national health benefits packages. It combines context-specific data on disease burden and intervention effectiveness to help stakeholders identify funding priorities and targets. HIPtool allows countries to use locally-generated cost, effectiveness, and coverage data to determine a mathematically optimised resource allocation that maximizes one or more of the following objectives: (1) health maximization, (2) equity, and (3) financial risk protection. In this analysis, only health maximization, measured by averted Disability Adjusted Life Years (DALYs) was used due to lack to financial risk protection data in the HIPtool at the time.

The mainstay of HIPtool is the findings from *Disease Control Priorities (DCP$_3$)*, which looks at 21 essential packages of interventions at five different platforms of care: (1) population, (2) community, (3) health center, (4) first level hospitals, and (5) referral or central hospitals. Combined, the packages form a single Essential Universal Health Coverage (EUHC) health benefits package developed by *DCP$_3$*, which contains the 218 interventions included in HIPtool. All 218 interventions are not relevant to each country, and even if they were, low- and middle-income countries would not have sufficient resources to fully implement each. Therefore, tools such as HIPtool are important to identify which of the 218 interventions should be prioritized with sufficient levels of coverage in different contexts.

HIPtool is able to determine the services that should be prioritized to maximize a given set of objectives within a fixed budget. HIPtool has the potential to consider health outcomes, financial protection, and equity as a comprehensive objective function mirroring the UHC goals. Although HIPtool is still in its nascent stages, this analytical work complements prior analyses and tools that have been developed and demonstrates the potential ability to inform national discussions on improving the efficiency of resource allocation in the health sector.

> “Zimbabwe’s communicable, maternal, neonatal, and nutritional disease burden remains high, yet, the country faces a double burden of communicable and non-communicable diseases (NCDs).”

3.2 Mapping of Interventions to *DCP*$_3$ Interventions

The NHS package was first mapped to EUHC interventions to determine the extent to which it is aligned with global evidence published by *DCP*$_3$. Mapping the existing NHS to *DCP*$_3$ interventions also enabled the use of relevant secondary data collated by *DCP*$_3$, pre-loaded in HIPtool, and in turn a timely analysis to inform the ongoing discussions on revisions to the NHS package. The mapping process included one-on-one intervention mapping consultations with experts (health workforce and laypersons) and intervention mapping workshops with clinicians, program planners, and policy makers. Published NHS protocols were the primary source of data for mapping NHS services to EUHC interventions. However, in the absence of a precise and common definition the primary cause of disease was used to indicate the scope of an intervention.

After mapping NHS services to EUHC interventions, necessary intervention datasets were collated by determining population in need, baseline and target coverage, and unit cost per person served.

3.3 Data Inputs

Three main types of data are required to run an allocative efficiency analysis using HIPtool: (1) burden of disease, measured in disability-adjusted life years (DALYs); (2) intervention cost-effectiveness; and (3) intervention spending. Country-specific disease burden data is available from the Global Burden of Disease Study conducted by the Institute for Health Metrics and Evaluation (IHME) and is pre-loaded in HIPtool. Data on the cost-effectiveness of interventions, available from the EUHC data published by *DCP*$_3$, is also included in HIPtool. However, given the lack of secondary data on intervention spending, this often has to be calculated. Once populated with data, HIPtool can identify which of the 218 EUHC interventions should be prioritized for a given context and present an optimised allocation snapshot across prioritized interventions. The three datasets are combined in HIPtool to investigate the latter by conducting an optimization analysis with the option to assign weights for up to three criteria: (1) health maximization, (2) equity, and (3) financial risk protection.

The HIPtool framework, how data are combined, and the optimization process are described in detail in Appendix A. The Zimbabwe study assigned full weight to health maximization.

Data collection methods for the exercise included a desk review of relevant national documents to provide the country context. The review examined details on existing health services; baseline and target coverage of existing services; and intervention unit costs, budgets and/or expenditures (see Appendix B for the list of documents reviewed). Interviews were conducted with key clinical officials from the Ministry of Health and Child Care (MoHCC) to gather information on the types of interventions that are being implemented in Zimbabwe. Interviews were also conducted with the Clinton Health Access Initiative (CHAI), the World Health Organization (WHO), and the Ministry of Finance and Economic Development (MoFED) to discuss resource-mapping data, data use and One-Health country-specific data on unit costs and intervention coverage, and evidence on fiscal space, respectively.

3.3.1 Intervention Spending

Intervention spending was estimated by combining unit cost and annual utilization estimates for each of the interventions.[7] Unit costs were sourced from the National Health Strategy 2015-2020 and expenditure data from the resource mapping study of interventions where local data was available (the full list of data sources is available upon request). Local unit cost data was mostly available for maternal and child health interventions, and the resource mapping analyses provided spending data for certain HIV- and malaria-related interventions. In cases where unit costs were not available from local sources, EUHC intervention unit costs published by DCP_3 were adjusted to the Zimbabwe context.

Costing and utilization data for non-communicable diseases, injury and cross-cutting care is very poor. For most interventions in these categories, we had to rely on the adjustment of EUHC unit costs, which are derived from averages across low-income countries in 2012 US dollars.[8] To generate average EUHC intervention unit costs for low-income settings, DCP_3 assumed that 70 percent of each EUHC unit cost is allocated to health worker salaries.[9] To further refine the estimate for a given EUHC intervention unit cost, the average health worker salary was adjusted to the country context and applied to the assumed 70 percent of unit cost. The ratio used to adjust the health worker salary components of EUHC unit costs was based on the health worker salary dataset used by DCP_3 to generate the EUHC unit costs, and on the GDP multipliers generated by the WHO-CHOICE econometric analysis to inform national averages for health worker salaries.[10] Once adjusted, the EUHC intervention unit costs were inflated to 2016 based on the World Bank consumer price index for Zimbabwe.[11]

7 $S_i = UC \times U_n$. Where intervention spending is S_i, unit cost is UC, and the annual number of people utilising an intervention is U_n. In turn, the number of people utilising a service U_n, is based on: $U_n = P_N \times A_p$. Where P_N denotes the number of people in need of an intervention, and A_p is the estimated access to an intervention as a percentage.

8 DCP_3 unit costs published for the EUHC package of interventions reflect long-run average costs

9 For more details, see the DCP_3 working paper: Watkins, D.A., Qi, J., Horton, S.E. 2017. Working Paper # 20: Costing Universal Health Coverage: The DCP_3 Model. Disease Control Priorities in Developing Countries, 3rd Edition.

10 Serje J, Bertram MY, Brindley C, Lauer JA. Global health worker salary estimates: an econometric analysis of global earnings data. Cost Effectiveness and Resource Allocation. 2018 Dec;16(1):10.

11 EUHC unit costs were inflated using the average of World Bank data on "Inflation, consumer prices (annual %) - low-income group" for 2012-6. The average inflation rate between 2012-6 used was 5.35%.

To estimate utilization for a given intervention, secondary data sources on population need and the percentage of population with access to an intervention were combined. Baseline data from the 2015 NHS report, as well as data from the WHO Global Health Observatory, UNICEF, UNAIDS, Demographic Health Surveys (DHS), Multiple Indicator Cluster Surveys (MICS), and other published peer-reviewed and grey literature were compiled to inform levels of access to each intervention. In the absence of data, *DCP₃* assumptions on baseline coverage were used.[12] To estimate population in need, disease-specific modeled prevalence for HIV was sourced from UNAIDS, and the GBD prevalence data was used for all other interventions directly linked to a cause of disease. Populations at risk, or eligible, for interventions that are not directly linked to a GBD cause were estimated based on data from the DHS, UNICEF, UN Populations Division, and from peer-reviewed studies conducted either in Zimbabwe or in Southern Africa.

3.3.2 Intervention Cost-Effectiveness Data

Data published by *DCP₃* on the cost-effectiveness of EUHC interventions, linked to NHS services through the mapping process, were used in the HIPtool analysis. However, due to the absence of some cost-effectiveness estimates in the published EUHC package, additional data was sourced from other *DCP₃* volumes and annexes. For certain EUHC interventions, data on cost-effectiveness was not available in any of the *DCP₃* volumes or supplementary materials. For these interventions, given that *DCP₃* developed the EUHC package based on cost-effectiveness through a rigorous review of the evidence, it was assumed that EUHC interventions fall within the upper-bound of estimated country-specific, cost-effectiveness thresholds.[13] Last, before undertaking the optimization analysis, a quality reduction factor of 30 percent was applied across all intervention cost-effectiveness estimates. This reduction adjusted the trial-based data to reflect the loss of effectiveness that occurs outside of controlled settings and when implementing at scale.[14]

3.3.3. Data Validation

The analysis was based on the 2016 fiscal year, which was used both for intervention data collection and inflation adjustment. Expenditure and budget data were extracted from the *2016 Resource Mapping Report*, the *National Health Accounts Report*, and the 2016 Ministry of Health and Child Care expenditure and appropriation account. Expenditure and budget data were then used to compare and validate aggregated intervention expenditure estimated for the HIPtool analysis (see section 4.2.1 below for key results from the expenditure validation process).

3.4 Optimization Analysis

The optimization module of HIPtool is described in detail in Appendix A. Following the steps outlined in sections 3.1 and 3.2, the three datasets necessary to run HIPtool were combined to calculate the maximum effective coverage for a given intervention. The maximum effective coverage for an intervention informs the upper spending constraint for the optimization process, based on the estimated maximum impact an intervention could have on the causes of the disease burden that it is linked to.[15]

12 Assumed baseline coverage of 40 percent of estimated prevalence for Tier I causes from the GBD study (communicable, maternal, perinatal, and nutritional disorders). For Tier II and III causes (noncommunicable diseases and injuries), assumed baseline coverage of 10 percent. For cross-cutting packages (e.g. palliative care or rehabilitation), assumed baseline coverage of five percent.

13 Woods B, Revill P, Sculpher M, Claxton K. Country-level cost-effectiveness thresholds: initial estimates and the need for further research. Value in Health. 2016 Dec 1;19(8):929-35.

14 Prost A, Colbourn T, Seward N, Azad K, Coomarasamy A, Copas A, Houweling TA, Fottrell E, Kuddus A, Lewycka S, MacArthur C. (2013) Women's groups practising participatory learning and action to improve maternal and newborn health in low-resource settings: a systematic review and meta-analysis. The Lancet. May 18;381(9879):1736-46.

15 See Appendix A for details on how maximum effective coverage is calculated.

It was possible to estimate the maximum effective coverage for 149 of the 168 interventions that were costed. The 19 interventions for which a maximum effective coverage could not be estimated were not optimised; associated intervention spending was fixed and therefore remained unchanged after the optimization analysis. The 'non-optimised interventions' do not have a direct link to a GBD cause of disease, except for the 'Fixed Injury and Rehabilitation Package,' which was excluded due to insufficient data to estimate the maximum effective coverage of related interventions. An optimization analysis was then conducted with the objective to maximize health impact.

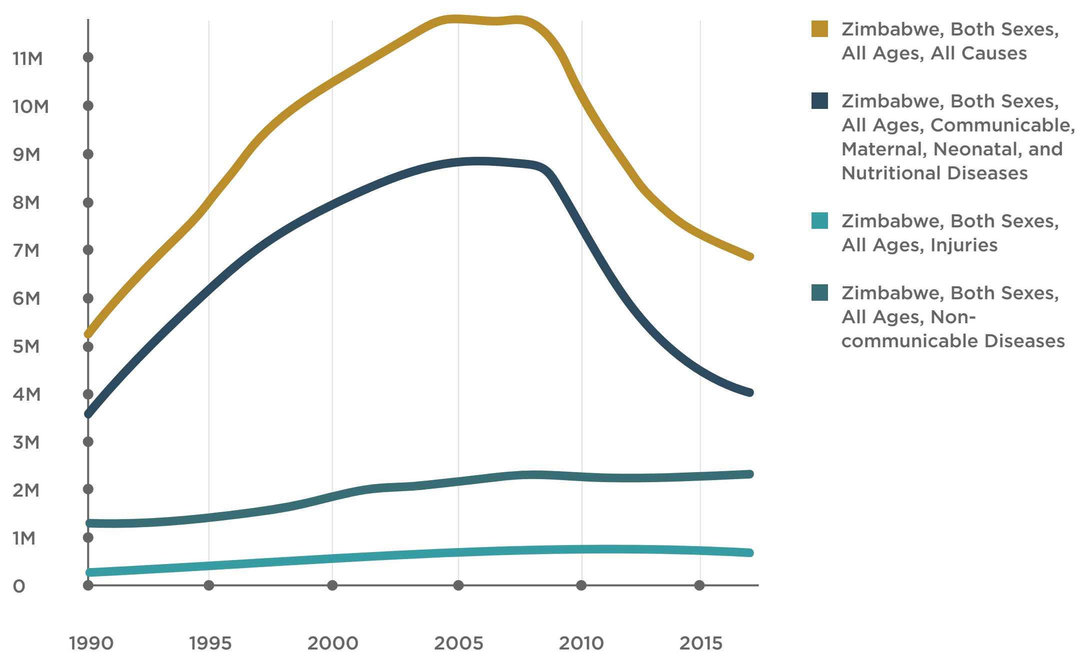
4. Results

4.1 The Disease Burden

A total of seven million disability-adjusted life years (DALYs) are estimated to have occurred in Zimbabwe in 2017. Communicable, maternal, neonatal, and nutritional diseases account for 57.5 percent of the total number of DALYs, while non-communicable diseases (NCDs) and injuries account for 33.4 percent and 9.1 percent respectively. The burden of disease doubled from 5.3 million DALYs in 1990, to 11.8 million DALYs in 2008 (figure 1), followed by a significant reduction to the seven million DALYs estimated for 2017. The rapid increase in the disease burden from 1990–2008, and subsequent reduction, is driven primarily by HIV/AIDS and improvements in the national HIV response. Also driving the increase in the disease burden between 1990 and 2017 is a steady rise in the number of NCD-related DALYs, from 1.3 million to 2.3 million (figure 1).

Disaggregating the disease burden in Zimbabwe by age and specific causes of disease highlights that a quarter (23.9 percent) of all DALYs are experienced by the first year of life (figure 2), and an additional 572,000 DALYs (eight percent) occur in the one- to four-year age range. Maternal and neonatal

FIGURE 1 Estimated Number of DALYs by Broad Disease Category, Zimbabwe, 1990-2017



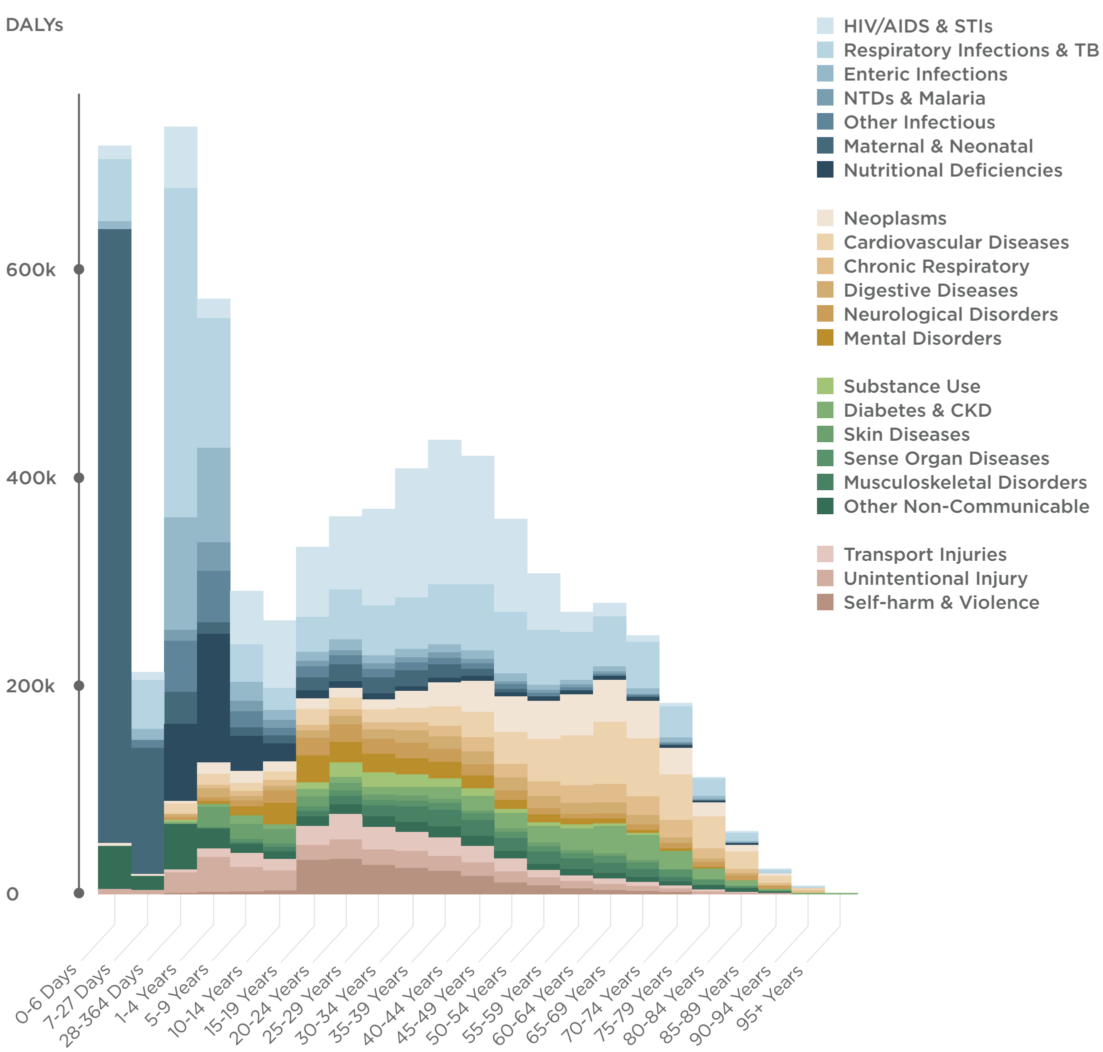
Source: IHME Global Burden of Disease Study, April 16, 2019 health conditions account for 80 percent of DALYs in the zero to six-day age range. Respiratory infections and TB, enteric infections, and nutritional deficiencies are the leading causes of DALYs in the seven-day to four-year age range. Across all age groups, HIV/AIDS (13.9 percent), maternal and neonatal disorders (12.3 percent), lower-respiratory infections (9.9 percent), and TB (7.3 percent) are the leading causes of DALYs in Zimbabwe.

4.2 Allocation of Health Spending in 2016

4.2.1 Validating Estimated Allocations of National Health Spending in 2016, by Broad Disease Categories, Compared with Previous Resource-mapping Studies

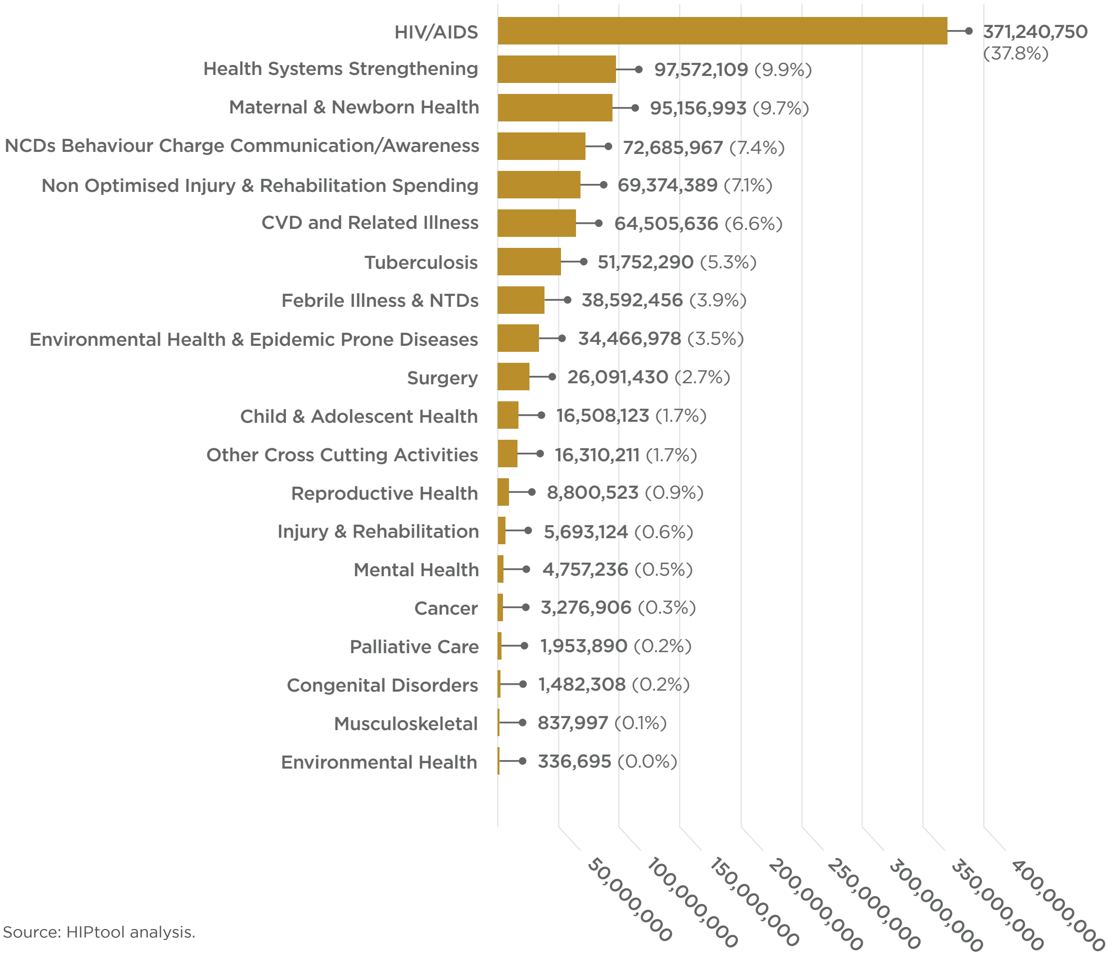
An estimated US$980 million was spent on health services in 2016. This expenditure in-

FIGURE 2 Estimated Number of DALYs by Age and Condition, Zimbabwe, 2017



Source: IHME Global Burden of Disease Study, April 16, 2019.

FIGURE 3 Estimated Total Expenditure Across NHS Services by Disease Program, in USD and as a % of Total Spending, 2016



Source: HIPtool analysis.

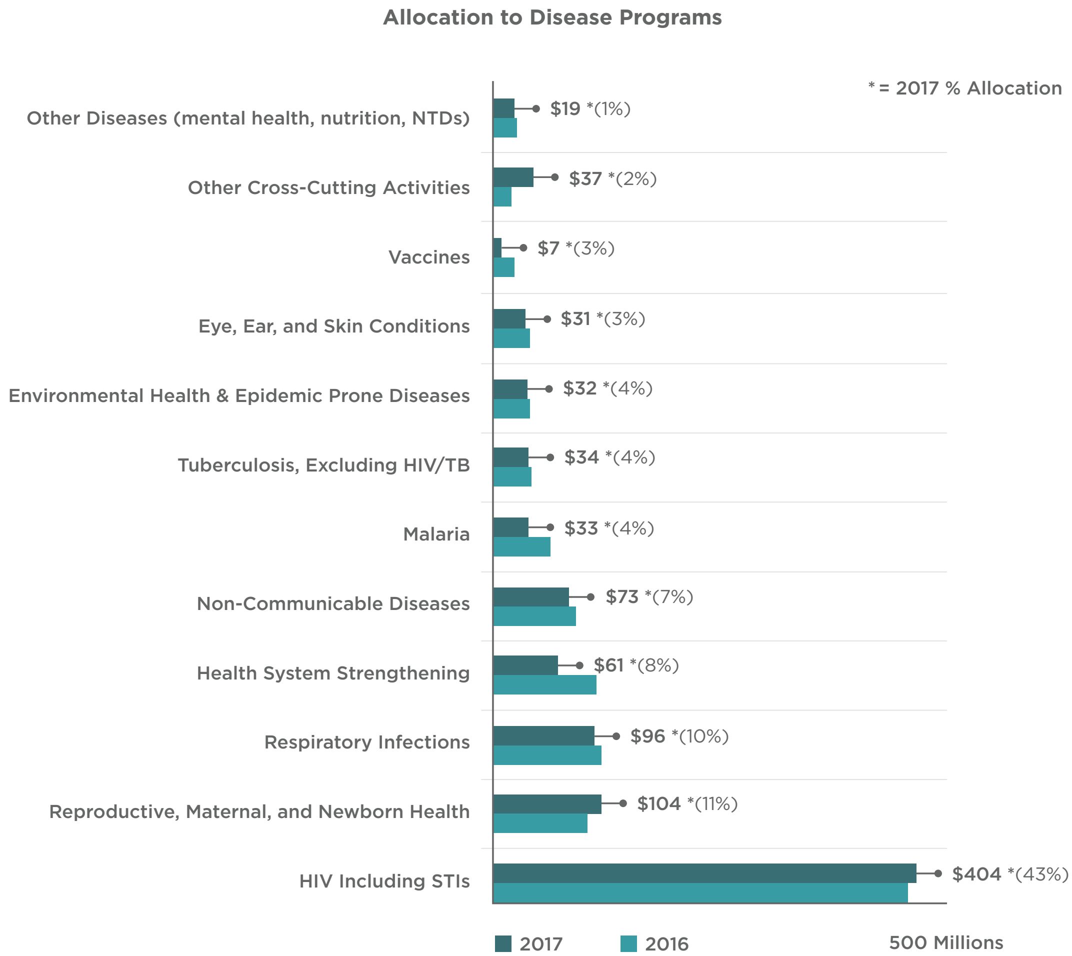
cludes both public health spending and most external financing.[16] The allocations estimated by disease are broadly in line with the results from the resource mapping studies (figures 3 and 4). Approximately US$371.24 million was allocated to HIV-related interventions, equivalent to 37.8 percent of total spending (figure 3), and US$262.5 million (26.7 percent) was spent on providing ART care in health centers for people living with HIV (PLHIV) as shown in figure 5. Overall, around 11.4 percent (US$111.8 million) of total spending was allocated to MNCH-related interventions, 5.3 percent (US$51.8 million) on TB-related interventions, and an additional 3.25 percent (US$38.6 million) on malaria and neglected tropical diseases (figure 3).

4.2.2 Health Spending Allocations Across Intervention Platforms in 2016

Approximately 41 percent of national health expenditure was spent on interventions delivered mainly through primary health centers.

16 The estimation of national health expenditure includes both domestic public financing and external financing. For external financing estimation, the method is described in the resource mapping study as follows "The MOHCC DPP provided the Resource Mapping team with a list of key health stakeholders to include in data collection. The Resource Mapping team distributed the data entry tool to these stakeholders and requested that they complete the tool and return it within 8 weeks. The result included a response rate of 90%, with submission from the MoHCC, 70 local authorities, 4 parastatals (National AIDS Council, Zimbabwe National Family Planning Council, Medicines Control Authority of Zimbabwe and National Pharmaceutical Authority of Zimbabwe) and 18 donors and 35 NGOs." It was estimated about 5 percent of financing were not included due to nonresponse from external stakeholders. The national health spending does not include private health spending.

FIGURE 4 Total Expenditure Across NHS Services and Mapped to Disease Program Areas, 2016-2017



Source: CHAI resource mapping study 2016–2017.

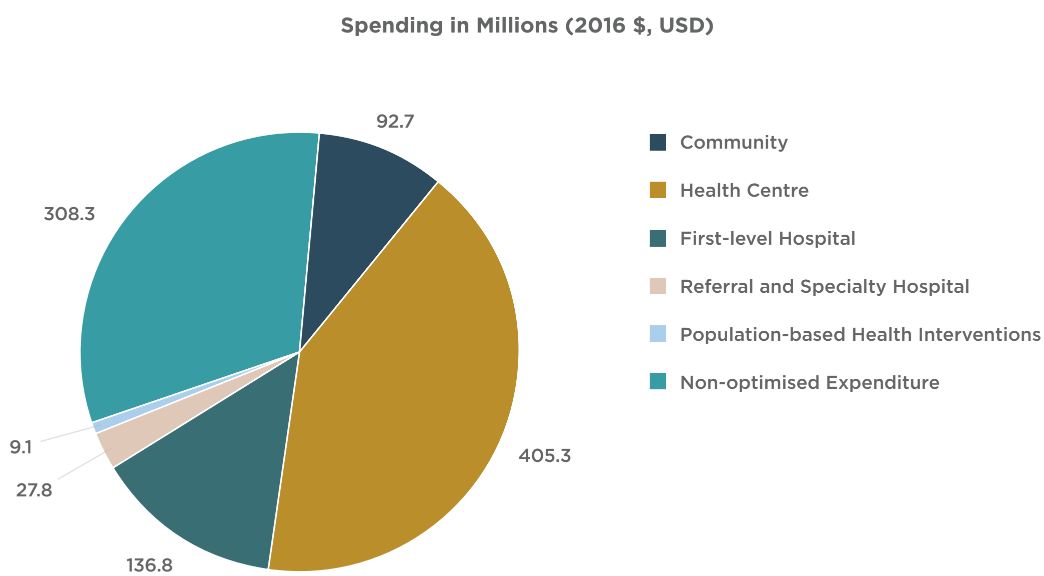
Using the platform allocation for *DCP*$_3$ interventions, the HIPtool analysis was able to predict expenditure by platform. As shown in figure 5, approximately US$405.3 million was allocated to interventions delivered through primary health centers in 2016. Around 14 percent (US$136.8 million) of total health spending was allocated to interventions delivered in first-level hospitals, nine percent (US$92.7 million) to interventions delivered at the community level, three percent (US$27.8 million) to interventions provided at referral and specialized hospitals, and one percent (US$9.1 million) to population-wide health interventions. Overall, 31 percent (US$308.3 million) of spending was not optimised due to the reasons outlined in section 3.3.

4.2.3 Interventions with the Highest Expenditure in 2016

The 15 interventions with the highest expenditure (figure 6) accounted for around 80 percent (US$542.2 million) of total health spending in 2016. After removing the non-optimised interventions the amount is equivalent to 55 percent of health spending. Spending on six of the 15 interventions, delivered at primary health centers, amounted to US$366.1 million. Another six (US$101.1 million), provided at first-level hospitals, accounted for US$101.1 million. Of the remaining three interventions, two (US$16.3 million) were referral and specialty hospital-based interventions, and one (US$58.7 million) was a community-based intervention.

Five of the 15 interventions with the highest amounts of spending (figure 6) were HIV-related, and US$262.5 million (27 percent of total spending) was spent on providing ART care in health centers for people living with HIV (PLHIV) – equivalent to 65 percent of total spending on interventions provided in health centers. In 2016, four of the 15 interventions with the largest expenditures addressed maternal and child health conditions. Overall, US$83.5 million was spent on the latter; of which 45 percent was spent in primary health centers and the rest in first-level (44 percent) and referral-level hospitals (11 percent). Aside from two TB-related interventions, the remaining four interventions address NCDs at first-level and referral hospitals.[17]

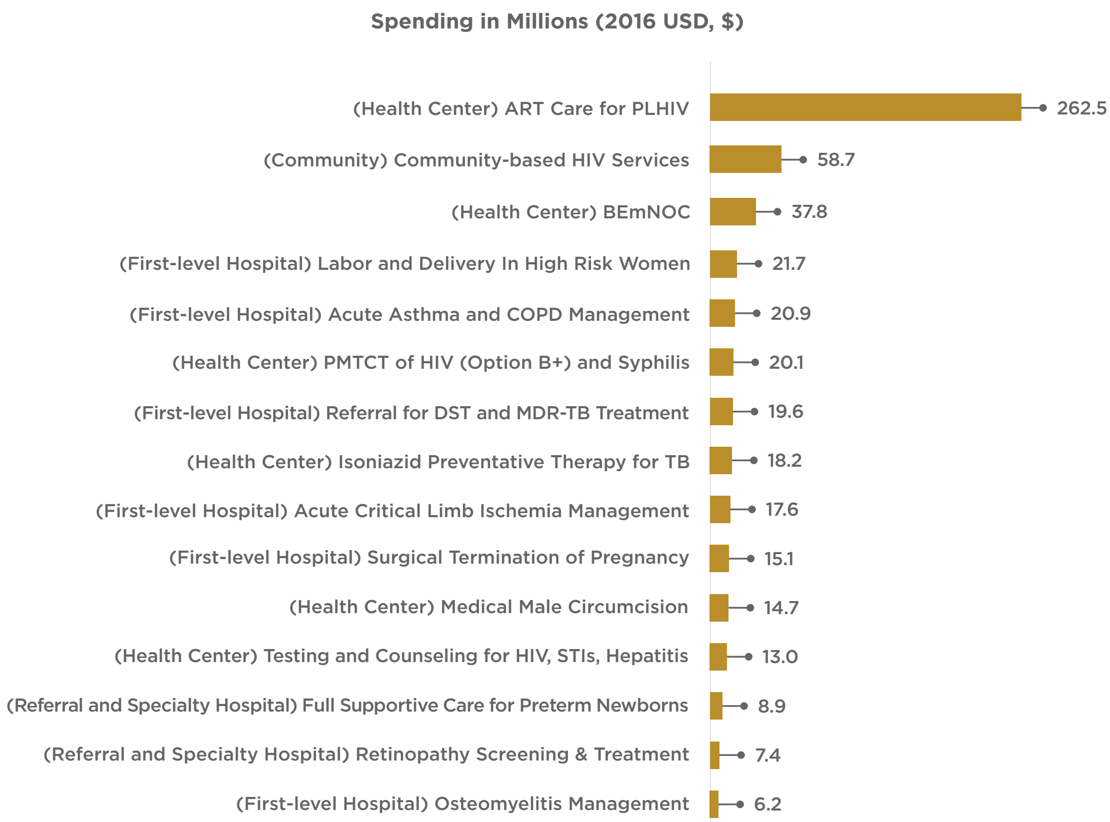
FIGURE 5 Zimbabwe Health Expenditure Across Intervention Platforms, 2016



Source: HIPtool analysis.

17 Insufficient local data was available to estimate and validate spending on NCD-related interventions. There is therefore uncertainty around the amounts stated for NCD interventions in figure 6.

FIGURE 6 The 15 Highest Expenditure Interventions, Zimbabwe, US$ millions, 2016



Source: HIPtool analysis.

4.3 Estimated Impact of 2016 Allocations on National Health Spending

4.3.1 Estimated Impact of 2016 Expenditure Allocations by Intervention Platform

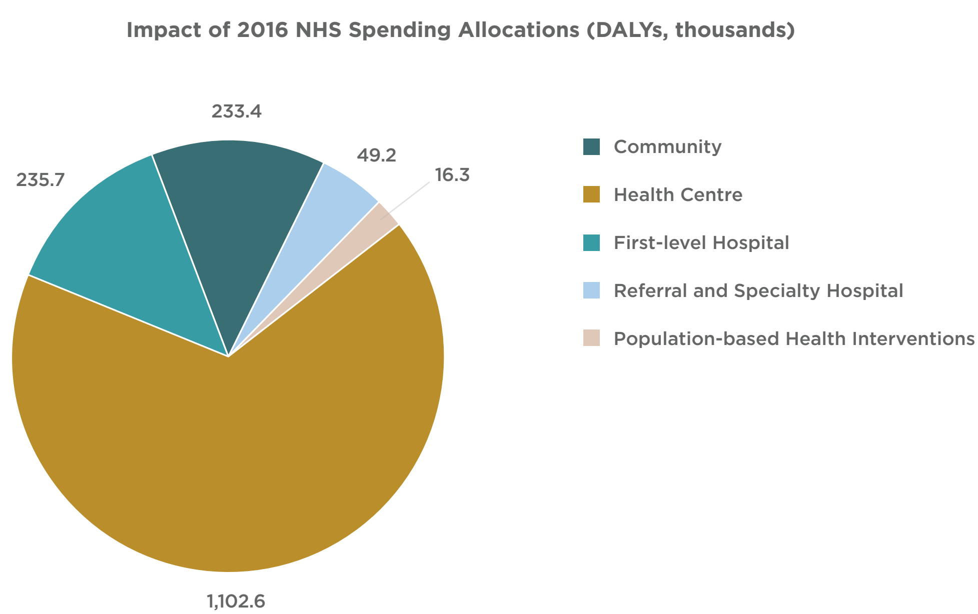
The existing amount and allocation of national health spending is estimated to have averted 1.6 million DALYs in 2016. Interventions provided at the primary health center platform alone accounted for approximately 67.3 percent (1,102.6 thousand DALYs) of the total number of DALYs averted (figure 7). A similar number of DALYs, 233.4 and 235.7 thousand, were averted through interventions delivered at the community and first-level hospital platforms respectively. Combined, community and first-level hospital interventions accounted almost 30 percent of all DALYs averted. Referral and specialty hospitals and population-wide interventions yielded three percent (49.2 thousand DALYs) and one percent (16.3 thousand DALYs), respectively, of the total 1.6 million DALYs averted in 2016.

> "Approximately 41 percent of national health expenditure was spent on interventions delivered mainly through primary health centers."

4.3.2 Interventions with the Highest Impact in 2016

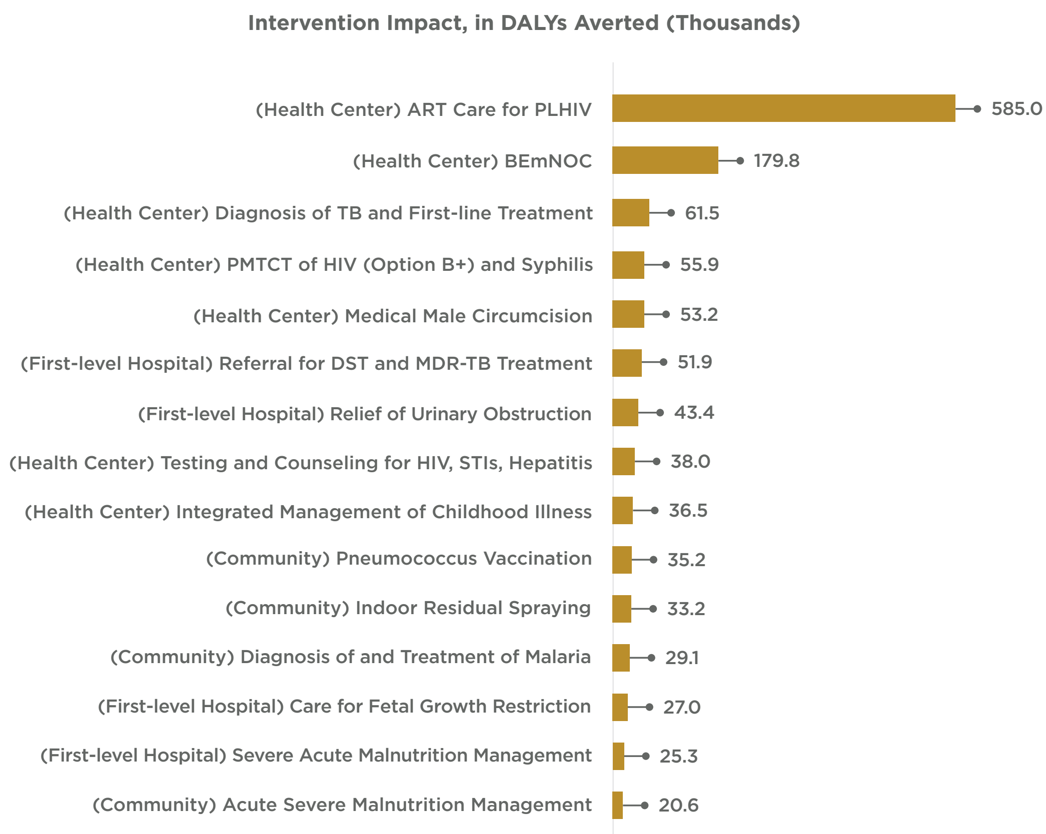
Interventions with the greatest impacts were delivered at the community and health center levels. The 15 interventions with the greatest impact on the disease burden are shown in figure 8 and accounted for 80 percent the total number of DALYs averted in 2016. Seven of the 15 interventions with the greatest impact were delivered through primary health centers, and combined they averted around 957 thousand DALYs – equivalent to 60 percent of all DALYs averted in 2016. The remaining eight interventions with the greatest impact were delivered by community (four interventions) and first-level (four interventions) hospitals, which accounted

FIGURE 7 Estimated Impact of 2016 Health Spending Allocations Across Intervention Platforms



Source: HIPtool analysis.

FIGURE 8 2016 NHS 15 Most Impactful Interventions, Zimbabwe



Source: HIPtool analysis.

for 7.4 percent (118 thousand DALYs) and 9.2 percent (148 thousand DALYs) of the total number of DALYs averted. None of the 15 interventions with the greatest impact were delivered at referral and specialty hospitals or were a part of population-wide interventions.

The most impactful interventions are HIV, maternal, child health and nutrition related. Four of the 15 interventions with the greatest impact were HIV-related; ART for PLHIV in health centers alone was responsible for approximately 585 thousand (36 percent) of the total number of DALYs averted. Six of the 15 highest-impact interventions were maternal, child health and nutrition interventions, which combined account for a fifth of all DALYs averted (324.5 thousand DALYs). Out of the six maternal, child, and nutrition interventions, Basic Emergency Neonatal and Obstetric Care (BEmNoC) in health centers alone accounts for 11 percent of all DALYs averted. The remaining five highest-impact interventions were two TB interventions, two malaria interventions, and the relief of urinary obstruction.

4.4 Optimised Allocation of National Health Spending in 2016

4.4.1 Optimised Allocation Across Intervention Platforms

The mathematical optimization suggests increasing investment to primary health centers and community-based interventions. As shown in figure 9, an optimised allocation of 2016 national health spending would increase investment in primary health centers (+US$33.08 million) to US$438 million, equivalent to 44.7 percent of total spending. Community-based interventions were also prioritized under an optimised allocation of spending (+US$19.47 million), accounting for US$112.2 million or 11.4 percent of total national health spending. Population-wide health interventions remained largely unchanged under the optimised national health spending allocation, but decreasing investment in both first-level and referral hospital spending was recommended so that funds can be reallocated to lower platforms of care (figure 10). First-level and referral hospitals would retain 74.9 percent (-US$34.34 million) and 36.3 percent (-US$17.7 million) of spending under an optimised allocation of spending.

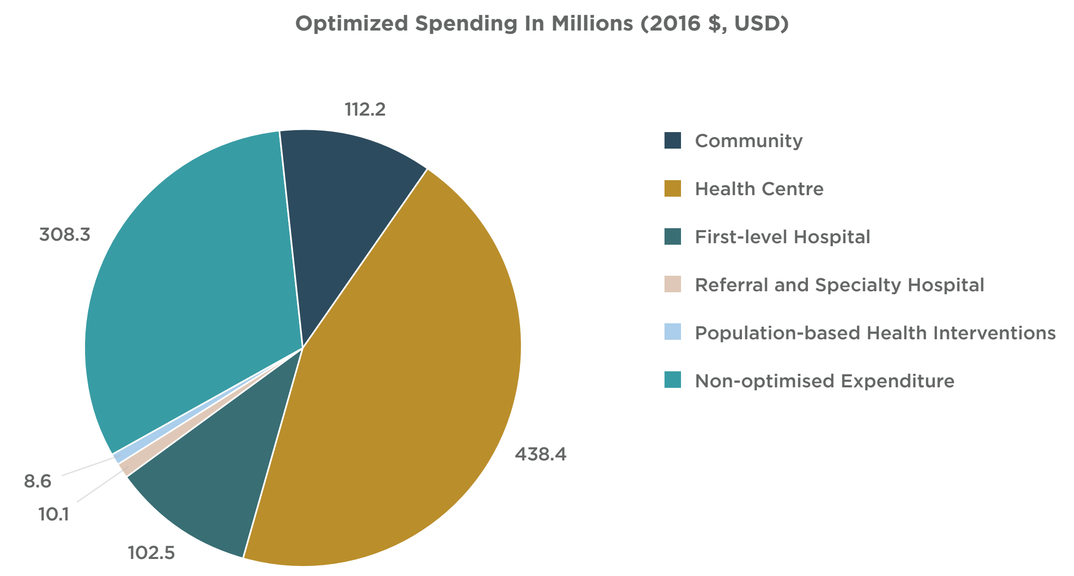
Population-wide health interventions remained largely unchanged under the optimised national health spending allocation, but decreasing investment in both first-level and referral hospital spending was recommended so that funds can be reallocated to lower platforms of care (figure 10). First-level and referral hospitals would retain 74.9 percent (-US$34.34 million) and 36.3 percent (-US$17.7 million) of spending under an optimised allocation of spending.

TABLE 1 2016 NHS Spending Comparison, Actual v. Optimised, Zimbabwe, US$

Platform	2016 Spending	Optimised Spending	Difference
Community	92,703,361	112,174,729	+ 19,471,367
Health Centre	405,315,540	438,392,777	+ 33,077,237
First-level Hospital	136,843,381	102,498,635	- 34,344,746
Referral and Specialty Hospital	27,809,711	10,098,716	- 17,710,995
Population-based Health Interventions	9,091,860	8,598,997	- 492,863
Fixed Programme (interventions not optimised)	308,266,683	308,266,683	N/A

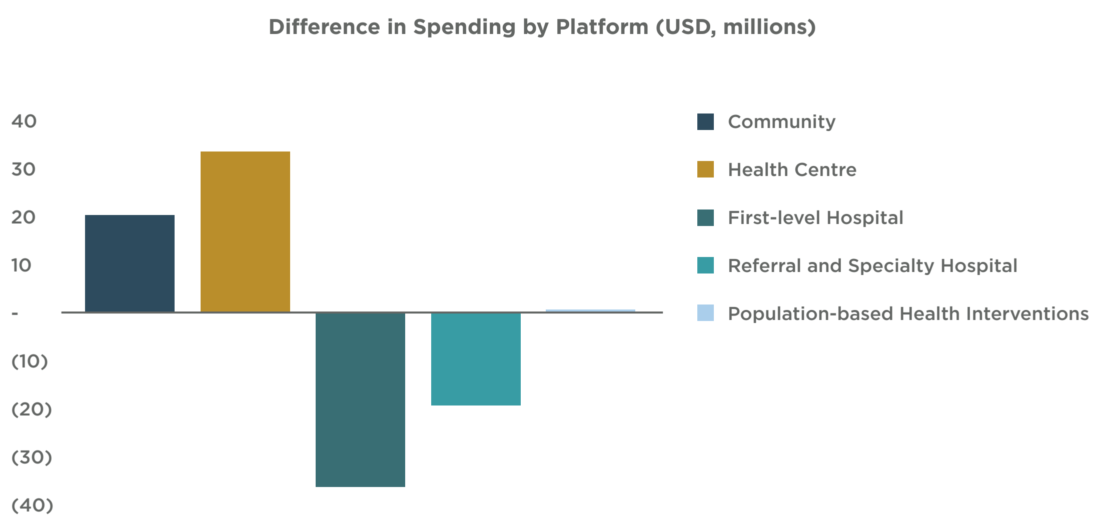
Source: HIPtool analysis.

FIGURE 9 Optimised Allocations of 2016 National Health Spending Across Intervention Platforms



Source: HIPtool analysis.

FIGURE 10 Variations in 2016 National Health Spending by Intervention Platform



Source: HIPtool analysis.

4.4.2 Optimised Interventions with the Highest Expenditure

The resource allocation on health interventions can be much more focused. The 15 optimised interventions with the highest amount of spending were equal to 58.3 percent of total 2016 national health spending (figure 10).[18] Nine of the 15 interventions were provided through primary health centers (US$418.4 million), four through first-level hospitals (US$71.2 million), and two were community-based interventions (US$81.8 million). The nine health center interventions shown in figure 10 accounted for 42.7 percent of total 2016 national health spending. None of the 15 optimised interventions with the highest amount of spending were delivered through the referral and specialty hospital or population-wide platforms. The optimised allocation of 2016 national health spending also prioritized integrated interventions that address multiple conditions (figure 10). Integrated community case management (+US$63.4 million); testing for HIV, STIs, and hepatitis (+US$23.2 million); and integrated management of childhood illnesses (+US$8.7 million) all receive additional funding under an optimised allocation of spending. Though the table provides specific numbers, it should be used as a directional tool, both due to limitations in the analysis and because amounts are contingent on the total national health-spending envelope specified in the analysis. HIPtool is able to provide analysis of different scenarios with varying levels of national health spending.

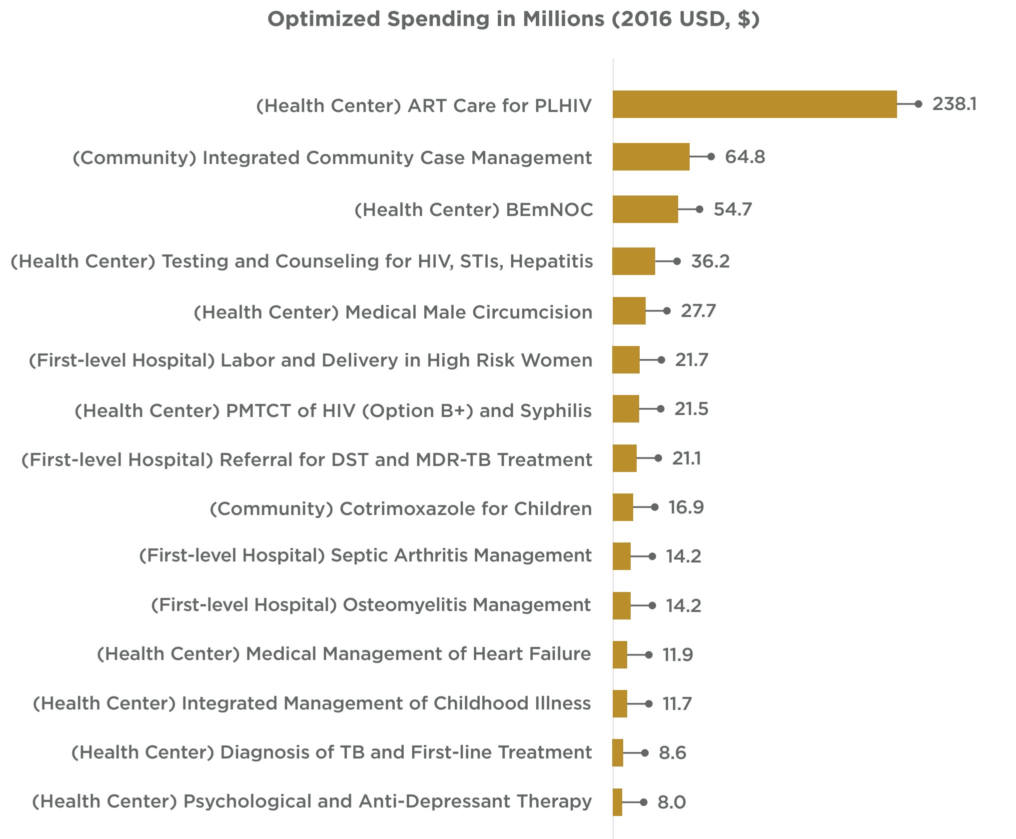
18 It accounts for around 85 percent (US$571.4) of total optimised spending, excluding non-optimised interventions.

TABLE 2 Comparison of 15 Optimised Interventions with the Highest Expenditure, US$, 2016

Intervention	2016 Spending	Optimised Spending	Difference
(Health Center) ART care for PLHIV	262,471,347	238,100,095	- 24,371,252
(Community) Integrated community case management	1,485,542	64,842,867	+ 63,357,325
(Health Center) BEmNOC	37,765,604	54,740,233	+ 16,974,628
(Health Center) Testing and counseling for HIV, STIs, hepatitis	12,956,836	36,162,784	+ 23,205,948
(Health Center) Medical male circumcision	14,658,943	27,734,623	+ 13,075,680
(First-level Hospital) Labor and delivery in high risk women	21,742,752	21,742,752	-
(Health Center) PMTCT of HIV (Option B+) and syphilis	20,053,179	21,503,299	+ 1,450,120
(First-level Hospital) Referral for DST and MDR-TB treatment	19,568,107	21,057,756	+ 1,489,649
(Community) Cotrimoxazole for children	538,496	16,937,770	+ 16,399,274
(First-level Hospital) Osteomyelitis management	6,170,745	14,206,573	+ 8,035,828
(First-level Hospital) Septic arthritis management	6,170,745	14,206,573	+ 8,035,828
(Health Center) Medical management of heart failure	1,474,547	11,858,629	+ 10,384,081
(Health Center) Integrated management of childhood illness	3,026,984	11,691,625	+ 8,664,641
(Health Center) Diagnosis of TB and first-line treatment	4,306,782	8,628,375	+ 4,321,593
(Health Center) Psychological and antidepressant therapy	1,587,945	7,961,859	+ 6,373,913

Source: HIPtool analysis.

FIGURE 11 Optimised Spending for 15 Highest Expenditure Interventions, US$ millions, 2016



Source: HIPtool analysis.

HIV-related interventions continued to account for five of the 15 optimised interventions, compared with the 2016 allocations of national health spending. The highest expenditures by category are shown in figure 11. The provision of cotrimoxazole to children at the community level was prioritized over community-based HIV treatment. Similarly, under the optimised 2016 national health spending allocation, investment for male circumcision increased by US$13.0 million, while the amount of spending on ART provision in health centers decreased by US $24.4 million.

Maternal and child health interventions remained critical in the optimised allocation and most interventions were delivered at the community and primary health center level. Except for high-risk labor and delivery, the maternal and child health interventions shown in figure 11 were all delivered at community or primary health centers. Under the optimised spending allocation, an additional US$16.9 million was allocated to BEmNOC, equivalent to a 44.9 percent increase.

TB interventions remained a strong area of focus. An additional US$5.8 million was designated to the two TB interventions. The interventions involved diagnosis and first-line treatment at the primary health center level and MDR-TB diagnosis and treatment at a first-level hospital.

Four of the 15 optimised interventions with the greatest amount of spending addressed NCDs. The management of musculoskeletal disorders at first-level hospitals (+US$16.1 million), heart failure management (+US$10.4 million), and psychological therapy (+US$6.4 million) at the health center level were all prioritized ahead of the more specialized NCD treatments delivered at higher platforms of care under 2016 allocations of national health spending.

4.5 Estimated Impact of an Optimised Allocation of 2016 National Health Spending

4.5.1 Potential Impacts of Allocation Optimization by Intervention Platform

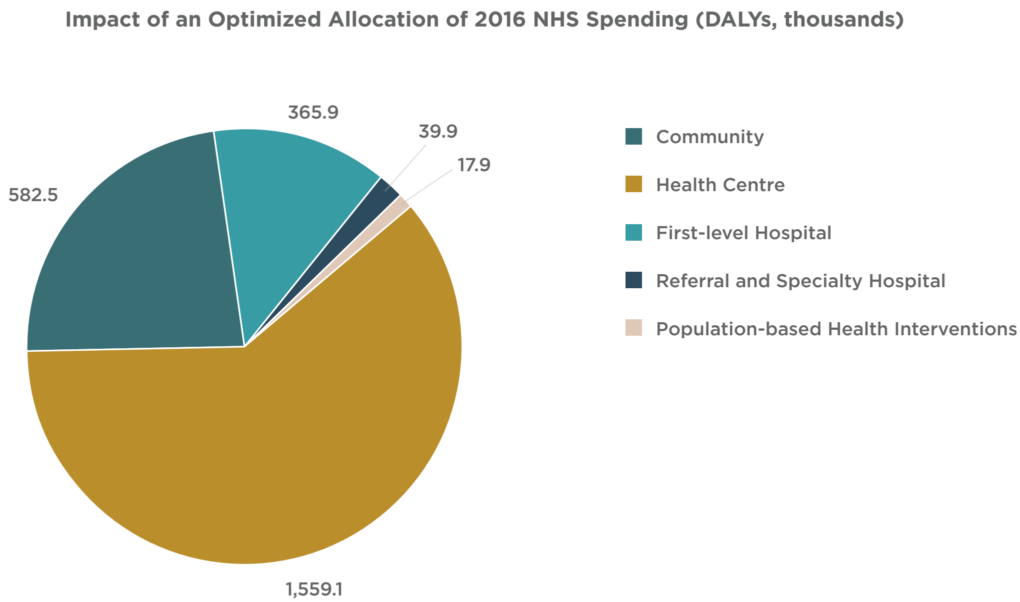
An additional million DALYs (2.6 million) could be averted with optimised reallocations of 2016 national health spending, according to the optimization algorithm described in Appendix A. As shown in figure 12, under an optimised spending allocation, primary health center interventions would be responsible for approximately 60 percent of all DALYs averted, which marks an additional 457 thousand DALYs averted compared with the 2016 spending allocations. Similarly, an additional 349 thousand and 130 thousand DALYs were averted through community and first-level hospital interventions, respectively. In the optimised spending scenario, the number of DALYs averted by population-wide interventions remained largely unchanged; the overall impact of referral and specialty hospital interventions decreased by nine thousand DALYs. Therefore, an optimised allocation of 2016 national health spending increased the impact of all but one platform of care, and generated cost-savings across first-level hospital interventions that yielded greater impact with a 25 percent spending reduction (see section 4.4.1).

TABLE 3 National Health Spending Impact Comparison Actual v. Optimised Scenarios, DALYs, 2016

Platform	2016 DALYs Averted	Optimised DALYs Averted	Difference
Community	233,380	582,517	+ 349,136
Health Centre	1,102,562	1,559,066	+ 456,504
First-level Hospital	235,691	365,892	+ 130,201
Referral and Specialty Hospital	49,153	39,881	- 9,272
Population-based Health Interventions	16,263	17,864	+ 1,601

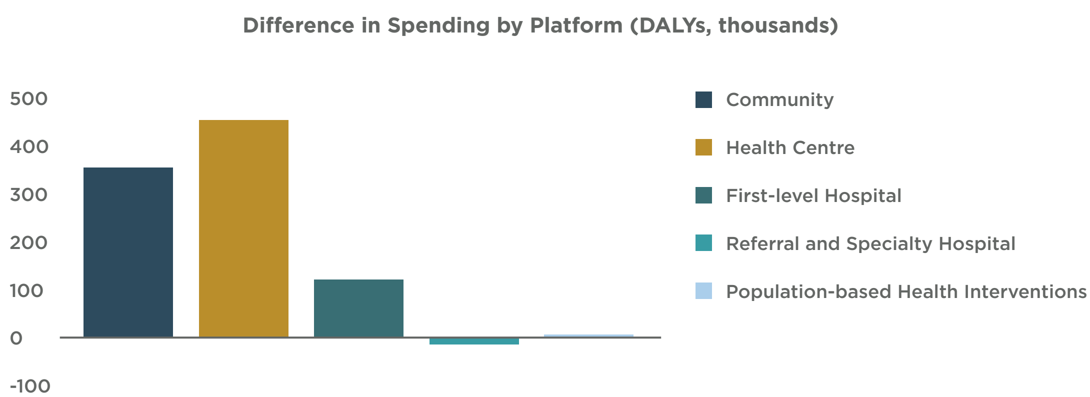
Source: HIPtool analysis.

FIGURE 12 Estimated Impact of an Optimised Allocation of 2016 National Health Spending Across Interventions, DALYs, thousands



Source: HIPtool analysis.

FIGURE 13 Difference in Impact of National Spending by Intervention Platform, DALYs, thousands, 2016



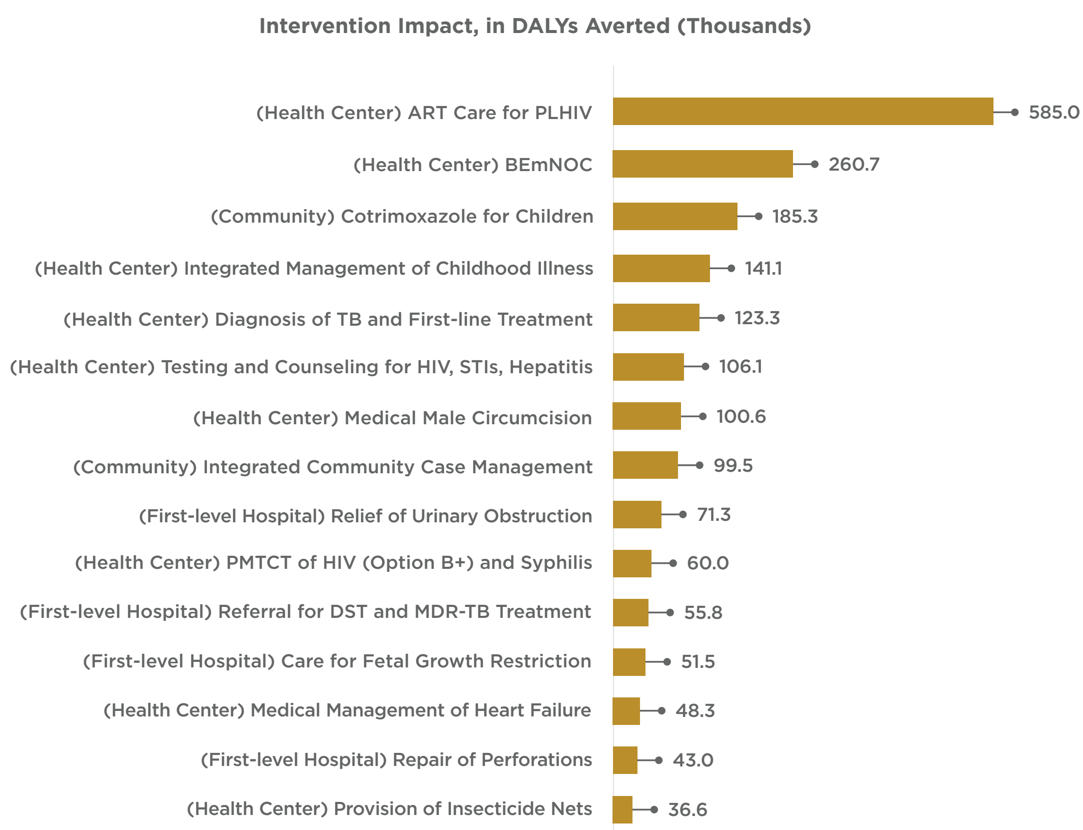
Source: HIPtool analysis.

4.5.2 Optimised Interventions with the Highest Impact

Nine of the 15 interventions with the greatest impact were delivered through primary health centers, and combined averted around 1,462 thousand DALYs – equivalent to 56.2 percent of all DALYs averted. The 15 optimised interventions with the greatest impact on the disease burden are shown in figure 14, and represent 76 percent of the total number of DALYs averted under an optimised allocation of 2016 NHS spending. The remaining six interventions with the greatest impact were comprised of four first-level hospitals and two community-based interventions, which accounted for 8.5 percent (222 thousand DALYs) and 11.0 percent (285 thousand DALYs) of the total number of DALYs averted, respectively. None of these 15 optimised impactful interventions were delivered at referral and specialty hospitals or were population-wide interventions.

Five of the 15 optimised interventions with the greatest impact were HIV-related, and combined they accounted for 39.9 percent of all DALYs averted under an optimised allocation of 2016 NHS spending (figure 14). The HIV-related intervention that yielded the greatest increase in the number of DALYs averted was cotrimoxazole for children. The additional US$16.4 million invested in cotrimoxazole under the optimised scenario was estimated to avert 179 thousand more DALYs.

FIGURE 14 Intervention Impacts in DALYs Averted of the 15 Most Impactful Interventions Under the Optimised Spending Scenario



Source: HIPtool analysis.

BEmNOC remained the intervention that yielded the second highest number of DALYs averted under an optimised allocation. BEmNOC, under the optimal spending increase of US$17 million, generated an additional 80.8 thousand averted DALYs.

The other two critical interventions were integrated management of childhood illnesses and integrated community case management, which yielded a significant increase in impact under an optimised spending allocation. The additional US$72 million invested in both interventions would avert 202.8 thousand DALYs more than the 2016 spending allocations.

Diagnoses and treatment of TB, provision of treatment for drug-resistant TB, and NCD-related interventions comprised the rest of top 15 high impact interventions in Zimbabwe. Under an optimised allocation of spending (a US$5.8 million increase), diagnosis and treatment of drug-susceptible and drug-resistant TB (figure 14) would avert an additional 65.7 thousand DALYs. Aside from the provision of insecticide nets, the remaining three optimised interventions with the greatest impact on the disease burden were NCD interventions. In contrast, the 2016 actual spending allocations highest-impact interventions did not include interventions that addressed NCDs. Combined, relief of urinary obstruction, medical management of heart failure, and the repair of stomach perforations accounted for 162.5 thousand DALYs averted with an US$19.6 million allocation.

5. Limitations of the Study

5.1 Challenges and Gaps in Data and Intervention Mapping

Better quality local data on unit costs and health coverage is needed to improve HIPtool analysis outputs. This pilot exercise demonstrated how HIPtool can assist countries with their resource allocation decisions. However, a large number of interventions have been considered, and the analysis is therefore affected more than usual by a scarcity of data – particularly for NCDs, injuries, and cross-cutting services.

The quality and robustness of some country-level unit costs was a major area of concern, particularly intervention costs offered at the hospital level. Public hospital service charges were used as proxy for the underlying costs. However, it proved a very poor representation of unit costs. The NHS costing had no clear reference to the origins of the unit costs that were used for each intervention among the service categories, making it difficult to ascertain whether the costs were locally generated or were from the international unit cost databases. The country lacks a defined framework that standardizes unit costs. Even for the few small studies that have been done on costing, there is clearly no reference to the use of any standardized costing protocols. Some unit costs sourced from the NHS were significantly higher than the *DCP*$_3$, but there were also *DCP*$_3$ unit costs that were significantly higher than locally-generated costs. This made it difficult to decide which costs were appropriate for use in the model. In those cases, health expenditure figures in resource mapping analysis were crosschecked to make the best selection.

Despite extensive consultations with directors, managers, clinicians, national reports, and guidelines there have been challenges when mapping local interventions to globally recommended packages and published effectiveness data – particularly for injuries and surgical interventions. In some cases there was a thin line separating health activities from being misconstrued as health interventions, blurring the actual understanding of the *DCP*$_3$ interventions. In some cases, the *DCP*$_3$ interventions were aggregated. For example, diagnosis, treatment, and management of a condition were included in one intervention making it difficult to map to local interventions. Data on coverage proved another challenge as some higher-level interventions were missing data, particularly for surgical, injury and rehabilitation, congenital disorders, and palliative care.

5.2 Limitations of HIPtool

HIPtool has potential to be a transformative enabler in the difficult country-level process of defining what health interventions will be offered under a UHC benefits package in resource constrained settings. However, at the current point in development, there are some critical limitations of HIPtool.

First, since there is a trade-off between usability and flexibility, there are many highly complex interactions between diseases and health interventions that cannot be captured in full, as these would require more data than are available in most country contexts. As a consequence, overlaps and synergies between the interventions included in HIPtool are not considered; currently, only the first-order impacts are incorporated into the analyses.

Second, the current HIPtool is not a disease modelling tool and therefore does not account for disease progression and infectiousness. Instead, it builds on the best existing projections of disease burden and studies of intervention effects in terms of DALYs averted, which limits outputs of HIPtool to DALYs averted. Analyses using HIPtool are only as valid as the data entered into them; and in the absence of high-quality, context-specific data, its analyses are more likely to replicate the findings of global studies such as *DCP$_3$*.

Third, HIPtool is not a costing or budgeting tool, and is intended only to contribute one component in the overall process of determining an effective HBP. Political, logistical, and other considerations need to be considered outside the context of HIPtool in determining what HBPs are feasible. In order for an explicit benefits package to be sustainably and consistently defined in the context of changing disease trend, shifting cost structures and ways of delivering care, and evolving evidence base, localised priority setting mechanisms should be established. These considerations are outside the scope of HIPtool, but are critical for the successful adoption of a HBP.

Fourth, all EUHC interventions are assigned a platform that allows useful indication of platform spend. However, the design of the interventions is not platform specific as many interventions requiring cross-platform care. In addition, the impact and efficiency at which health interventions can be offered is highly dependent on the availability of other interventions, particularly in co-morbid conditions. The current algorithm does not provide for intervention interdependency.

Last but not least, since HIPtool adopts a health system perspective, it is unable to capture cross-sectoral benefits that lie outside of the health budget. For example, effects such as gains in productivity or school attendance would not be captured, which means that the positive impact of a HBP estimated by HIPtool is likely to be an underestimate compared to its full cross-sectoral impact.

HIPtool will be continuously updated and some of these limitations will be addressed in the later versions.

6. Policy Recommendations

Zimbabwe was one of the first few countries in which HIPtool was piloted at the proof of concept stage. The power of HIPtool extends beyond a static and polished report. Rather, HIPtool can provide instant results based on various budget scenarios and can be constantly updated with the improvement of the underlying unit cost and utilization data. As discussed earlier, at its nascent stage, HIPtool still has strong limitations. Therefore, the policy discussion below is more indicative of potential high-level recommendations that could be withdrawn from the results. The targeted audience are government and development partners.

A shift of resource allocation from hospitals to community and health centers can result in a significant increase of DALYs averted. This is consistent with government and development partner's recent discussion on strengthening community health benefits. One such community initiative is the Integrated Community Case Management (ICCM). In Zimbabwe, ICCM involves the training and deployment of community health workers to provide diagnostics and treatment for communities. The diseases that they can diagnose and treat include pneumonia, diarrhea, malaria, and neonatal conditions for children of families that have difficulties accessing treatment at health facilities. This intervention is likely to be highly cost effective, and investment in its expansion is expected to provide good value for money. The extent to which the approach is comprehensively implemented varies across districts and disease areas. The results from the HIP analysis show that more than a 100,000 DALYs can be averted by reallocating more resources to this intervention. This also provides an opportunity to refine interventions proposed in the country's Community Health Strategy.[19]

Similarly, results from the HIP analysis suggests investing more resources in MCH interventions that can be offered at the community and primary care levels, particularly BEmNOC interventions. Maternal and child-related interventions are among the top 15 in terms of both spending and impacts. This is consistent with the government focus on promoting maternal and child health interventions. The country developed its first Maternal and Neonatal Health Roadmap (2007–2015) in response to the African Union's call for African countries to develop their own MNH Roadmaps. The roadmap emphasized the development of a clear referral system for maternal services – from the community level right up to the highly specialized tertiary and central/quaternary hospitals. Most of Zimbabwe's primary health care facilities are able to offer basic obstetric care, while most secondary level facilities and upwards are able to offer comprehensive emergency obstetric care. The roadmap emphasizes effective utilization of scarce resources for cost effective and high impact MNH interventions. It promotes the four pillars of Safe Motherhood: family planning, antenatal care, clean and safe delivery for mother and newborn, and essential obstetric care. Further, the services have integrated HIV and STI services. The HIPtool analysis show that the country can achieve better health outcomes by investing more resources in these interventions that can be offered at the community and primary care levels. This certainly has implications for health workers training at the frontline and the delivery of necessary medical equipment and supplies.

19 A Community Health Strategy is under development, a draft is ready and still to be finalized.

The HIPtool analysis provides evidence on the integration of care, such as the prioritization of testing and counseling for HIV, STIs and Hepatitis at health centers, that can be harmonized by the government with other initiatives to holistically enhance efficiencies. MoHCC recently undertook some studies on implementation efficiencies with support from the World Bank and other partners. A three-year study conducted from 2015–2018 to assess the efficiency gains from integrating HIV and Sexual Reproductive Health (SRH) services provided evidence and insights on the opportunities to improve technical efficiencies through integrated service delivery. The study showed that between 2013 and 2016, Zimbabwe's HIV and SRH response became more integrated at a time that there was also task shifting to primary health care sites. The evaluation showed that Zimbabwe could deliver – for the same funding – more SRH services. Integration resulted in a nine percent drop in the average cost of delivering HIV and SRH services at district hospitals in Zimbabwe and more than a 20 percent drop in the average cost of delivering services at primary health care sites. Clearly, in the context of UHC with its focus on people-centered and integrated care, the efforts by Zimbabwe to integrate not just within the HIV and SRH program, but across different programs and to put the patient first, is essential.

Overall, the analysis provides some concrete evidence in terms of resource allocation. However, more in-depth analyses are required and implementation remains a challenge. The government's efforts in expanding fiscal space for health need to be complemented with the reprioritization of health in order to improve efficiencies in spending the available funding. This includes both domestic financing and external financing. From the domestic financing budgeting and execution perspectives, implementing PFM reforms to better turn allocated funds into inputs at various service platforms is essential. Under external financing, close development partner coordination with a stronger government leadership will help implement a coherent health sector strategy. A more transparent budget calendar, broad consultation, and incorporation of evidence-based prioritization mechanisms are some of the keys for implementation.

7. Conclusion

Zimbabwe was one of the first few countries in which HIPtool was piloted at the proof of concept stage. HIPtool demonstrates its potential to mathematically estimate an optimised spending allocation across a set of health interventions to maximize three UHC objectives. It provides a technical foundation to further develop an essential health benefit package that can be rapidly and regularly adjusted. Admittedly, at this stage, HIPtool still has several strong limitations. In addition, the tool is constrained by the availability and quality of underlying unit cost and utilization data in the low- and middle-income country context. This limitation is particularly severe for interventions falling into non-communicable diseases, injury or cross-cutting care categories, and underscores the global need to invest in collecting and analyzing such data for broader use. HIPtool will be continuously updated and applied in several more countries.

Appendixes

Appendix A HIPtool: Technical Specifications for the Health Interventions Prioritization Tool

Background

This document briefly outlines the Health Interventions Prioritization Tool (HIPtool), which combines all available country-specific evidence on intervention cost, coverage, and impact with demographics, disease burden, resource availability, and other data. HIPtool can help inform policymakers via the three components used to determine interventions: (1) maximize disability-adjusted life years (DALYs) averted, (2) maximize equity, and/or (3) maximize financial risk protection. Specifically, HIPtool is designed to address the following questions: (1) What is the cost and impact of an optimised national package of health services or interventions based on global and local evidence? (2) What health services or interventions outside of the optimised HBP would be cost-effective and important to deliver? (3) How do changes in available funding affect the interventions included in an optimised HBP? The results from these analyses can then be linked to delivery platforms to provide an initial step towards developing an optimal HBP.

Applicability and Methodology

HIPtool, the Health Interventions Prioritization Tool, leverages the disease burden framework of the Institute for Health Metrics Evaluation's (IHME) Global Burden of Disease (GBD) estimates, as well as the interventions framework of DCP (specifically the EUHC package), and allows tailoring to specific country needs and data. These studies represent a synthesis of the best available international evidence on the priorities for disease burden and disease control in different sectors. The following sections provide technical details on how HIPtool can be used as a preliminary step in exploring the implications of different HBP choices.

Aims and Scope

HIPtool is designed for countries at various stages of progress toward UHC to help achieve their strategic goals. For countries defining a HBP for the first time, as well as for countries that are reviewing their HBPs, HIPtool facilitates a multi-variate approach to decision-making by incorporating available evidence on costing, impact, and disease burden within a single analytical framework.

HIPtool allows countries to estimate a HBP's potential impact and facilitate preliminary discussions on priority setting and how to improve a package by balancing its projected health impacts with equity and financial risk protection for certain populations. In addition, HIPtool can be useful for Ministries of Health seeking to draft an economic and social case to justify the need and potential returns from a national health insurance scheme or an increase in funding allocated in a certain way.

Questions HIPtool is able to address are as follows:

- What packages of health services or interventions should be prioritized for consideration for inclusion in an optimised HBP?
- What health services or interventions outside of the optimal HBP would be cost-effective and important to deliver?
- How do changes in available funding affect the interventions included in an optimal HBP?

HIPtool is primarily aimed as a gateway to designing a HBP, by comparing different possibilities of optimal HBPs depending on policy objectives and available budgets. By synthesizing and linking best available evidence, HIPtool seeks to provide a starting point for different options for HBPs and their potential impacts. Therefore, HIPtool provides an accessible starting point, preceding analysis provided by more detailed and specific costing and implementation tools such as OneHealth.

Data Input Requirements

HIPtool is based on country-specific disease burden data. Users select their country from a drop-down selector, with the full list of available countries listed in Appendix A. This is used to pre-populate demographic and disease burden data. Demographic data is by default based on UN Population Division estimates, although national or other estimates can also be used. Default disease burden data for each primary cause is based on the IHME GBD database, although users are able to add, remove, or edit causes. Causes are defined by the following properties:

1. Primary cause name
2. Health category
3. Population prevalence by year*
4. Number of people affected by year*
5. Total DALYs by year
6. Total mortality by year

* *If one of these quantities is entered or updated, the other will be automatically calculated.*

All cause data is visualizable and editable, with import/export options to Excel available. Users are able to enter data for multiple years if available (e.g., 2015, 2020, 2025, and 2030).

Each intervention is defined by the following properties:

1. Intervention name
2. Targeted disease
3. Delivery platform
4. Unit cost per person covered
5. DALYs averted per person covered*
6. Cost per DALY averted*
7. Default coverage of intervention†
8. Maximum coverage of intervention†
9. Equity score
10. Financial risk protection score

† *Default data not present. Percentage coverage estimates are usually collated from secondary sources, and where unavailable DCP_3 coverage assumptions are used.*

Where possible, country-specific estimates for each of these measures are utilized; a simple tabular graphical interface is provided to easily update estimates, with full data import/export available via Excel. Default values for indicators are based on international estimates, including DCP_3, and in a format that could be populated using data from sources such as Tufts Cost-Effectiveness Analysis Registry (for cost per DALY averted) and WHO CHOICE (for unit costs). All default values are visible to the user, editable, and fully documented. In addition, the user has the option to add, edit, or delete interventions, providing a fully customizable list of interventions for a given country context.

Impact Model

Each intervention in HIPtool is linked to one or more causes of disease burden classified in the GBD conducted by IHME. The linking of interventions to GBD causes of disease was carried out with guidance from WHO experts. In turn, the burden of disease data (prevalence, mortality and DALYs) associated with EUHC interventions in HIPtool is based on this linking exercise. The impact or outcome of a given set of interventions on burden of disease is defined as:

$$\mathbf{O = S/(ICER/Q)}$$

where *O* is the outcome expressed as burden averted in DALYs, *S* is the total amount of spending on an intervention, and *Q* is the quality factor that reflects realistic implementation of interventions (assumed to be 70 percent reduction in cost-effectiveness).

Effective Coverage and Maximal Effective Coverage

Each intervention is defined by a maximal effective coverage EC_M to reflect real constraints of scaling up an intervention by parameterising the upper-bounds of intervention spending for the optimization process. Maximal effective coverage is defined as the ratio between target nominal coverage T_C and current nominal coverage N_C, multiplied by the effective coverage *EC:*

$$\mathbf{EC_M = (T_C/N_C)*EC}$$

The effective coverage *EC* is dependent on the disease burden *b* (in terms of DALYs) and the outcome of the single intervention *o* expressed as burden averted (in terms of DALYs). This burden is given by the ratio of the spending needed to implement the intervention *S* and the incremental cost-effectiveness ratio (ICER) relative to the implementation of the intervention. This ICER can be reduced by a rate *Q* (as mentioned above) to account for a loss of effectiveness during implementation.

$$\mathbf{EC = O/b}$$

Equity and Financial Risk Protection Modules

As noted above, individual interventions included in HBPs have health equity and financial risk protection scores assigned to them by default, sourced from DCP_3, which can be modified by the user based on in-country needs.

Health equity is defined in terms of the heath-adjusted age at death (HAAD). Three general HAAD cut-offs are used to assign a high- or low-ranking equity score to a health intervention. For example, if an intervention addresses a cause for which individuals have a HAAD of less than 40 years, the intervention receives a score of 3; interventions addressing a cause with a HAAD of more than 40-50 years receives a score of 2 while causes with a HAAD more than 50 years receives a score of 1. HIPtool provides the option to include the current life expectancy, allowing for the HAAD cut-offs to be automatically scaled up or down, tailoring the health equity scores to a given context. Where data are available, additional factors can be included in the calculation of the equity score, including socio-economic status, geographic location, or gender.

The financial risk protection module of HIPtool is based on three dimensions: (1) likelihood of impoverishment (LOI) in the absence of public financing; (2) urgency of need of the intervention; and (3) average age of death and level of disability, with a favourable weighting for interventions that address high disability causing diseases and improve the health of wage-earners. The LOI in the absence of public health financing is especially likely to vary between countries because it is based on unit cost data. Following any updates made to intervention unit costs by users, HIPtool adjusts the weighting of the LOI accordingly, in order to reflect more closely the level of financial risk protection awarded by interventions in a given country.

Optimization Module

A key aim of HIPtool is to generate an HBP within a given budget and to meet three defined objectives, which are to (1) maximize DALYS averted, (2) maximize equity, and/or (3) maximize financial risk protection.

Optimizations can be run in two different modes. *Constrained mode* is used to optimize for health impact (for which the user chooses to maximize DALYs averted), with constraints imposed on equity and financial risk (by default, the constraint is that equity and financial risk protection must stay the same or improve with the optimised package compared to baseline). *Weighted mode* instead performs a user-specified weighted optimization over health impact, equity, and financial risk protection; default weights are 60 percent, 20 percent, and 20 percent, respectively, normalized with respect to maximum and minimum possible outcomes for each measure. Two additional types of constraints may be implemented by the user: (1) funding for a given intervention must remain constant (i.e., be excluded from the optimization); (2) funding cannot scale up or down faster than a given rate (e.g., 30 percent per year). If we define the funding for each intervention as a budget vector **B**, the health outcome (DALYs averted) corresponding to this budget as *O*(**B**) (as above), the total equity as *E*(**B**), and the total financial risk protection as *F*(**B**), then we have:

$$E(\mathbf{B}) = \int_{t=t_0}^{t_{max}} \sum_{i=1}^{n} e_i c_i(\mathbf{B}) p_i \, dt,$$

$$F(\mathbf{B}) = \int_{t=t_0}^{t_{max}} \sum_{i=1}^{n} f_i c_i(\mathbf{B}) p_i \, dt,$$

where *e* and *f* are the equity and financial risk protection score per person covered (as defined above or user-defined), and where coverage is shown here as a function of budget **B**.

Constrained optimization is defined as

$$\max(O(\mathbf{B})) \ \text{subject to} \begin{cases} \sum \mathbf{B} = const. \\ E(\mathbf{B}) \geq E_{min} \\ F(\mathbf{B}) \geq F_{min} \end{cases},$$

where E_{min} and F_{min} are the user-specified minimum values for equity and financial risk protection, respectively.

Weighted optimization is defined as

$$\max\left(w_o O(\mathbf{B}) + w_e E(\mathbf{B}) + w_f F(\mathbf{B})\right)$$
$$\text{subject to} \sum \mathbf{B} = const. \ ,$$

where w_o, w_e, and w_f are user-chosen weights for disease outcome, equity, and financial risk protection, respectively.

Limitations

First, since HIPtool adopts a health system perspective, it is unable to capture cross-sectoral benefits that lie outside of the health budget. For example, effects such as gains in productivity or school attendance would not be captured, which means that the positive impact of a HBP estimated by HIPtool is likely to be an underestimate compared to its full cross-sectoral impact.

Second, since there is a trade-off between usability and flexibility, there are many highly complex interactions between diseases and health interventions that cannot be captured in full, as these would require more data than are available in most country contexts. As a consequence, overlaps and synergies between the interventions included in HIPtool are not considered, and currently, only the first-order impacts are incorporated into the analyses.

Third, the current HIPtool is not a disease modeling tool and therefore does not account for disease progression and infectiousness. Instead, it builds on the best existing projections of disease burden and studies of intervention effects in terms of mortality and DALYs averted. The analyses performed by HIPtool are only as valid as the data entered into it; in the absence of high-quality, context-specific data, its analyses are likely to replicate the findings of global studies such as *DCP_3*.

Finally, HIPtool is not a costing or budgeting tool, and is intended only to contribute one component in the overall process of determining an effective HBP. Political, logistical, and other considerations need to be considered outside the context of HIPtool in determining what HBPs are feasible. In addition, a given HBP needs to be carefully costed, with implications for implementation fully considered. These considerations are outside the scope of HIPtool, but are critical for the successful adoption of a HBP.

Appendix B: Key Documents Reviewed

Key documents reviewed are listed below:

(**i**) district core health services package, which defines the services that the population is entitled to at the district level or secondary level and below;

(**ii**) costed essential health services package;

(**iii**) essential drugs list for Zimbabwe (EDLIZ), which has information on diseases, essential medicines and treatment guidelines;

(**iv**) the costed National Health Strategy (NHS, 2015 - 2020) which had the baseline and target coverage data and unit cost prioritized packages such as maternal and newborn health, child and adolescent health, reproductive health interventions, mental health interventions and selected cross-cutting packages such as surgical, rehabilitation and palliative care packages;

(**v**) the health financing policy and health financing strategy;

(**vi**) fiscal space for health analyses;

(**vii**) resources mapping reports (2015 – 2018) which mapped government and partner financing by disease and by major expenditure types;

(**viii**) national health accounts (NHA – 2015);

(**ix**) the National Health Profiles (2014 - 2017); and

(**x**) District Health Information System 2 (DHIS2) summary indicator reports.

Table B.1 shows an example of selected NHS maternal and child-care interventions and how they were mapped to DCP_3.

TABLE B.1 Zimbabwe Maternal and Child Care Interventions

DCP_3 Intervention Code	Intervention Name	NHS Definition/Classification
C1	Antenatal and postpartum education on family planning	Defined as maternal and neonatal disorders
C2	Counseling of mothers on providing thermal care for preterm newborns (delayed bath and skin-to-skin contact)	Defined as kangaroo mother care
C3	Management of labor and delivery in low risk women by skilled attendants, including basic neonatal resuscitation following delivery	Defined as labor and delivery management and Neonatal resuscitation, which is listed as separate intervention.
FLH1	Detection and management of fetal growth restriction	Defined as Pre-referral management of labour complications would be linked to this, but could also be potentially included in “labor and delivery management”
FLH2	Induction of labor post-term	Defined as beyond 41 weeks
FLH3	Jaundice management with phototherapy	Defined as localised infection

Appendix C: Additional Graphs on Top Ten Interventions by Existing and Optimised Spending, Within Intervention Platforms

FIGURE C 1A Comparison of Top 10 Health Center Interventions by Existing Spending, US$ millions

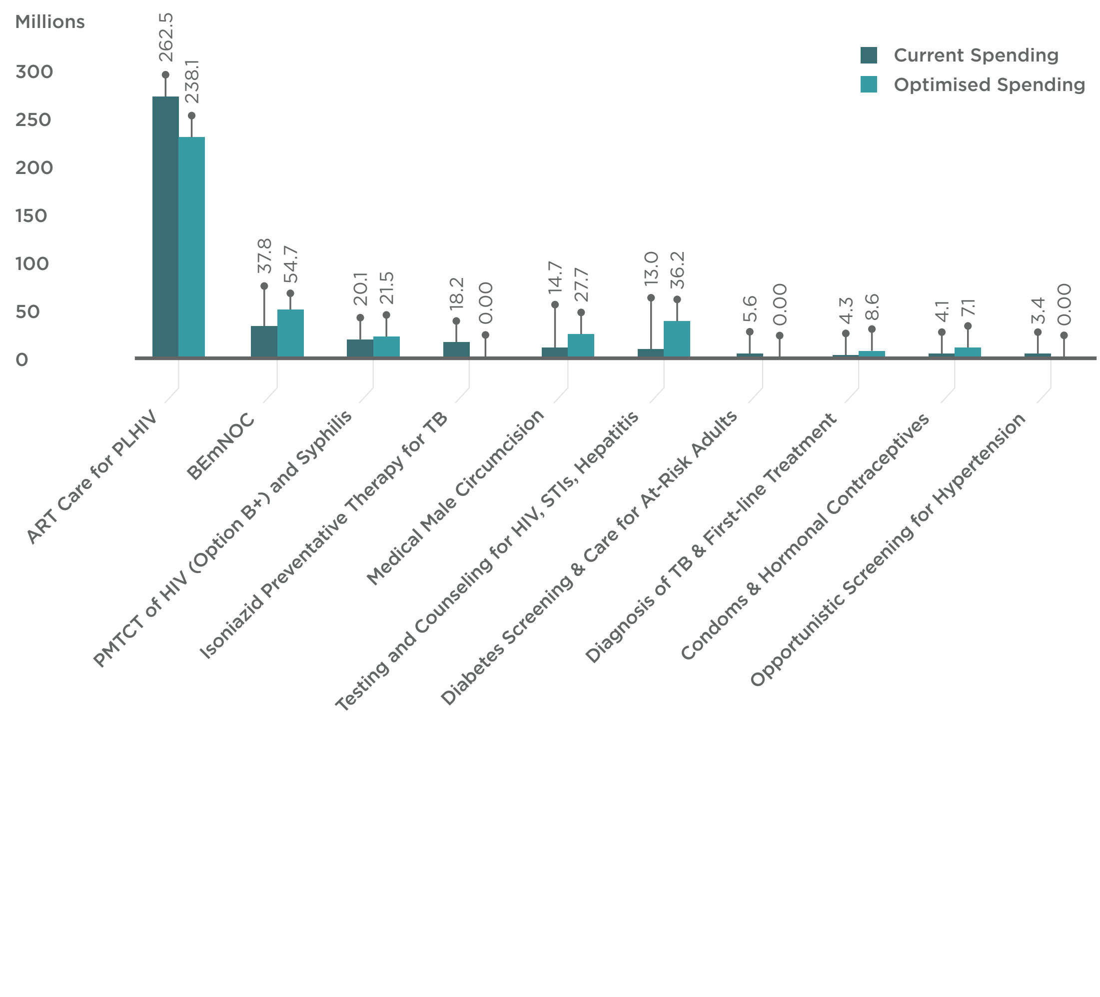


FIGURE C 1B Comparison of Top 10 Health Center Interventions by Optimised spending, US$ millions

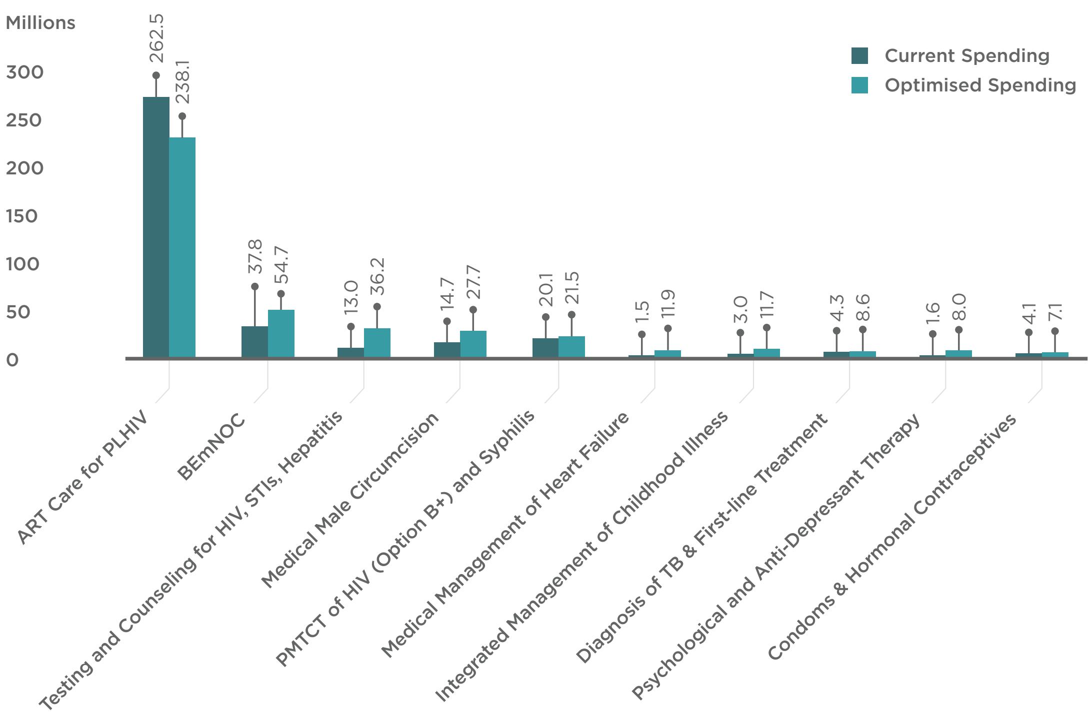


FIGURE C 2A Comparison of Top 10 First-level Hospital Interventions by Existing Spending, US$ millions

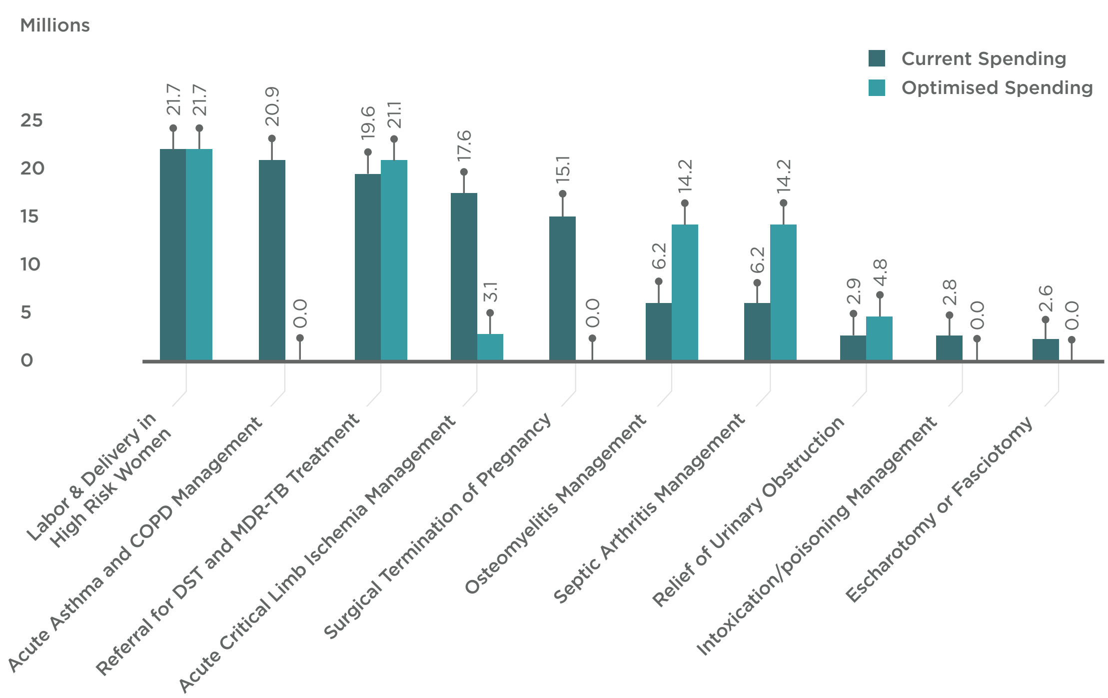


FIGURE C 2B Comparison of Top 10 First-level Hospital Interventions by Optimsied Spending, US$ millions

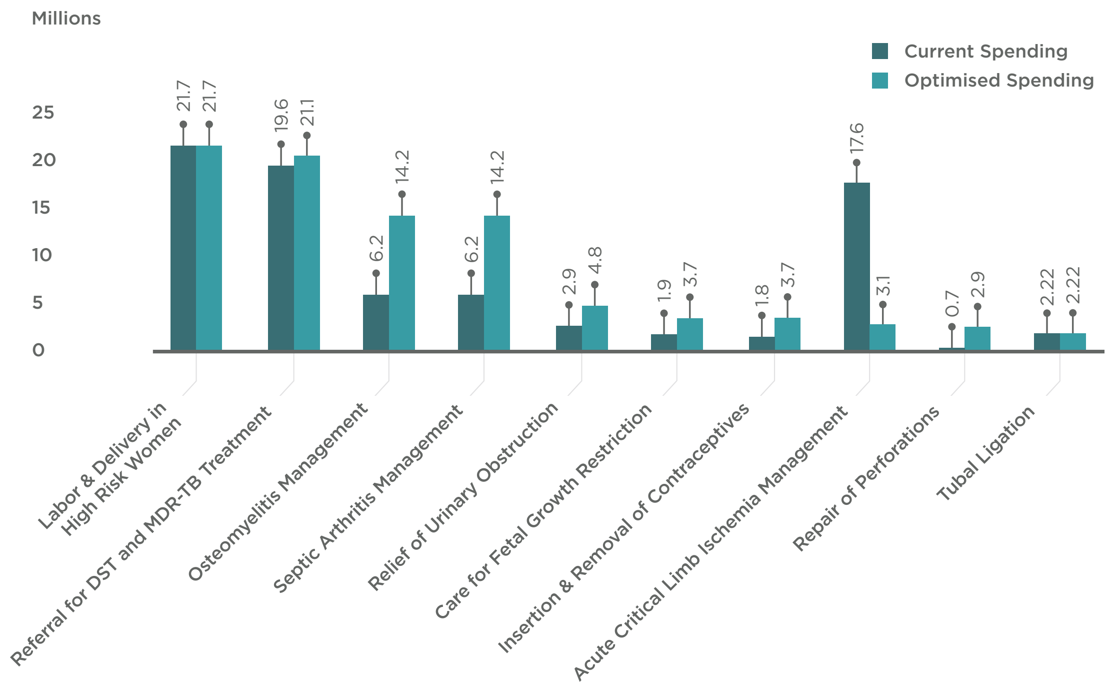


FIGURE C 3A Comparison of Top 10 Referral and Specialized Hospital Interventions by Existing Spending, US$ millions

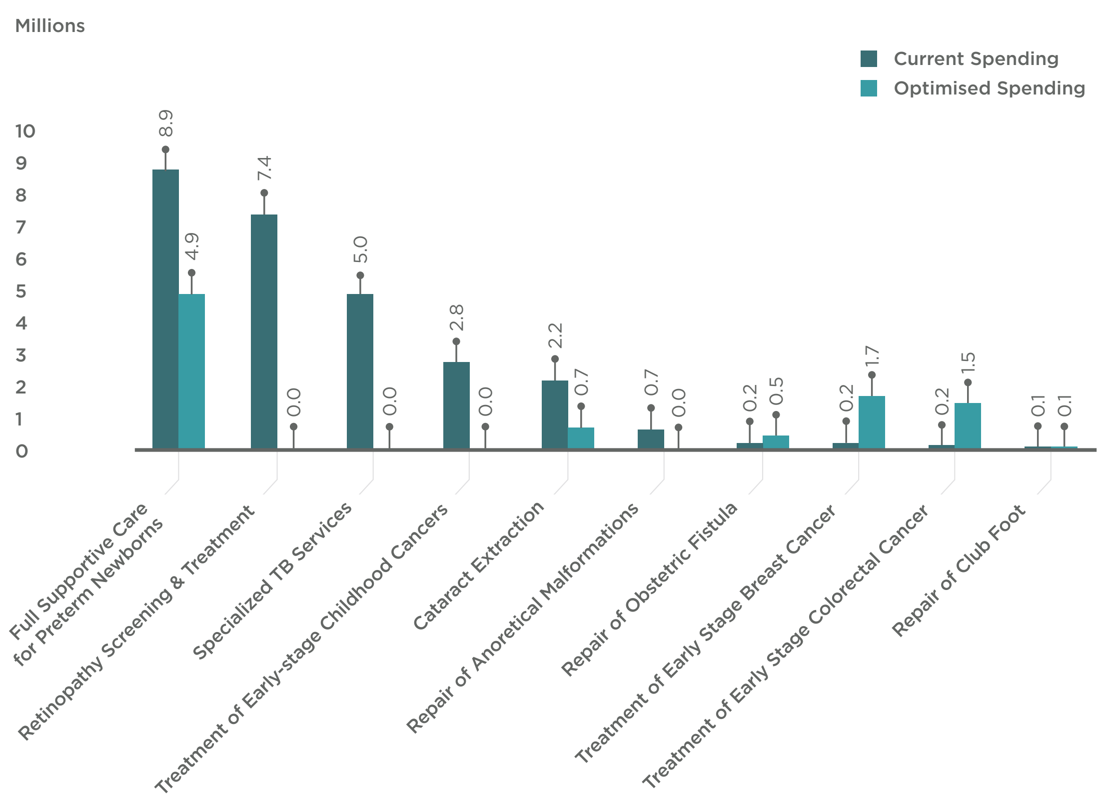


FIGURE C 3B Comparison of Top 10 Referral and Specialized Hospital Interventions by Optimised Spending, US$ millions

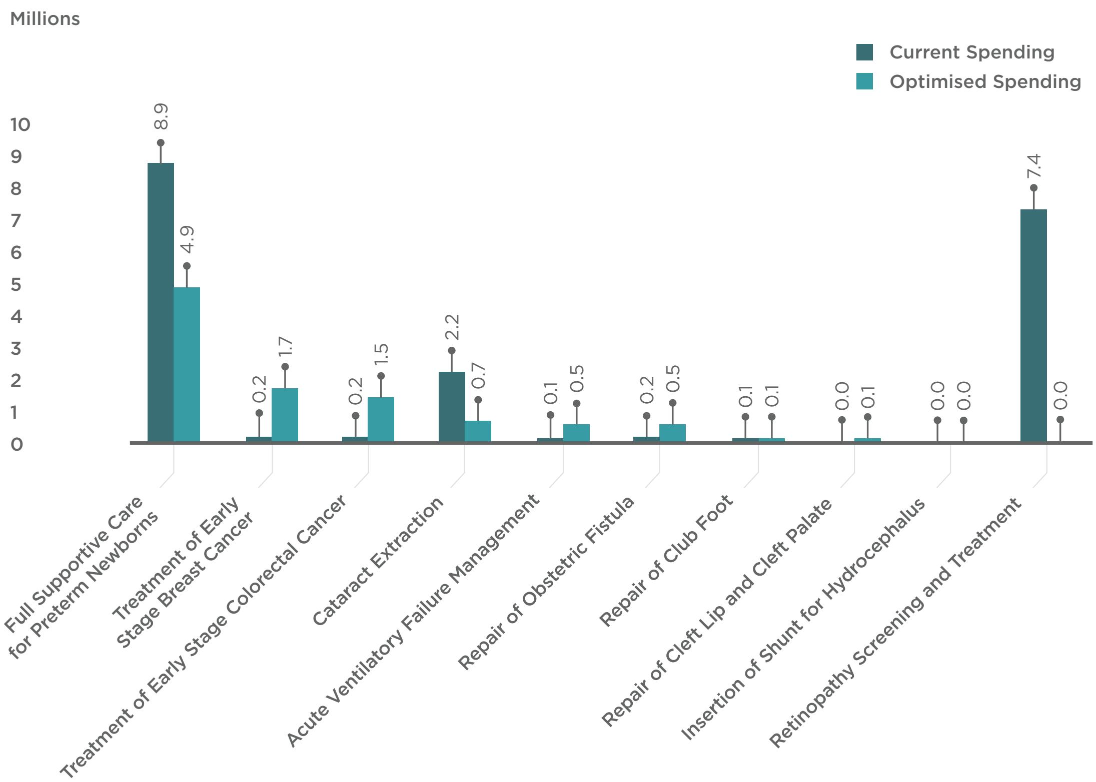


FIGURE C 4A Comparison of Top 10 Community Interventions by Existing Spending, US$ millions

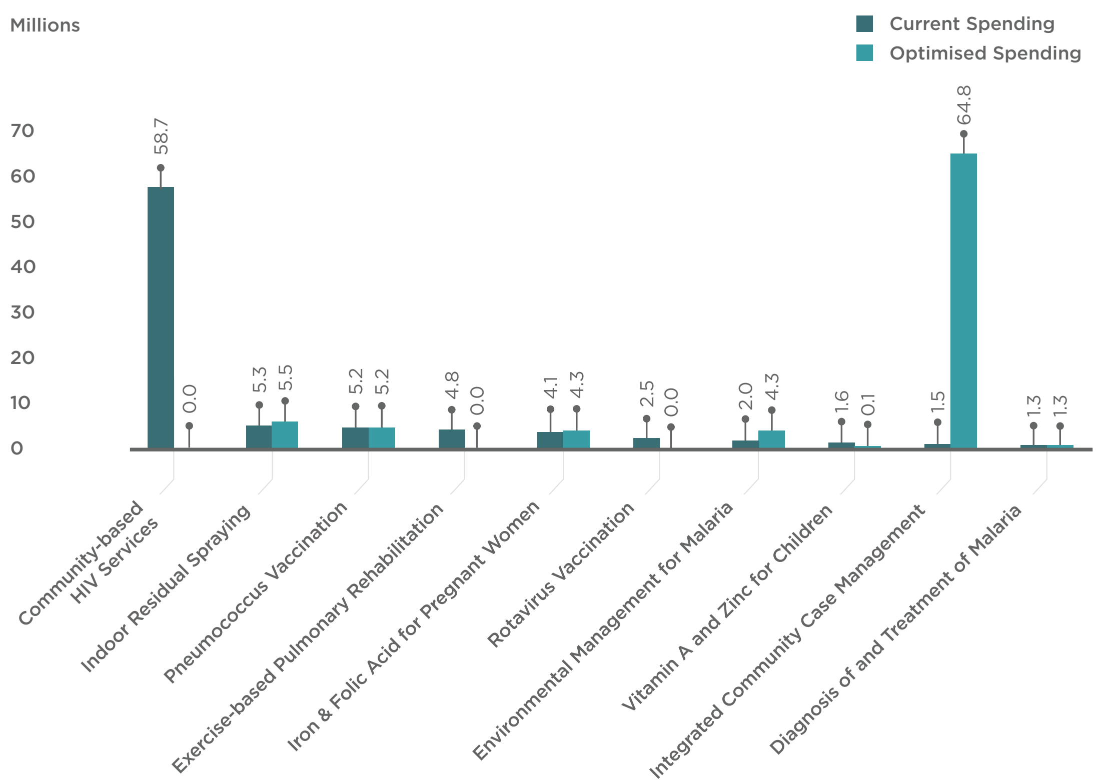


FIGURE C 4B Comparison of Top 10 Community Interventions by Expenditure, Current v. Optimised, US$ millions