TECHNICAL SUPPORT FOR UNIVERSAL HEALTH COVERAGE IN ARMENIA

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REFORMING THE BASIC BENEFITS PACKAGE IN ARMENIA:

MODELING INSIGHTS FROM THE HEALTH INTERVENTIONS PRIORITIZATION TOOL

Nicole Fraser
Adanna Chukwuma
Marianna Koshkakaryan
Lusine Yengibaryan
Xiaohui Hou
Tommy Wilkinson

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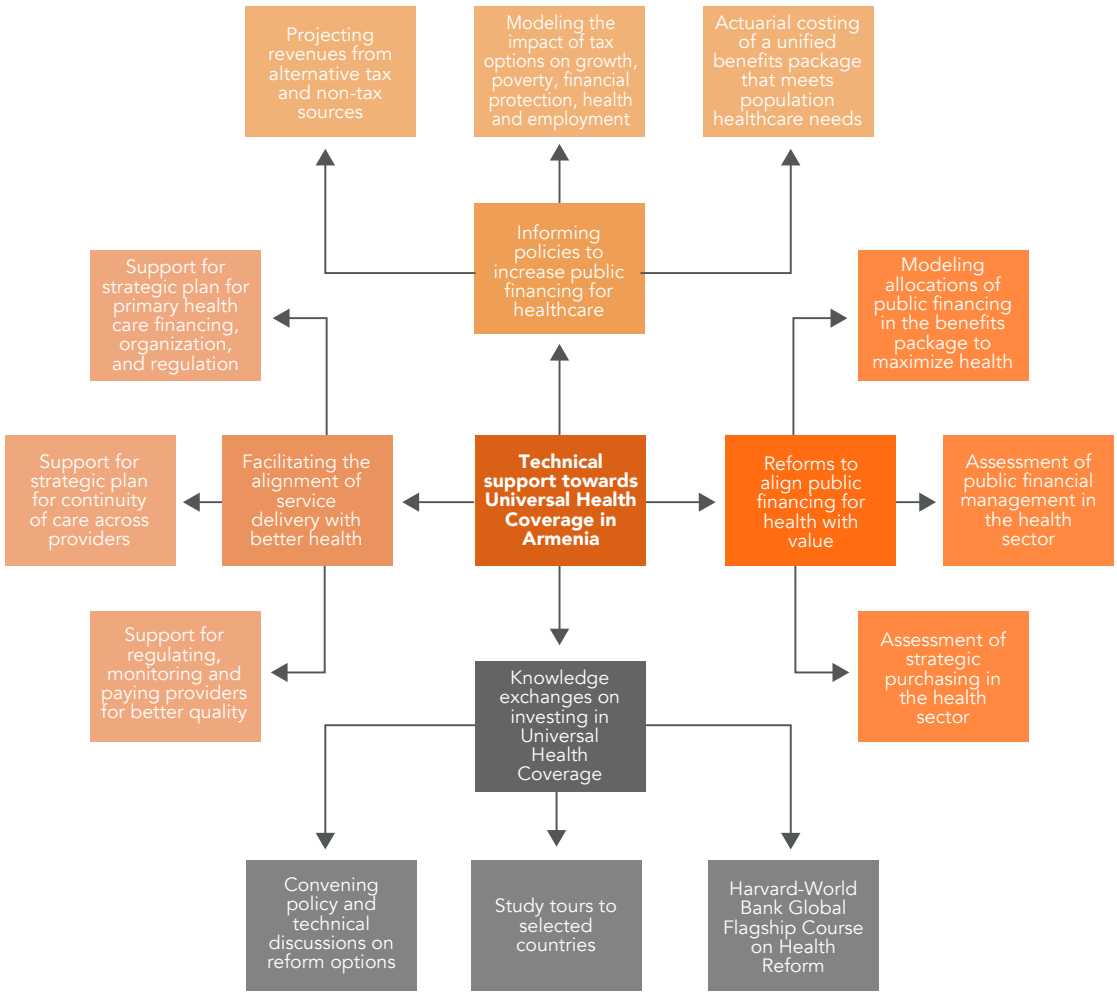
ABOUT THIS REPORT

This report, *Reforming the Basic Benefits Package in Armenia: Modeling Insights from the Health Interventions Prioritization Tool*, is part of the World Bank's technical support toward universal health coverage in Armenia, which includes advisory services and analytics aimed at supporting the government's efforts to expand access to high-quality health care. The report draws on the Health Interventions Prioritization Tool to optimize allocations across essential health services in the basic benefits package and estimate the potential impact of these allocations on population health. The analysis was financed by Gavi, The Vaccine Alliance, The Global Fund to Fight AIDS, Tuberculosis, and Malaria, and the Bill and Melinda Gates Foundation.



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ABOUT THE AUTHORS

Nicole Fraser is a Monitoring and Evaluation Specialist in the Health, Nutrition and Population Global Practice of the World Bank, who has participated in the development and application of the Health Interventions Prioritization Tool. In 2002, she joined the Global HIV/AIDS Program and subsequently the Decisions and Delivery Science Team to lead allocative efficiency modeling, impact evaluation, and implementation research studies. She has collaborated with Governments, development partners, and academia in Africa, East Asia and the Pacific, and Europe and Central Asia. She holds a Master of Science in Biology from the Swiss Federal Institute of Technology Zurich, a Master of Science in Communicable Disease Epidemiology from the London School of Hygiene and Tropical Medicine, and a Doctor of Philosophy in Epidemiology from the University of Basel.

Adanna Chukwuma is a Senior Health Specialist at the World Bank Group, where she leads the health team in Armenia and is co-leading the COVID-19 vaccine procurement and deployment team in Moldova. She has led and supported the design, implementation, and evaluation of reforms to improve access to high-quality health care, through service delivery organization, strategic purchasing, revenue mobilization, and demand generation, in Sri Lanka, Sierra Leone, India, Moldova, Tajikistan, the South Caucasus Countries, and Romania. Adanna obtained a medical degree from the University of Nigeria, a Master of Science in Global Health from the University of Oxford, and a Doctor of Science in Health Systems from Harvard University.

Marianna Koshkakaryan is a Health Consultant at the World Bank Group. She has worked as a medical expert at ClinChoice Inc, where she was responsible for clinical trial safety, and as a monitoring and evaluation specialist in the Health Project Implementation Unit of the Ministry of Health. She has ten years of experience as a general practitioner in primary health care. Marianna obtained a medical degree from the Yerevan State Medical University and a Master of Public Health from the American University of Armenia.

Lusine Yengibaryan is a Health Consultant at the World Bank Group. Since 2018, she has been the Head of the Department of E-Health System Performance and Summary Reports at the State Health Agency of the Ministry of Health. Between 2011 and 2018, she was the Chief Specialist at the Medical Services Purchasing and Information Department of the State Health Agency. Lusine has ten years of experience as an oncologist in primary health care. She holds a medical degree from the Yerevan State Medical University.

Xiaohui Hou is a Senior Economist in the World Bank. She has worked on development issues in East Europe, South Asia, Africa and East Asia and Pacific region. Her fields of specialization include health financing, service delivery and overall health system strengthening. She has led World Bank lending operations, country health program development and several analytical flagship reports. She has published books, book chapters and journal papers in both economic and health peer reviewed journals. She also taught as a visiting scholar in several universities. Xiaohui holds a Doctorate degree in the Health Services and Policy Analysis and a Master's degree in Economics from the University of California, Berkeley and a Bachelor's degree in biochemistry from Beijing University.

Tommy Wilkinson is a Consultant Economist at the World Bank and a Senior Lecturer at the Health Economics Unit at the University of Cape Town, South Africa. Tommy has worked in various roles leading research and technical assistance projects aimed at strengthening priority setting and health technology assessment in sub-Saharan Africa. Tommy holds a Bachelor of Pharmacy from the University of Otago and a Master of Science in Health Economics from the University of York.

ACRONYMS

AMD	Armenian Dram
AUHC	Armenian Universal Health Coverage
BBP	Basic Benefit Package
CE	Cost-effectiveness
CVD	Cardiovascular disease
DALY	Disability Adjusted Life Year
DCP3	Disease Control Priorities 3rd Edition
EUHC	Essential Universal Health Coverage
GBD	Global Burden of Disease
GDP	Gross Domestic Product
HIPtool	Health Interventions Prioritization Tool
ICER	Incremental cost-effectiveness ratio
IHME	Institute of Health Monitoring and Evaluation
MoH	Ministry of Health
NCD	Non-Communicable Disease
NHA	National Health Accounts
NIH	National Institute of Health
OOP	Out-of-Pocket
PHC	Primary Health Care
SHA	State Health Agency
TB	Tuberculosis
THE	Total health expenditure
UHC	Universal Health Coverage
UMI	Upper-middle-income
WHO	World Health Organization
YLD	Years lost to disability
YLL	Years of life lost

EXECUTIVE SUMMARY

ES.1: INTRODUCTION

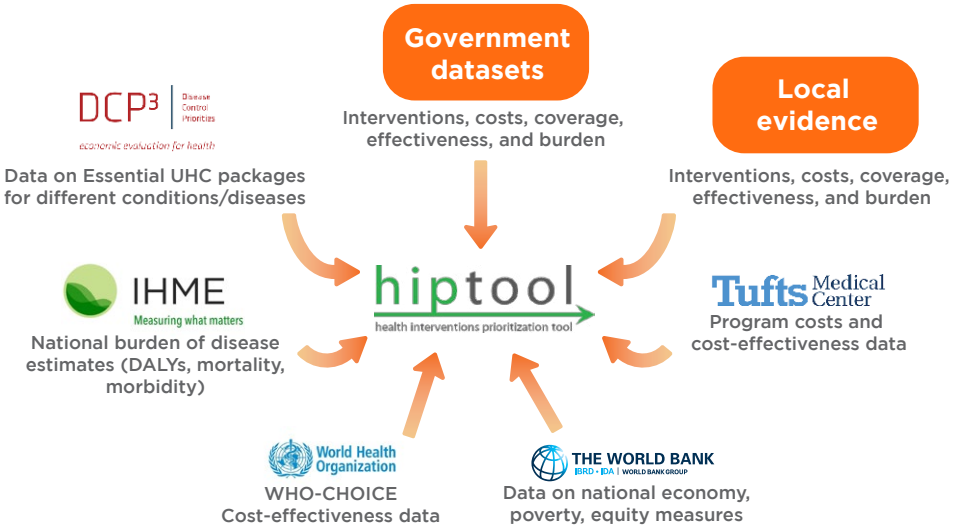
Armenia is an upper-middle-income (UMI) country in the South Caucasus region, with a gross domestic product per capita of US$ 4,655 in current US$ in 2019. The COVID-19 pandemic and a regional crisis have resulted in the real economy's contraction of 6.3%, following rapid growth in the past five years. A rise in chronic disease prevalence has accompanied improvements in longevity. Compared to other countries with similar social and demographic indicators, Armenia has a higher age-standardized rate of disability-adjusted life years per 100,000 of ischemic heart diseases, stroke, and diabetes. Also, Armenia is one of ten countries in the World Health Organization European region that attained a cumulative incidence of COVID-19 over 2000 per 100,000 people.

Improving access to high-quality health care is essential for responding to non-communicable diseases (NCDs) and preventing mortality from infectious diseases in Armenia. However, the gains in improving intervention coverage (that is, health service utilization rates) of maternal and child health care, and services for infectious diseases, have been put at risk by the COVID-19 pandemic. Furthermore, 84.3% of current health spending was paid out-of-pocket (OOP), rising from 58.2% in 2007, introducing financial barriers to access. At the same time, with its newfound status as a UMI, Armenia is experiencing a decline in donor financing that supported intervention coverage for essential health services. Armenia is faced with the challenge of achieving Universal Health Coverage (UHC) when funding for health services faces downward pressures due to a donor funding transition, the COVID-19 pandemic, and regional conflict.

The main instrument for ensuring access to health services through the state is the Basic Benefits Package (BBP). The package provides universal access to primary health care and emergency services. However, it covers hospital and (in some cases) expensive diagnostic services for low-income earners, vulnerable populations, and some state employees, about 30% of the population. A 2006 analysis showed that groups eligible for expanded benefits coverage (that is, eligibility for state funding for health benefits) through the BBP had 36% higher rates of using outpatient care. However, even among beneficiaries of expanded benefits coverage under the BBP, the cost of outpatient medicines and care that is excluded introduces financial barriers to outpatient health care use.

The BBP urgently needs reforms to review the services, depth of coverage of benefits, and beneficiaries consistent with improvements in population health, universal access to essential care, and sustainable financing. The Health Interventions Prioritization Tool (HIPtool) was developed to provide technical assessments that can support resource allocations' prioritization in national benefits packages. The tool draws on the disease burden, service effectiveness, health spending, and intervention coverage levels, using a model-based algorithm (ES. Figure 1). The HIPtool provides a snap-shot of disease burden and optimal spending at a point in time. Since it is not a dynamic tool, it has specific limitations for the modeling of infectious diseases like HIV and TB. This report presents findings from support provided by the World Bank on using the HIPtool to model the implications of BBP changes on population health, involving close collaboration with the Ministry of Health, National Institute of Health, State Health Agency, Health Project Implementation Unit, and Global Fund Project Coordination Team.

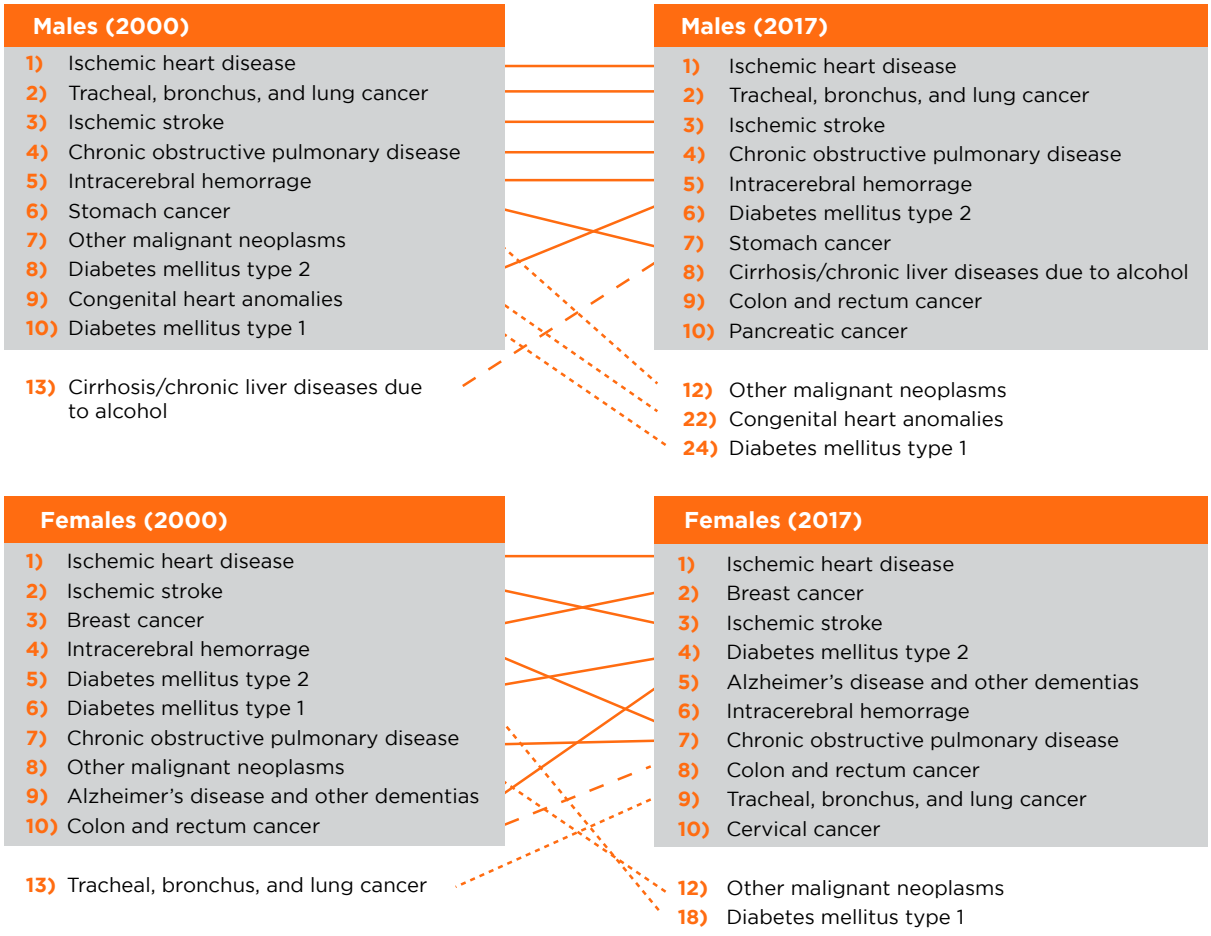
ES. FIGURE 1 • Data inputs into the HIPtool optimization algorithm



ES.2: THE CURRENT AND PROJECTED BURDEN OF DISEASE IN ARMENIA

NCDs are the leading contributors to disease burden, including years of life lost (YLLs) and years lost to disability (YLDs) in Armenia. The top five causes of YLDs in males and females are low back pain, type 2 diabetes mellitus, falls, hearing loss, and migraines. Dietary iron deficiency is the leading cause of YLDs among children from 5 to 9 years. Conduct disorder is the leading cause of YLDs from 10 to 14 years, while migraine causes the most YLDs from 15 to 19 years. Cardiovascular diseases (CVD), including ischemic heart diseases and ischemic stroke, are in the top three causes of YLLs among males and females. While YLLs due to respiratory (including lung) cancers are prevalent among males, premature death due to breast cancer is high among women (ES. Figure 2).

ES. FIGURE 2 • NCD causes of YLLs, by gender, in 2000 and 2017



For men and women alike, the metabolic risk factors, including high blood pressure and high fasting plasma glucose, are by far the most critical drivers of the burden of disease. Dietary risks, including consumption of ultra-processed foods, are the second most important risk category, with a more significant contribution to premature deaths in males than females. Smoking is the most critical risk factor for premature death among males in Armenia. Metabolic, dietary, and other risk factors contribute significantly to YLLs from ischemic heart diseases, strokes, lung cancer, and other NCDs.

If current patterns persist, it is forecast that in 2030, the leading causes of premature death will be similar to 2018, including ischemic heart disease, stroke, respiratory tract cancers, and diabetes mellitus. There will be small decreases in premature deaths due to ischemic heart diseases and most infectious diseases. In contrast, the shares of premature deaths due to diabetes, several cancers, road injuries, dementias, hypertensive heart disease and chronic kidney diseases are expected to increase. Having identified the main contributors to the disease burden, we carefully parametrized interventions targeting these conditions in optimizing resource allocations with the HIPtool.

ES.3: HEALTH SPENDING LEVELS AND ALLOCATIONS

The effect of reprioritizing services within the BBP on health utilization and outcomes depends on the extent to which public health financing is a proportion of overall health spending. Public spending on health is relatively low in Armenia. The public sector's share of total health expenditure (THE) declined from 17.4% in 2016 to 13.2% in 2018 (ES. Table 1). This level is low relative to the average public sector spending of THE of 57% in UMI countries and 63% in the World Health Organization European region in 2017. By 2018, OOP spending was Armenian Dram (AMD) 507,469.5 million, equivalent to 84.3% of THE. In contrast, the average of OOP spending of THE was 31% in UMI countries and 30% in the World Health Organization European region in 2017.

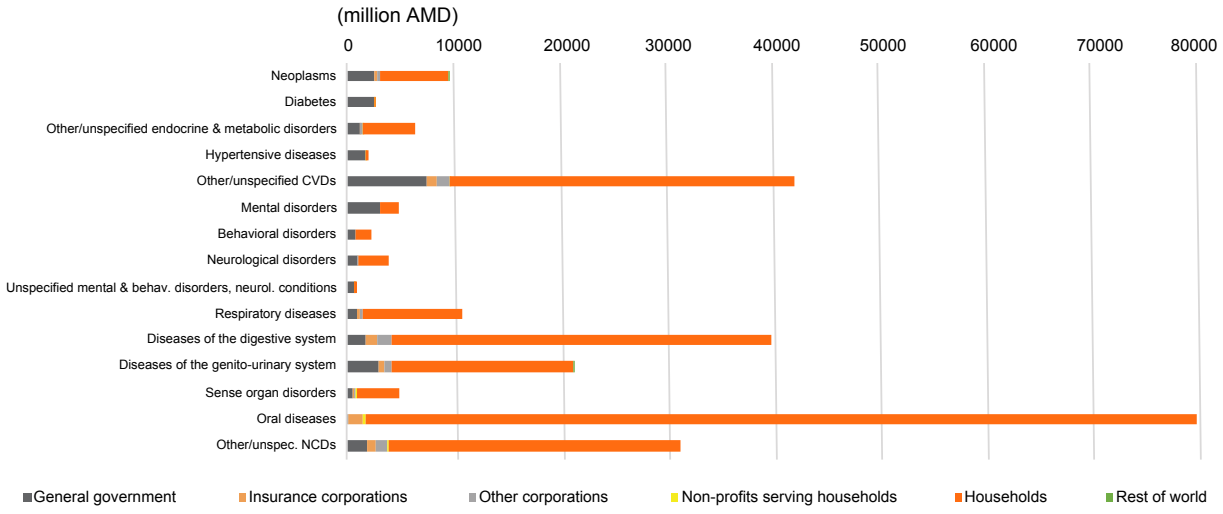
ES TABLE 1 • Public health spending in Armenia, 2014 to 2018

	2014	2015	2016	2017	2018
Public spending on health (million AMD)	76,596.4	85,299.1	87,930.9	81,490.0	79,678.0
Public spending on health as a percentage of THE (%)	15.6	16.7	17.4	14.1	13.2

Overall, NCDs dominate health spending, in line with the disease burden and population health needs. Between 2014 and 2018, health spending was predominantly allocated to services for NCDs, increasing from 41% to 44% of THE, an absolute spending increase of 30%. Over the same period, spending also increased for infectious diseases by 25% and nutritional deficiencies by

24%, whereas funding for reproductive health fell by 7%. However, most NCD spending was allocated to oral diseases (30%), and households were responsible for 84% of NCDs' spending on average. Public spending as a proportion of THE was the largest for CVDs (ES. Figure 3). The dominance of OOP spending as a financing source in the Armenian health care system limits opportunities for the state to improve coverage of benefits through re-allocations within the BBP.

ES. FIGURE 3 • Spending on NCDs by financing scheme in 2018



ES.4: OPTIMIZING BBP RESOURCE ALLOCATIONS

We summarized results from the optimization of spending within the BBP under pre-specified scenarios using the HIPtool. Parametrization of the tool involved mapping the approximately 3,700 services in the Armenia BBP to Essential UHC interventions, resulting in 135 Armenian UHC interventions, organized in 19 packages, that are included in the mathematical optimization. The Armenian UHC interventions represented total spending of AMD 45.9 billion in 2019. Of this amount, AMD 45.0 billion was government expenditure (representing 56.4% of public health spending in 2019), and the remainder was HIV/TB intervention funding from the Global Fund, amounting to AMD 885 million.

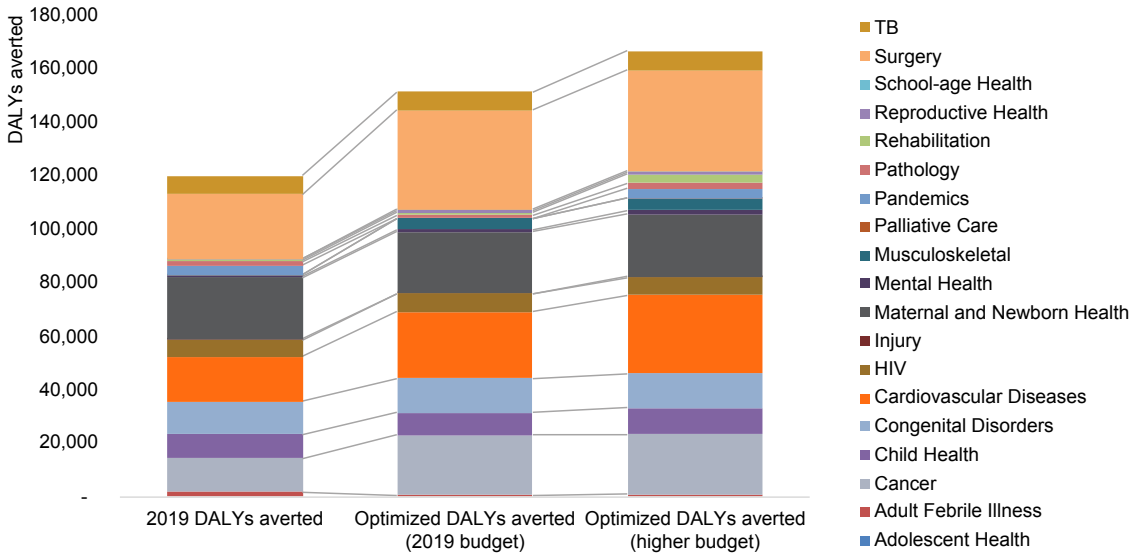
In Scenario 1, we optimized spending within the 2019 budget and explored the implications of limiting the maximum increases in intervention coverage during reallocation. In Scenario 2, we compared optimization in the 2019 budget with a hypothetical budget that is 40% higher than the current budget, to explore the potential implications of increased public health funding on reallocations. We followed these models with findings on optimal allocations

across interventions within the packages in Scenario 3 and comparing a model with a higher weighting for cost-effectiveness (CE), relative to equity and financial risk protection, to one with equal weights for these factors.

The cardiovascular package received the highest allocation in the actual and optimized 2019 budgets. Following optimization, the musculoskeletal and cancer packages received significant increases in funding given their contribution to averting Disability Adjusted Life Years (DALY) through cost-effective interventions. Optimizing resource allocation within the 2019 budget would have averted an additional 10,600 DALYs if the maximum increases in intervention coverage were limited or 31,400 DALYs where there were no limits in the extent to which intervention coverage could increase.

When a higher budget was optimized, there was an increase in spending on the following packages: cardiovascular, musculoskeletal, cancer, surgery, mental health, palliative care, pandemics, and rehabilitation, and an additional 15,000 DALYs were averted (ES. Figure 4). At the intervention level, optimizing spending within the 2019 budget led to significant changes in spending patterns. For instance, there was increased spending on physiotherapy, school-based human papillomavirus vaccination for girls, and long-term CVD management.

ES. FIGURE 4 • Higher averted DALYs following optimization and increased public health funding



ES.5: CONCLUSIONS

This analysis demonstrates how mathematical modeling can inform decision-making on the funding of services within the Armenia BBP. In the interpretation of model outputs, important limitations of the tool and the inputs into it need to be born in mind, for instance regarding linkages between interventions, their local effectiveness, infectious disease dynamics, and progression of uncontrolled disease. Also, any model outputs need to be contextualized in the broader understanding of disease epidemiology. The study involved partnerships between policymakers, technical staff in public agencies, and experts in epidemiology, clinical medicine, health economics, and modeling. Despite the challenges due to data availability and mapping, there are important lessons from the analysis for funding priorities consistent with making progress towards UHC in a financially sustainable manner in Armenia.

Lesson 1: Increase relative funding for high-impact curative and preventive interventions: Up to 2030, CVD will remain the leading cause of morbidity and mortality in Armenia, driven by a high prevalence of metabolic risk factors. Consistent with this finding, in the 2019 and optimized budgets, the cardiovascular package received the most funding. Improving population health is consistent with higher funding for the highly cost-effective interventions in the musculoskeletal and cancer packages, which address a considerable burden of disease. We estimated that optimizing resource allocations within the 2019 budget can increase the DALYs averted by up to 30,000 DALYs.

Lesson 2: Increase public spending on health: In relative and absolute terms, public health financing in Armenia is low. This analysis illustrated how the limited public health financing available restricts investments in cost-effective interventions and targets prioritized groups. With a 40% higher budget, additional funding was allocated to CVD, surgery, mental health palliative care, rehabilitation, and pandemic management. The budget increase, combined with optimal resource allocation, translated to an additional 15,000 DALYs averted, over and above the DALYs averted through optimized 2019 budget allocations.

Lesson 3: Pool spending on the BBP and vertical programs: There are new opportunities to improve efficiency in health spending that will arise from the health financing transition, where national stakeholders will have increased autonomy over spending priorities. A model can help identify potential efficiency gains, but care must be taken to maintain investment in programs which control infectious diseases such as HIV and TB. As the state budget assumes funding for priorities funded by donors, it would be necessary for vertical programs' resources to be pooled with other health service funding. Allocations should not default to historical patterns but adapt to reflect population health needs and overall health system priorities.

Lesson 4: Implement structured and consultative benefit package revisions: Modeling the allocative efficiency of health interventions using the HIPtool can inform consultations on benefit package revisions in Armenia in the short-term. We recommend that the revision process be outlined in legal documents that specify the criteria against which alternative interventions will be considered, the frequency for revisions, and the steps. It is critical that these steps include an obligatory requirement for consultations with key stakeholders, including provider associations and patients. The government may commission studies to build a national database on intervention unit costs and CE, which are key inputs into technical assessments for benefit package revisions.

Lesson 5: Strengthen strategic purchasing mechanisms: In addition to implementing a structured and consultative process for revising the BBP, we propose that the legal status for State Health Agency be redefined, ensuring independence from the Ministry of Health, clear decision rights and external oversight, and restricting the role of private insurers to health services outside the BBP. We also recommend the adoption of an annual strategy for quality-based purchasing, including monitoring of key indicators of the quality of care, publication of provider performance, and introduction of payment mechanisms that reward better quality of care, such as add-on payments. Where possible, provider performance on quality should also inform the selection of providers for funding under the state budget. Efforts to improve the efficiency of resource allocations should ideally be accompanied by reforms to improve technical efficiency in the health sector, including through service delivery reorganization.

CHAPTER 1. INTRODUCTION

KEY POINTS:

- Improving access to high-quality health care is essential for responding to NCDs and preventing mortality from infectious diseases in Armenia.
- Armenia is faced with the challenge of achieving Universal Health Coverage when funding for health services faces downward pressures due to a donor funding transition, the COVID-19 pandemic and regional conflict.
- The Basic Benefits Package (BBP) provides universal access to primary and emergency care, but excludes coverage for outpatient medicines, hospital, and diagnostic care for nearly 70% of the population, contributing to financial barriers to health care access.
- The package is in urgent need of reforms to review the services, depth of benefits coverage, and beneficiaries consistent with improvements in population health, universal access to essential care, and sustainable financing.
- This report presents findings on using the Health Interventions Prioritization Tool to model the implications of reallocations in the BBP on population health.

1.1. ECONOMIC AND POLITICAL CONTEXT

Armenia is an upper-middle-income (UMI) country in the South Caucasus region, with a Gross Domestic Product (GDP) per capita of US$ 4,655 in current US$ in 2019 (Table 1).[1] The country

occupies an area of 29,743 km^2 divided into ten provinces and the capital city of Yerevan. Armenia is landlocked and bordered by Turkey to the West, Georgia to the North, Azerbaijan to the East, and Iran to the South. In 2019, of a population of 2.9 million, 63.9% resided in urban areas.[2] Armenia experienced a significant political transition in 2018. Nikol Pashinyan, a parliamentary opposition member, was appointed the prime minister following the velvet revolution and has renewed the government's commitment to improving governance and reducing poverty.[3]

TABLE 1 • Selected social and economic indicators

INDICATOR	VALUE
Population, million	2.9
GDP, per capita (current US$)	4,655.3
Poverty headcount ratio at US$ 5.50 a day, as a percentage of the population (2011 purchasing power parity) – UMI poverty line	42.5
Poverty headcount ratio at US$ 3.20 a day, as a percentage of the population (2011 purchasing power parity) – the lower-middle-income poverty line	9.4
Poverty headcount ratio at US$ 1.90 a day, as a percentage of the population (2011 purchasing power parity) – the international poverty line	1.4
Life expectancy at birth, years*	74.9
Population aged 65 years and above, as a percentage of the population*	11.3

The COVID-19 pandemic and a regional political crisis have resulted in the real economy's contraction, following rapid growth in the past five years. Between 2014 and 2016, there was near-zero real economic growth in Armenia due to commodity price shocks and political tensions. However, from 2017 to 2019, the GDP had real annual growth rates ranging from 5.2% to 7.6%. Simultaneously, the proportion of the population living below the UMI poverty line fell from 41.5% to 37.0%. Armenia has experienced relatively high COVID-19 infection rates per capita since March 2020 and regional conflict in the last quarter of the year. In 2021, the economy is projected to contract by 6.3% and the proportion of the population living below the UMI poverty line will increase by 4.8 percentage points.[4] Also, government debt as a share of the GDP will rise from 53.5% in 2019 to 63.8% in 2020.

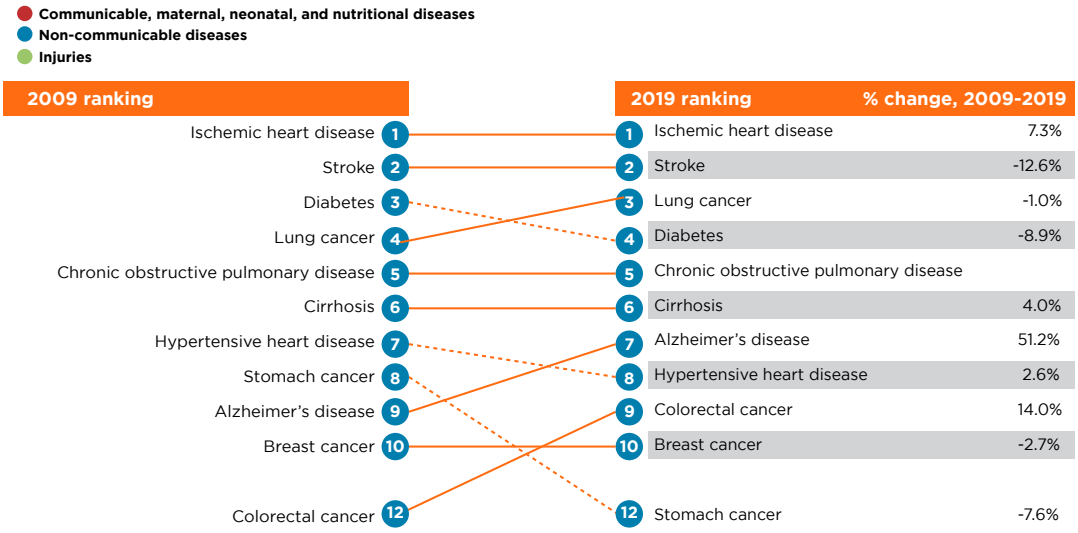
1.2. POPULATION HEALTH OUTCOMES

Over the past two decades, population health outcomes have improved in Armenia, driven by better maternal and child health, and declines in infectious diseases. Illustratively, the infant mortality rate fell from 41.7 to 11 deaths per 1,000 live births between 1990 and 2018.[5] Between

2005 and 2018, TB incidence rate fell from 92 to 31 cases per 100,000 population.[6] In 2019, Armenia had a measles incidence rate of 2.38 per 1,000,000 population, below the average in the World Health Organization (WHO) Europe region of 125.14, mirroring the low incidence rates for other vaccine-preventable illnesses.[7] In the same year, the prevalence of HIV among people aged 15 to 49 years was also low at 0.2%.[8] These health improvements have contributed to a rise in the life expectancy at birth from 68 to 75 years since 1990.[9]

A rise in chronic disease prevalence has accompanied improvements in longevity in Armenia. Non-Communicable Diseases (NCD) are responsible for 93% of deaths.[10] In 2019, the top five causes of death were ischemic heart disease, stroke, lung cancer, diabetes, and chronic obstructive pulmonary diseases (Figure 1).[11] Compared to other countries with similar social and demographic indicators, Armenia has a higher age-standardized rate of disability-adjusted life years per 100,000 of ischemic heart diseases, stroke, and diabetes.[12] The high burden is driven by aging and exposure to behavioral and metabolic risks, including high blood pressure, tobacco, unhealthy diets, high body mass index, and high blood sugar.[13] For example, 51.5% of Armenian men between 18 and 69 years of age are active smokers.[14] By 2030, one in ten Armenian residents will be aged 70 or above.

FIGURE 1 • Leading causes of mortality in Armenia, 2009-2019



Source: Institute of Health Monitoring and Evaluation (IHME)

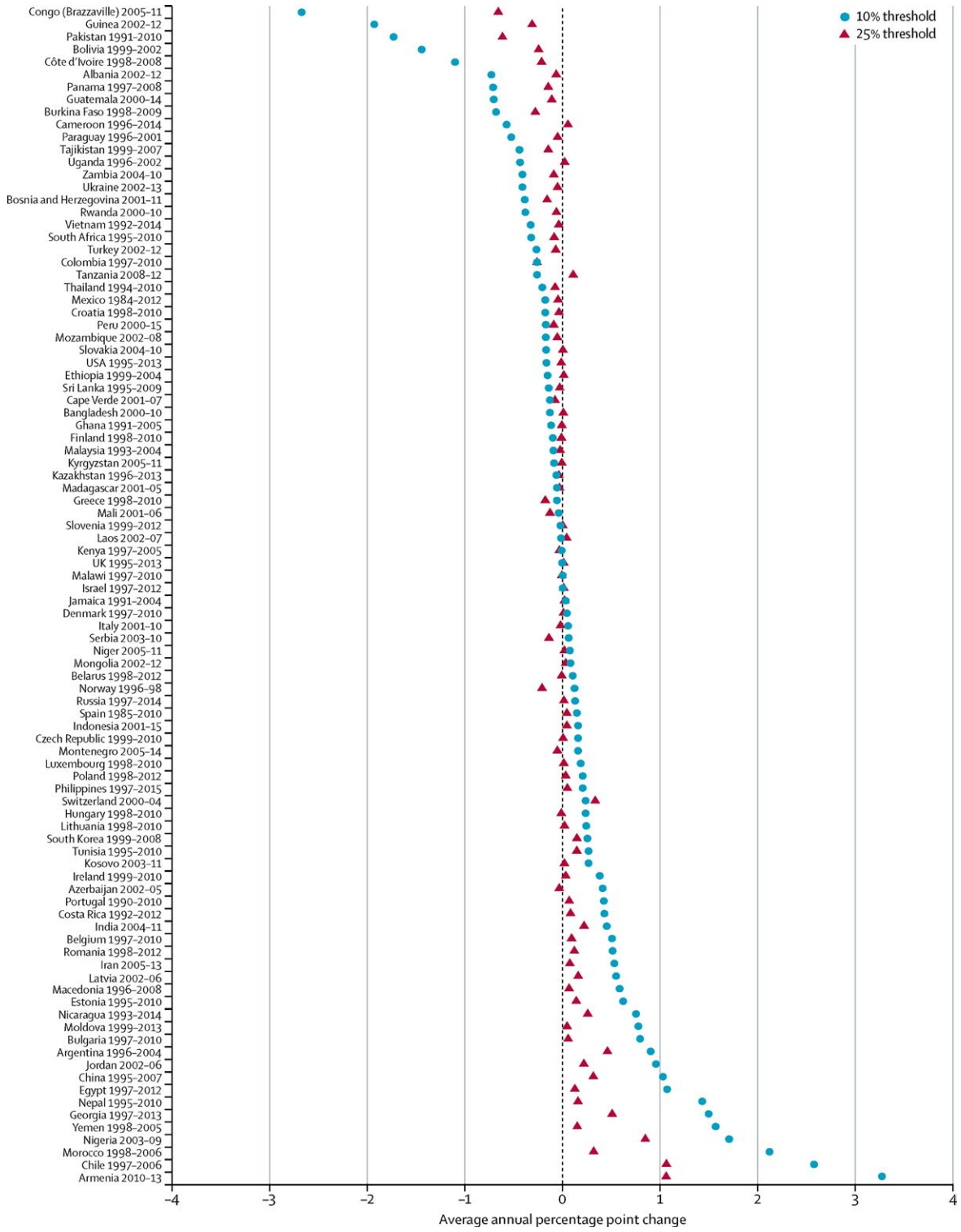
Containing the COVID-19 pandemic, maintaining gains in reducing infectious diseases, and responding to NCDs' high burden are interrelated. By March 1, 2020, Armenia reported the first case of COVID-19. In October 2020, Armenia was one of ten countries in the WHO European region with a cumulative incidence of over 2000 per 100,000 people.[15] However, one in five people globally is at an increased risk of severe COVID-19 if they become infected, in part due to underlying NCDs and aging.[16] Hence, Armenia's aging population and the high burden of NCDs increase the population's vulnerability to COVID-19. NCDs cost the Armenian economy an estimated 362.7 billion AMD annually, equivalent to 6.5% of the annual national income. Hence, there is a strong public health and economic rationale to respond urgently to the high burden of NCDs in Armenia.[17]

1.3. ENSURING ESSENTIAL HEALTH BENEFITS COVERAGE

Improving access to high-quality health care is essential for responding to NCDs and preventing mortality from infectious diseases.[18] Hence, the Republic of Armenia was one of 193 countries that adopted the 2030 Agenda for Sustainable Development in 2015, including the commitment to achieve Universal Health Coverage (UHC).[19] This UHC target focuses on ensuring that all can use the quality health services they need without financial hardship exposure.[20] Armenia has made progress in improving access to health care interventions since 2000, as measured through the UHC service coverage index – that monitors health care utilization—on which the country performs above the average for Europe and Central Asia and UMI countries.[21] Nonetheless, these gains have been put at risk by the COVID-19 pandemic, during which over 90% of countries, including Armenia, have reported interruptions to essential health care use.[22]

Health care utilization has risen at a high cost to Armenian households, due to the relatively low levels of public health spending. In 2013, 16% of people spent more than 10% of household consumption on Out-of-Pocket (OOP) health care expenditure, also referred to as catastrophic health spending at the 10% level.[23] Before this time, between 2010 and 2013, the average annual change in catastrophic health spending at the 10% level was 3.3%, the highest in the world (Figure 2).[24] In 2018, 84.3% of current health spending was paid OOP, rising from 58.2% in 2007, a decade earlier. This level far exceeds the global and UMI averages of 18.2% and 32.9%, respectively.[25] Funding health care through OOP introduces financial barriers to access. In one in five cases, the main reason for forgoing essential care when needed in Armenia is the cost.[26]

FIGURE 2 • Annual percentage point change in incidence of catastrophic health spending



Source: Wagstaff et al. (2018)

Furthermore, the overall progress in improving health care access in Armenia obscures variation by service types. While utilization rates for maternal and child health care and services for infectious diseases are high, there is relative underutilization of NCD services. The country has maintained between 90% and 100% vaccination rates under the National Immunization Program over the past decade. Similarly, nearly 100% of pregnant women receive antenatal care from a skilled health care provider.[27] Between 2010 and 2019, the probability of receiving antiretroviral therapy among those living with HIV has risen from 30% to 62%.[28] In contrast, 43.5% of the population above 15 years of age has been screened for hypertension. Less than 25% of the population above 15 years of age have been screened for diabetes mellitus, illustrating lower utilization rates for NCD services.[29]

The COVID-19 pandemic puts past progress in expanding access to care for maternal and child health and infectious diseases in jeopardy. Illustratively, childhood vaccination rates had fallen by 27% by October 2020.[30] Armenia is also experiencing a decline in donor financing that supported interventions to increase access to essential health services. Since 2019, the Government of Armenia is responsible for 100% funding to the National Immunization Program, which had previously received Gavi support.[31] The country has also been classified as eligible for transition funding in 2020-2022 by The Global Fund and will be ineligible for support in future allocation periods. Hence, Armenia is faced with the challenge of achieving UHC when funding for health services faces downward pressures due to a donor funding transition and the COVID-19 pandemic.

1.4. A ROLE FOR STRATEGIC PURCHASING

Public spending on health care must increase to expand access to essential health services in Armenia. However, there are also missed opportunities to facilitate progress towards UHC through strategic purchasing. Purchasing strategically ensures that allocations of funds for health care provision are deliberately linked to population health needs and improving provider behavior. Following the dissolution of the Soviet Union, Armenia embarked on a first generation of health financing and service delivery reforms, that contributed to gains in population health outcomes. Armenia established the State Health Agency (SHA) as an independent, third-party purchaser, responsible for allocation of public health financing to essential health services. At this time, the Basic Benefits Package (BBP) was introduced, explicitly defining benefits coverage, including the services to be funded through the national budget, eligible groups, and reimbursement rates.[32] Passive line-item budgeting for health service inputs, including beds and health workers, was replaced with output-based payment mechanisms, including case-based payments and performance-based financing, to contain costs while improving essential health service utilization rates.

Despite these reforms, purchasing decisions remain largely passive, and through the perverse incentives facing providers and patients, contribute to challenges in ensuring access to high quality health care in Armenia.[33] Institutional arrangements for purchasing are fragmented. The SHA lost its independent status in 2002 and its subordination under the Ministry of Health (MoH) has negated the principle of separating purchasing from provision, given the MoH's involvement in service provision. The introduction of multiple purchasers, to process claims for a subset of the population, contributes to fragmented fund flows, and has been associated with reductions in the supply of preventive care and higher OOP payments, relative to the SHA. The SHA's influence over provider behaviour is limited by the overall low and fragmented public health spending that prevents the use of monopsony power to incentivize improvements in quality and health care use.[34] The SHA predominantly focuses on contracting, processing claims, and fraud detection, with less attention given to monitoring and rewarding improvements in quality of care. No institution is responsible for ensuring that clinical guidelines are available, compliance is monitored, and findings on compliance are incorporated into purchasing decisions. Payments to providers are not adjusted for the quality of service provision and provider contracting is not conditional on service standards.

Akin to other aspects of purchasing, the lack of a systematic process to design and revise the BBP contributes to challenges in ensuring access to high quality health care in Armenia. The initial BBP was informed by assessing the burden of disease, the budgetary impact of guaranteeing access to interventions through the state, and the relative cost-effectiveness (CE) of alternative services, with analytical support from international experts. Since 2001, the parliament has delegated responsibility for authorizing changes to the BBP to the MoH. There are no official regulations that specify the process of reviewing the package – including the criteria to be considered, relative importance, and stakeholder involvement procedures. Hence, BBP changes have been predominantly driven by political considerations.[35] The benefits coverage in terms of groups, services, and depth has changed frequently, contributing to confusion among citizens on eligibility to receive health care. Between 2001 and 2019, children's eligibility for care has included all children below 18 years in some years, excluding those above three years at others, with other changes in between.

The BBP provides universal access to Primary Health Care (PHC) and emergency services. However, it covers hospital and (in some cases) expensive diagnostic services for low-income earners, vulnerable populations, and some state employees, about 30% of the population. A 2006 analysis showed that groups eligible for expanded benefits coverage through the BBP paid 45% less during health care visits and had 36% higher rates of using outpatient care than other groups.[36] Even among beneficiaries of expanded benefits coverage under the BBP, the cost of outpatient medicines and care that is excluded introduces financial barriers to outpatient health care use. Some services in the package are also reimbursed at levels that are below the cost of delivery, owing in part to the low levels of public health financing, incentivizing the undersupply of these services by providers and demand for informal

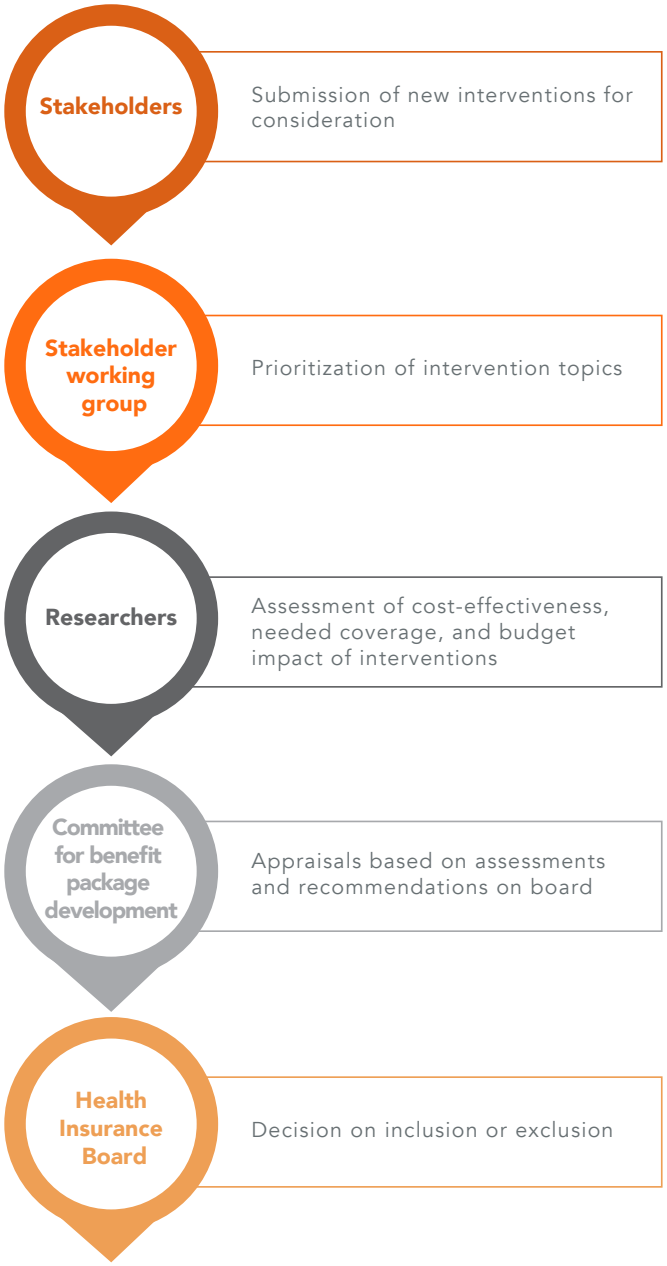
payments. Hence, the current BBP design, including depth of benefits coverage, services included, and groups provided for, contributes to the high OOP in Armenia and financial barriers to health care access. Armenia cannot fund all services for the entire population. To make progress towards UHC, the BBP is in urgent need of reforms that are consistent with improvements in population health, universal access to essential care, and sustainable financing.

1.5. A SYSTEMATIC APPROACH TO BENEFITS PACKAGE REVISION

In revising a benefits package, the available funding is a constraint regardless of the national income. Therefore, even in high-income countries, there are mechanisms to prioritize health services for inclusion in the guaranteed package, as in the United Kingdom's National Institute for Clinical Excellence. Revisions to the benefits package should be consistent with improvements in value within available resources. The definition of value will vary by society, depending on the objectives that each society aims to achieve through the health system, including better health, equity, quality, and access. As there will be winners and losers following decisions on the package, it is crucial to make the basis for defining the content, depth, and eligibility transparent. This clarity may reduce resistance from proponents of losing proposals.

When the sector objectives and revision criteria are clearly defined, they should inform the technical analysis of alternative technologies, where possible. For instance, if an important objective is to maximize health within available resources, CE analysis can help compare health returns per dollar spent. Disaggregating this analysis by population groups and service cost can provide insight into equity and financial protection implications.[37] If a country aims to reduce the burden of specific diseases, the analysis can also focus on evaluating interventions focused on this disease. To ensure that revisions are compatible with sustainable health financing, an analysis of changes' budgetary impact is also essential. These and other analyses can inform deliberations among crucial stakeholders, including service users, providers, pharmaceutical agencies, technical experts, and policymakers. The transparent and technically rigorous process for revising the benefits package in Thailand provides a useful model for other low- and middle-income countries (Figure 3).

FIGURE 3 • Benefits package revision process in Thailand

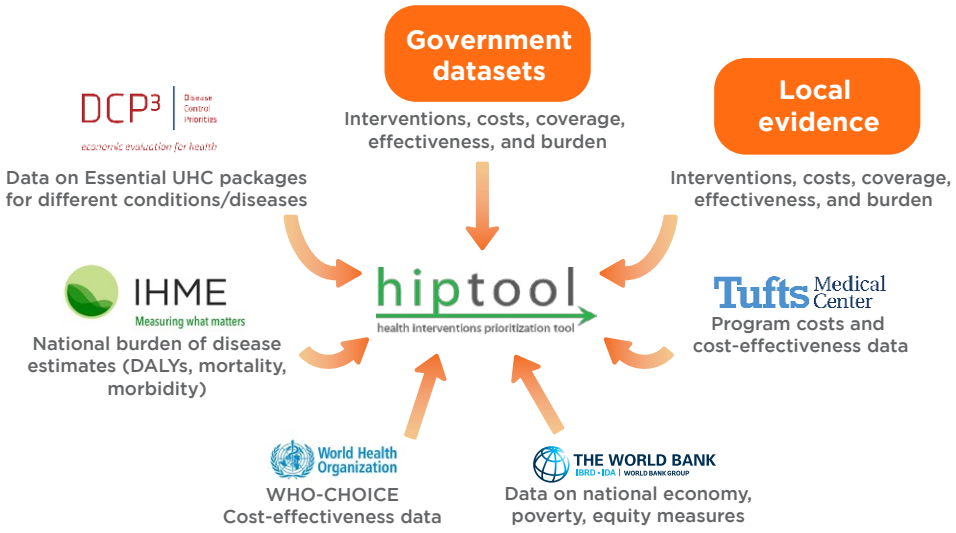


Source: Ministry of Public Health, Thailand; World Bank

The Health Interventions Prioritization Tool (HIPtool) was developed to provide technical assessments that can support resource allocations' prioritization in national benefits packages. Drawing on the disease burden, intervention coverage (that is, health service utilization rates), spending and effectiveness, the HIPtool uses a model-based algorithm to identify resource allocations that maximize health outcomes, measured in terms of averted Disability Adjusted Life Years (DALYs) (Figure 4). The HIPtool provides a snap-shot of disease burden and optimal spending at a point in time. Since it is not a dynamic tool, it has specific limitations for the modeling of infectious diseases like HIV and TB. To account for equity and financial protection,

weights can be introduced that reflect societal value for these considerations and applied to the interventions across which allocations are being optimized. However, governments may want to consider additional criteria, for instance to prioritize infectious disease interventions taking into account disease dynamics and objectives such as disease elimination. The tool optimizes resource allocations across the entire public health budget rather than marginally. Insights from the mathematical optimization can complement other considerations during discussions among stakeholders. In Annex 1, we describe the technical specifications of the HIPtool.

FIGURE 4 • Data inputs into the HIPtool optimization algorithm



1.6. THE OBJECTIVE OF THIS REPORT

The MoH has launched public discussions on a second generation of health financing and service delivery reforms to address the challenges to improving access to quality care. The initial proposal was published in draft "Concept Note for the Introduction of Universal Health Insurance" for public review and debate. The proposal includes reforms in domestic resource mobilization, strategic purchasing, and service delivery, encompassing the introduction of earmarked taxes for health, an increase in prioritization of health services in the state budget, establishing a new and independent purchaser, introduction of selective contracting of providers that meet defined service standards, performance-based payments that reward improvements in quality of care, and adopting a systematic process for reviewing the BBP using CE and disease burden data. It is also proposed to ensure that state provides universal benefits coverage, including for care for NCDs, within the BBP.

Since 2019, the World Bank has provided support, at the request of the MoH, towards the design of the proposed reforms, including in strategic purchasing. This support includes technical assistance towards actuarial costing of an expanded BBP, an assessment of purchasing arrangements, as well as developing a regulatory framework for monitoring and rewarding improvements in quality of care. This report is part of broader support towards building technical capacity for revisions to the BBP in Armenia. A series of technical discussions were held on using the HIPtool to model the implications of BBP changes involving the MoH, National Institute of Health (NIH), State Health Agency (SHA), Health Project Implementation Unit, and Global Fund Project Coordination Team. The report summarizes the findings of this analysis and is aimed at policy makers and technical experts involved in the revision of the BBP in Armenia. The report is structured as follows. Chapter 2 describes trends in the burden of disease and identifies disease-specific priorities for resource allocations. Chapter 3 reviews current spending levels and allocations across diseases and delivery functions. Chapter 4 draws on the HIPtool to optimize resource allocations to improve population health. Chapter 5 concludes with recommendations for prioritizing resource allocations.

CHAPTER 2. THE CURRENT AND PROJECTED DISEASE BURDEN IN ARMENIA

KEY POINTS:

- The leading causes of YLLs and YLDs across all ages in Armenia are cardiovascular diseases and low back pain, respectively.
- Also, there has been a significant increase in the contribution of diabetes mellitus type 2 to premature mortality.
- The metabolic risk factors that contribute to the development of cardiovascular diseases overlap with diabetes mellitus 2, creating opportunities to reduce the burden attributable to both diseases by addressing these risks.
- The disease burden and patterns of exposure to risk factors vary by gender. The high exposure to tobacco smoking among males contributes to the prevalence of premature mortality due to respiratory cancers.

2.1. THE CAUSES OF DISABILITY AND PREMATURE DEATH

NCDs are the leading contributors to the burden of disease (Box 1), including years of life lost (YLLs) and years lost to disability (YLDs) in Armenia. The top five causes of YLDs in males and

females are low back pain, type 2 diabetes mellitus, falls, hearing loss, and migraines (Figure 5). However, total YLDs due to migraine are higher among females, and the total YLDs for alcohol use disorders are higher among males. Females contribute a more significant share to YLDs from NCDs (Figure 6).

Box 1 • Estimating the burden of disease

The burden of disease can be conceptualized as the gap between the actual population health status and an ideal health status in which the entire population lives to a pre-specified advanced age, completely free of disability and disease.

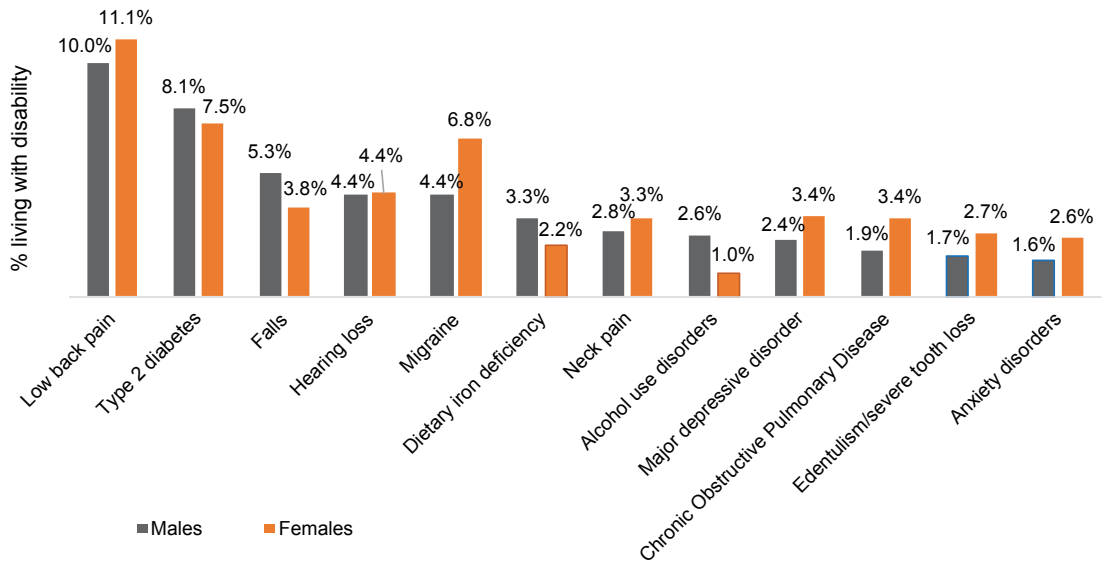
One metric for quantifying the burden of disease is the DALY, which can be thought of as one lost year of completely healthy life and is calculated as the sum of YLLs due to premature mortality and YLDs at the population level: DALY = YLL + YLD

To describe the current and projected burden of disease, this study drew on the IHME's Global Burden of Disease (GBD) database, including country-specific estimates up to 2017, and projections using the foresight function for 2018 onwards.

The YLDs is calculated by multiplying the number of prevalent cases with the disability weight for that condition. Disability weights reflect the severity of different conditions, on a scale from 0 (perfect health) to 1 (equivalent to death) and are developed through population surveys. The number of prevalent cases equals the number of incident cases multiplied by the average duration of a case until remission or death. The YLDs metric was available up to 2017, at the time of this study.

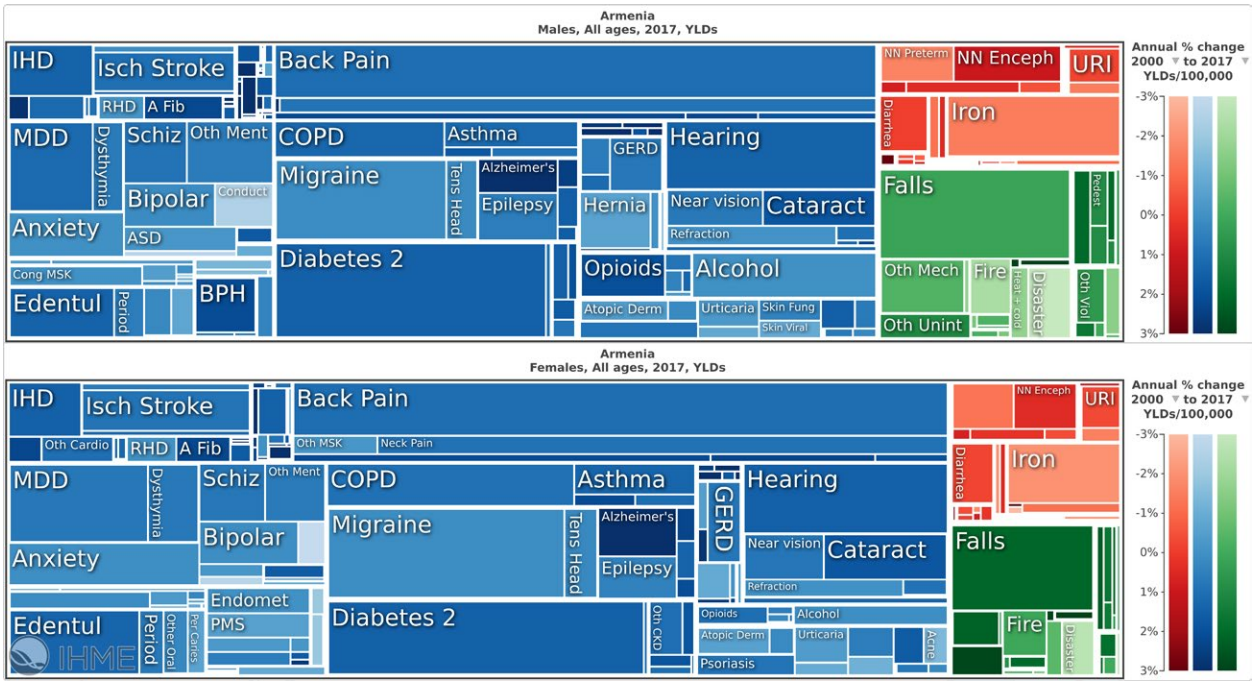
The YLLs is calculated as the sum of the difference between the age at premature death and the longest possible life expectancy for a person at that age. The IHME estimates YLLs and deaths based on a framework that accounts for the relationships between risk factors and health outcomes for 79 independent drivers to capture causal pathways of changes in health status. The process generates forecasts for 195 countries and territories through 2040.

FIGURE 5 • Causes of YLDs by sex among all ages in 2017



Source: IHME

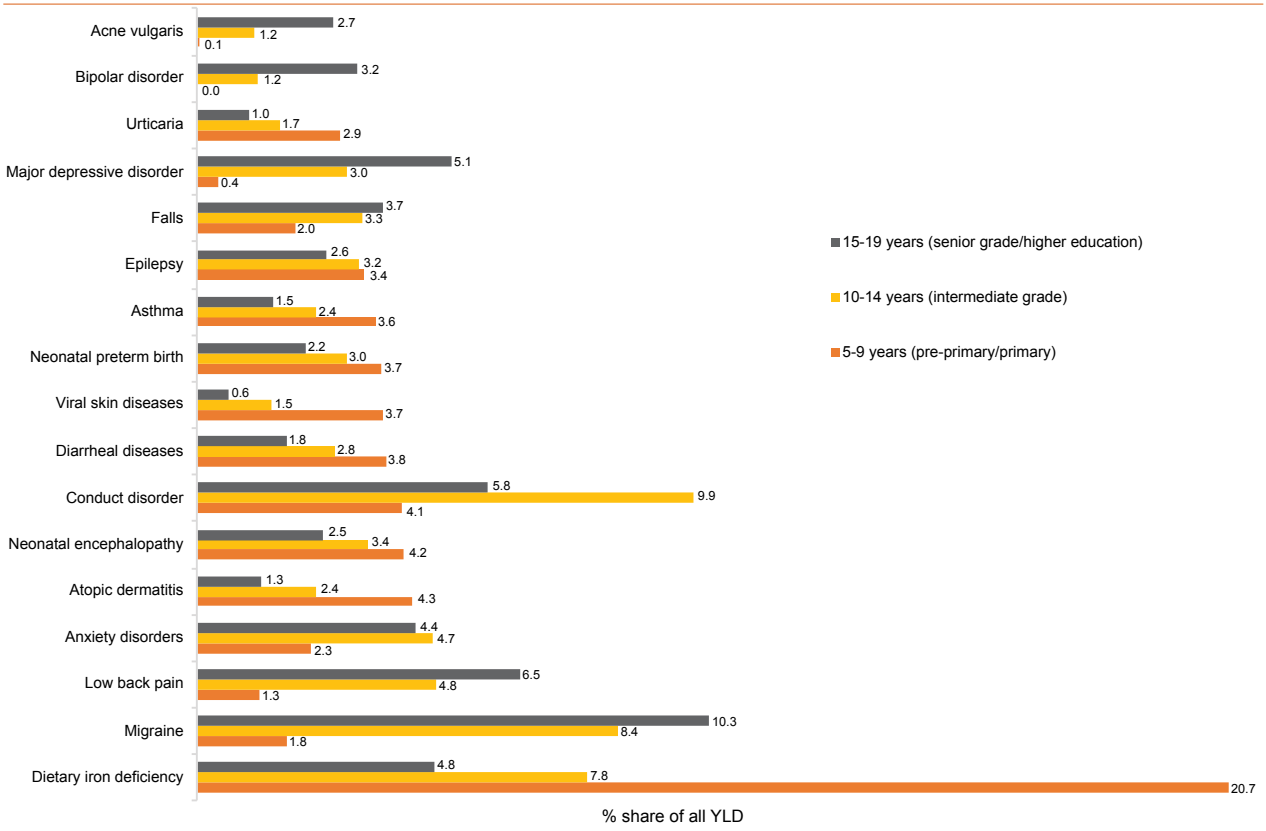
FIGURE 6 • Causes of YLDs by sex among all ages in 2017



Key: Blue = NCDs, Red = Communicable, maternal, neonatal and nutritional disease, Green = Injuries
Source: IHME

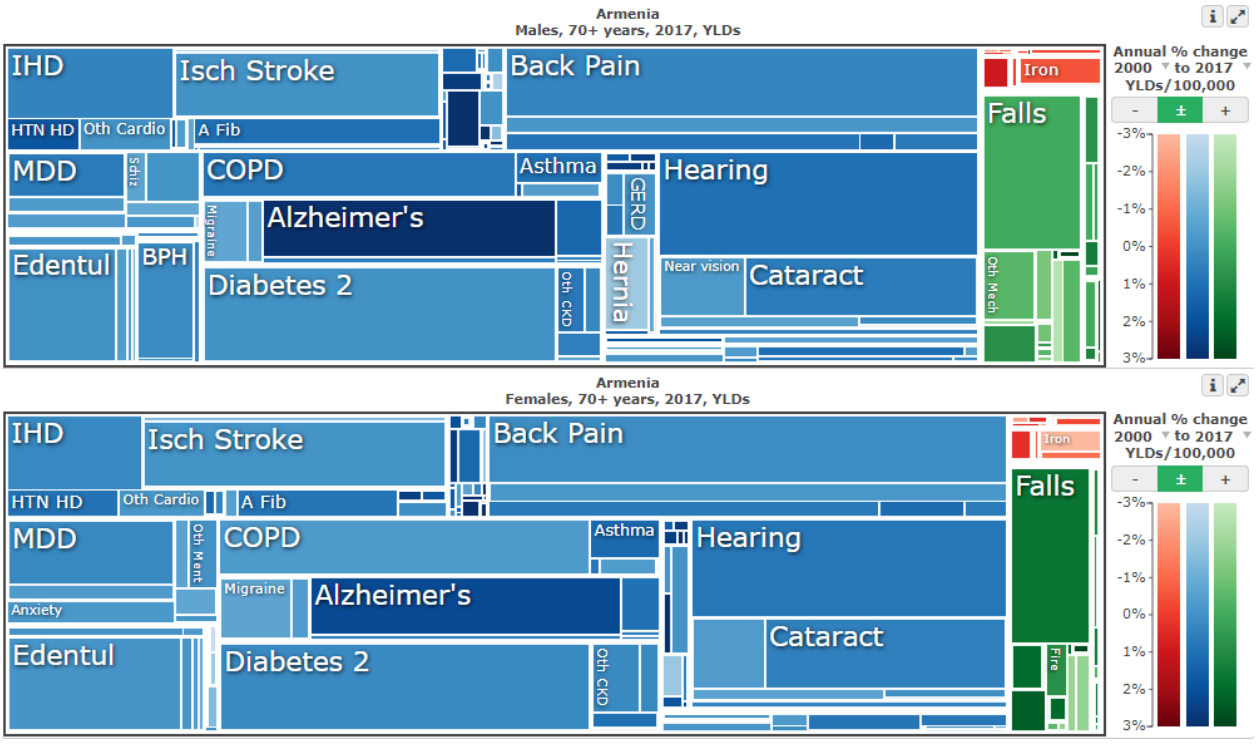
We also examined the main contributors to YLDs among school-aged children and the aged. Dietary iron deficiency is the leading cause of YLDs among children from 5 to 9 years (Figure 7). Conduct disorder is the leading cause of YLDS from 10 to 14 years, while migraine causes the most YLDs from 15 to 19 years. Migraine is also a leading contributor to the YLDs among children between 10 and 14 years. Lower back pain, depression, and anxiety contribute significantly to YLDs between 10 and 19 years (Figure 7). Among people aged 70 years and above, the main contributors to YLDs are loss of hearing, diabetes, cardiovascular diseases (CVD), back pain, Alzheimer's disease, and cataracts (Figure 8).

FIGURE 7 • Causes of YLDs among school-aged children in 2017



Source: IHME

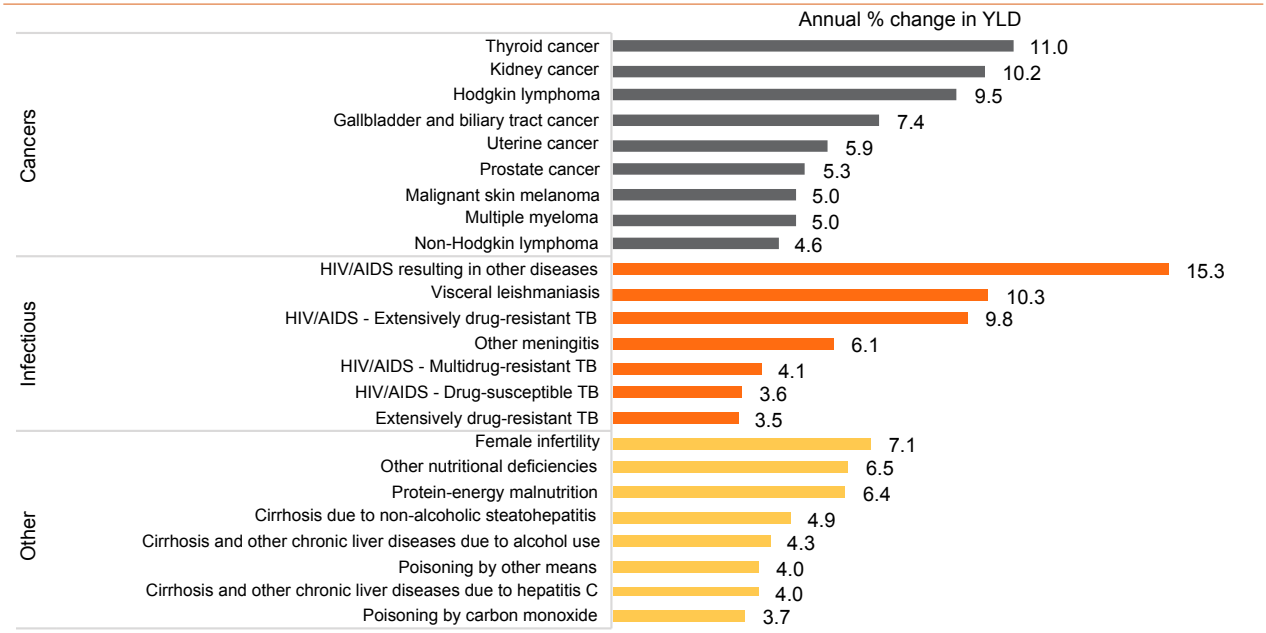
FIGURE 8 • Causes of YLDs among people aged 70 years and above by sex in 2017



Key: Blue = NCDs, Red = Communicable, maternal, neonatal and nutritional disease, Green = Injuries
Source: IHME

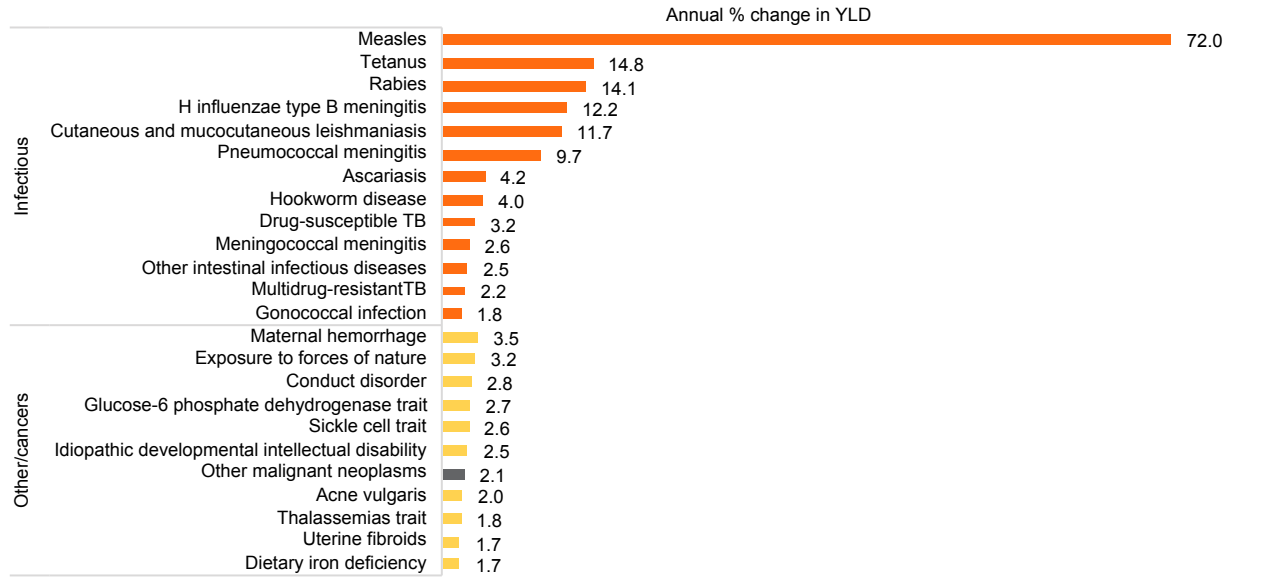
Between 2008 and 2017, the leading causes of YLDs were relatively stable. The annual percentage increase in YLDs due to low back pain, migraine, and type 2 diabetes was below one percent. YLDs due to falls and hearing loss increased by 2.2% and 1.2% annually, respectively. Contributors to YLDs with positive annual percentage increases included cancers, HIV/AIDS-related disorders, female infertility, and cirrhosis (Figure 9). The annual percentage change in YLDs due to several vaccine-preventable diseases, other infections, and maternal hemorrhage fell (Figure 10).

FIGURE 9 • Causes of disability which have increased between 2008 and 2017, among all ages



Source: IHME

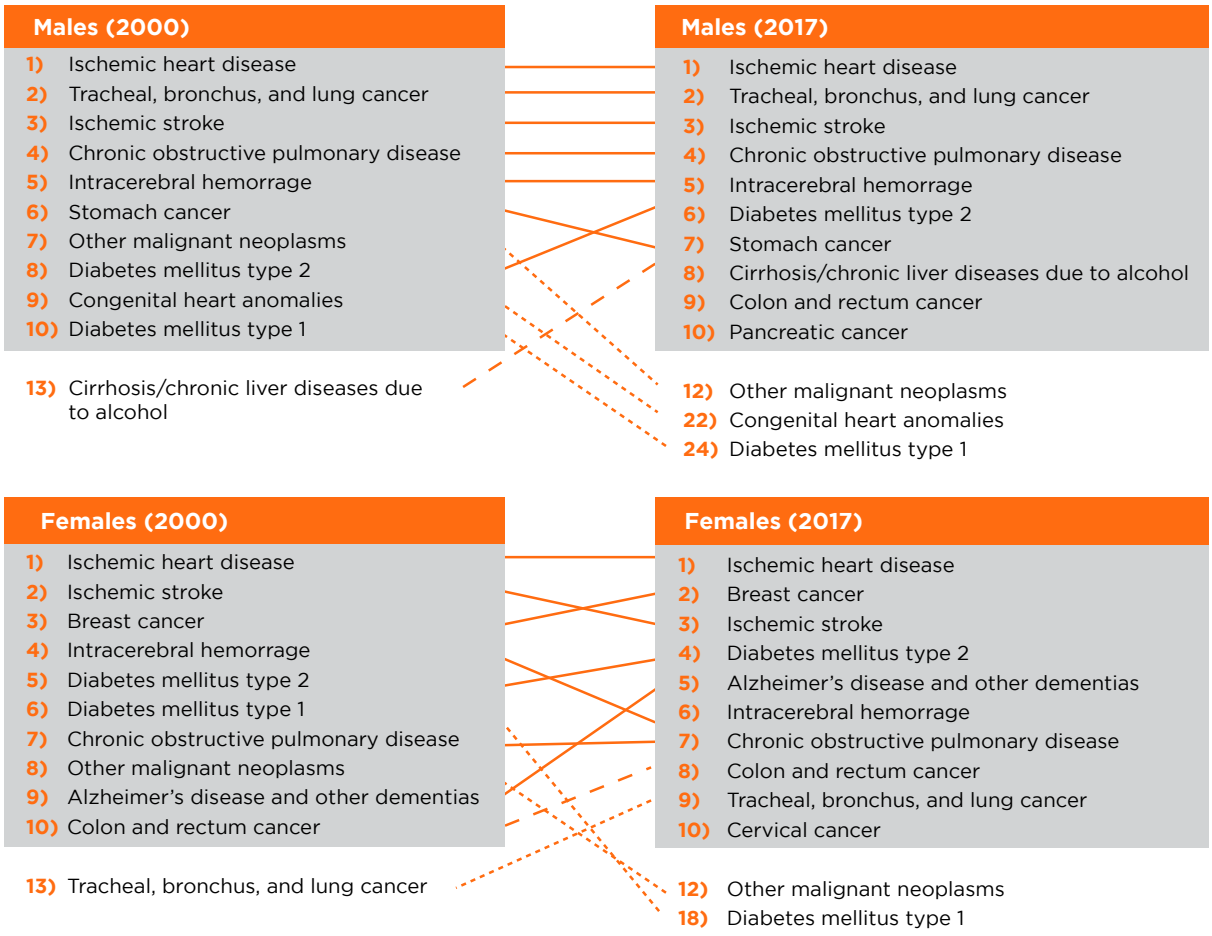
FIGURE 10 • Causes of disability which have decreased between 2008-2017, among all ages



Source: IHME

NCDs are also leading causes of YLLs or premature death in Armenia. CVDs, including ischemic heart diseases and ischemic stroke, are in the top three causes of YLLs among males and females. Between 2000 and 2017, diabetes mellitus type 2 has increased its contribution to YLLs in both genders. While YLLs due to respiratory (including lung) cancers are prevalent among males, premature death due to breast cancer is high among women (Figure 11).[38]

FIGURE 11 • NCD causes of YLLs, by gender, in 2000 and 2017



Source: IHME

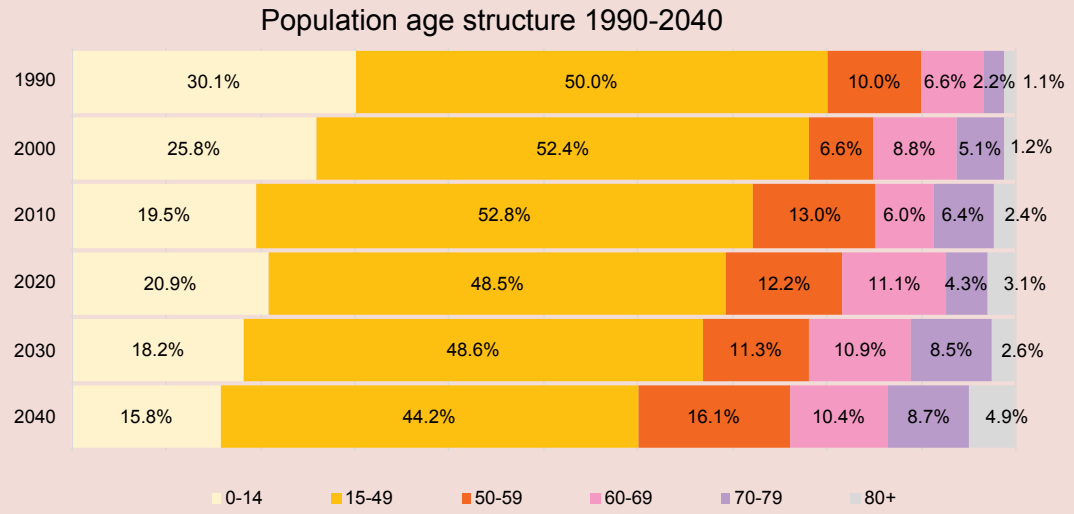
2.2. RISK FACTORS AS DRIVERS OF THE DISEASE BURDEN

A rise in NCDs' prevalence is driven by broader forces, including unplanned urbanization, unhealthy lifestyles, and population aging. These forces expose populations to the behavioral risk factors that contribute to NCDs, including unhealthy diets, physical inactivity, exposure to tobacco smoke, and alcohol's harmful use. Behavioral risk begets metabolic risk factors, including increased blood pressure, increased blood glucose, elevated blood lipids, and overweight or obesity, predicting an increased probability of developing NCDs.[39] The high prevalence of NCDs in Armenia is also driven by population aging (Box 2).[40]

Box 2 • Age structure of the population in Armenia

An examination of the evolution in population age structure from 1990 to date, and projected to 2040, highlights that the Armenian population is shrinking and aging. Armenia's population decreased from 3.54 million in 1990 to 2.96 million in 2020 and is projected to be 2.90 million in 2040. The share of children has been decreasing and is projected to reduce further. The working-age population, that is between 15 and 59 years, ranges between 60% and 65% between 1990 and 2040.

The number of adults in their 60s has increased, rising from 6.6% in 1990 to 11.1% in 2020, but is projected to stabilize going forward. The population aged 70 and above has grown from 3.3% in 1990 to 7.4% in 2020 and is projected to increase to 13.6% of the population in 2040. Hence, while in 1990, one in ten people in Armenia was aged 60 years and above, in 2040, nearly one in four Armenians will be aged 60 years and above .



Source: United Nations Population Division

For men and women alike, the metabolic risk factors, including high blood pressure and high fasting plasma glucose, are by far the most critical drivers of the burden of disease (Table 2). However, these risk factors cause more YLLs among males than females. Dietary risks, including consumption of ultra-processed foods, are the second most important risk category, with a more significant contribution to premature deaths in males than females. Smoking is the most critical risk factor for premature death among males in Armenia. Both tobacco exposure and alcohol consumption are more prevalent among males than females.

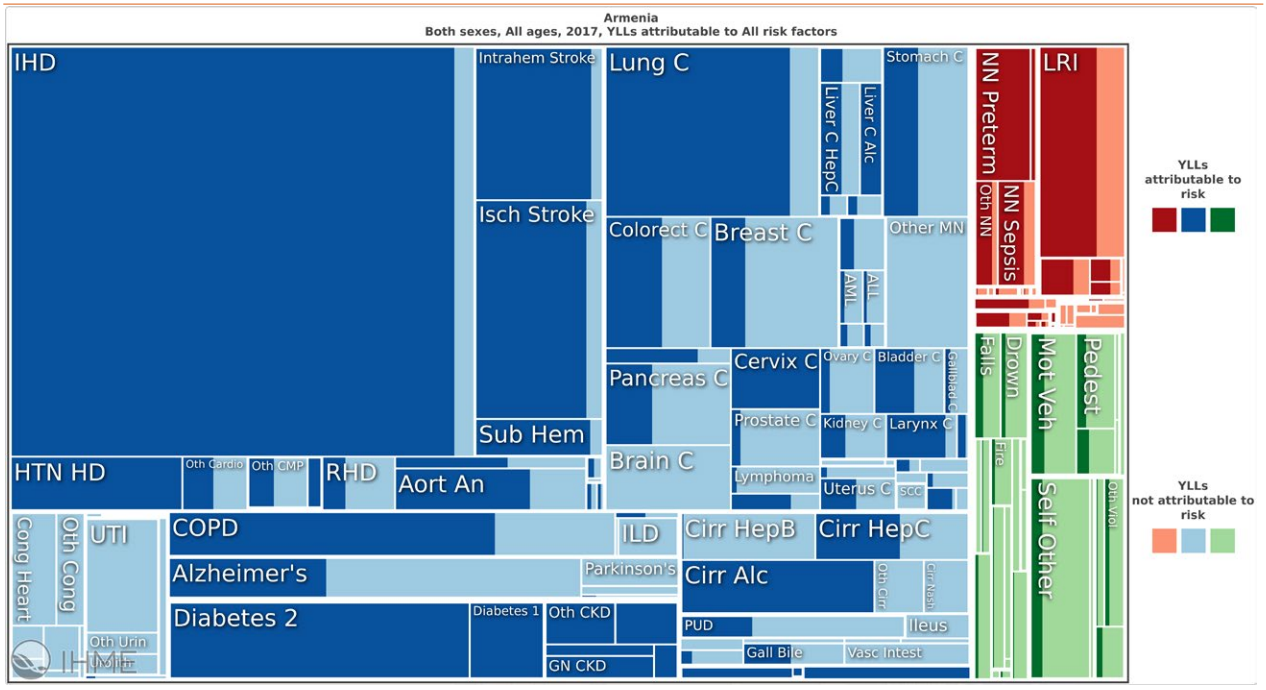
TABLE 2 • Overview of risk factors driving premature death in Armenia

RISK CATEGORY	RISK FACTORS (decreasing order of importance)	DISEASES
Metabolic risks	• High blood pressure • High fasting plasma glucose • High low-density lipoprotein • High body mass index • Impaired kidney function • Low bone mineral density	• Ischemic heart disease • Stroke • Diabetes • Chronic kidney disease • Hypertensive heart disease
Dietary risks	• Low whole grains due to (ultra)-processed foods • Low nuts and seeds • High sodium • Low fruit and legumes • Low omega 3 • Low fiber • Low polyunsaturated fatty acids, high trans fat • Sweetened beverages • Other dietary risks: low calcium, low milk, high processed meat, high red meat, and low vegetables	• Ischemic heart disease • Stroke • Diabetes • Hypertensive heart disease • Subconjunctival hemorrhage • Cancers of the lung, stomach, and colorectal
Tobacco	• Smoking • Second-hand smoke	• Lung cancer • CVDs • Chronic obstructive pulmonary disease • Cancers of the larynx, stomach, bladder, and pancreas • Lower respiratory infections
Alcohol	• Alcohol consumption	• Cirrhosis and other chronic liver diseases • Liver cancer • Cardiomyopathy • Alcohol use disorder • Contributing to other cancers, hypertensive heart disease, intracerebral hemorrhage, pancreatitis

Source: IHME

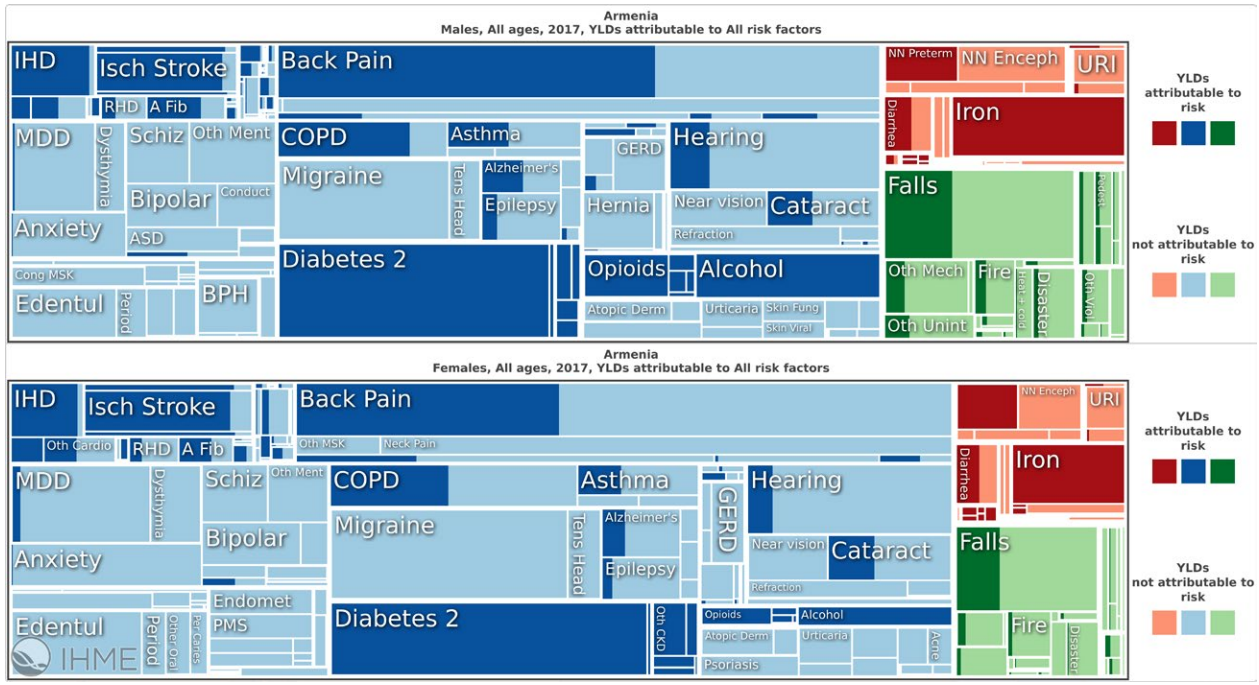
Metabolic, dietary, and other risk factors contribute significantly to YLLs from ischemic heart diseases, strokes, lung cancer, and other NCDs (Figure 12).[41] The most striking difference between males and females is the significant impact of risk factors on premature lung cancer deaths in males and cervical and breast cancer deaths in females. Exposure to risk factors contributes significantly to YLDs from diabetes mellitus type 2, back pain, and CVDs, in males and females (Figure 13).

FIGURE 12 • YLLs attributable to all risk factors in 2017, all ages



Key: Blue = NCDs, Red = Communicable, maternal, neonatal and nutritional disease, Green = Injuries
Source: IHME

FIGURE 13 •YLDs attributable to all risk factors in 2017, all ages, by gender

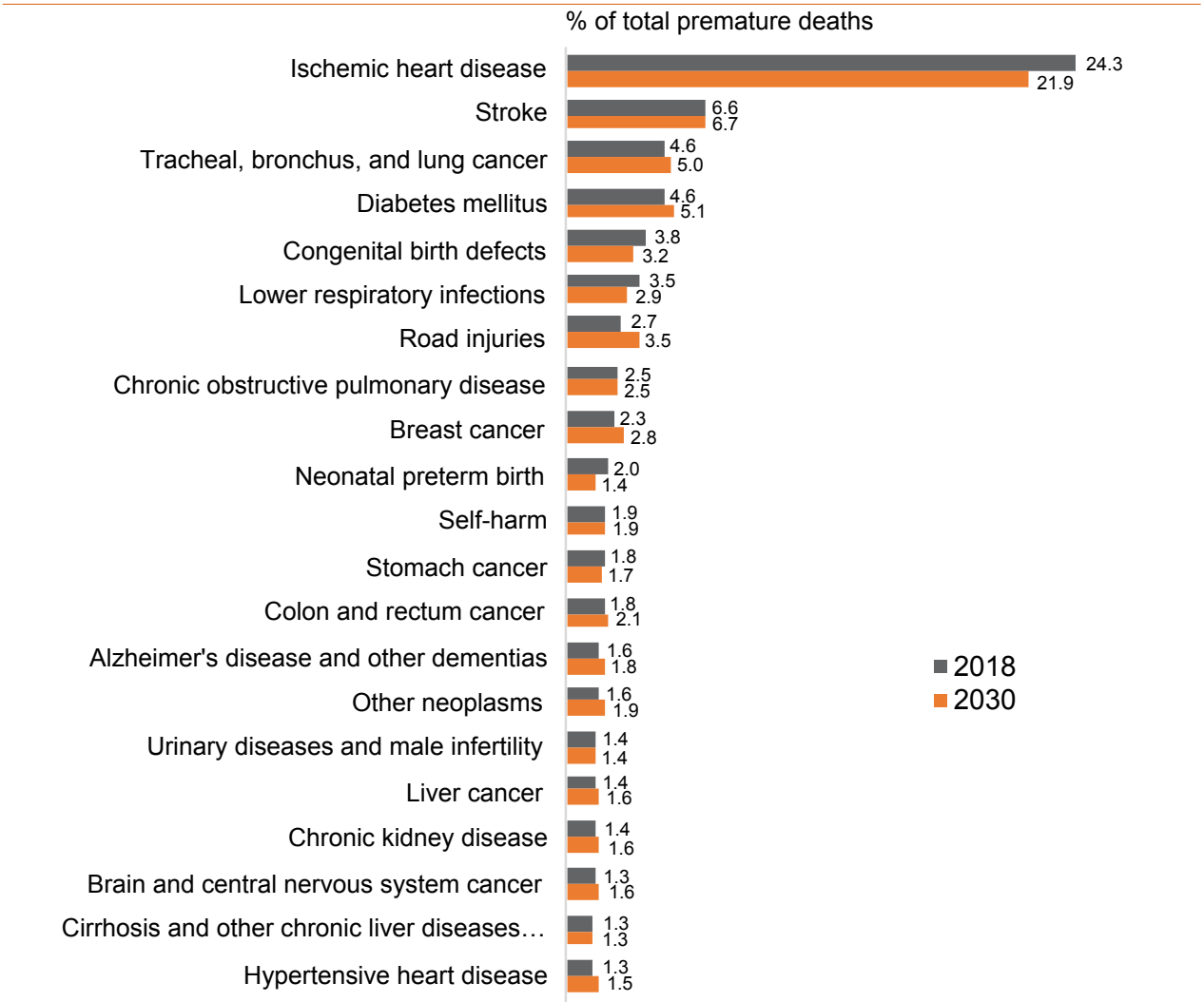


Key: Blue = NCDs, Red = Communicable, maternal, neonatal and nutritional disease, Green = Injuries
Source: IHME

2.3. PROJECTED DISEASE BURDEN IN 2030

Drawing on the IHME modeling framework, we describe projections of the YLLs up to 2030.[42] This year is when countries have committed to achieving the Sustainable Development Goals, including reducing premature mortality from NCDs and attaining UHC[43]. If current patterns persist, in 2030, the leading causes of premature death in Armenia will be similar to 2018, including ischemic heart disease, stroke, respiratory tract cancers, and diabetes mellitus (Figure 14). There will be small decreases in premature deaths due to ischemic heart diseases and most infectious diseases. In contrast, the shares of premature deaths due to diabetes, several cancers, road injuries, dementias, hypertensive heart disease, and chronic kidney diseases are expected to increase.

FIGURE 14 • Projected causes of premature mortality in 2018 and 2030



Source: IHME

CHAPTER 3. HEALTH SPENDING LEVELS AND ALLOCATIONS

KEY POINTS:

- The dominance of OOP spending as a financing source in the Armenian health care system limits opportunities for the state to improve coverage through re-allocations within the BBP.
- Between 2014 and 2018, health spending was predominantly allocated to services for NCDs, increasing from 41% to 44% of total health spending.
- Households were responsible for 84% of spending on NCDs - the share of household contribution to total health spending ranged from 0.1% for diabetes mellitus to 98% for oral diseases.

3.1. TOTAL, PUBLIC, AND PRIVATE HEALTH SPENDING

The effect of reprioritizing services within the BBP on health utilization and outcomes depends on the extent to which public health financing is a proportion of overall health spending. Public spending on health is relatively low in Armenia. Between 2014 and 2018, total health expenditure (THE) in Armenia increased from 491.5 billion to 601.9 billion Armenian Dram (AMD). However, the public sector's THE share declined from 17.4% in 2016 to 13.2% in 2018 (Table 3).[44] In contrast, the public sector THE share was 57% in UMI countries and 63% in the

WHO European region in 2017. By 2018, OOP spending was AMD 507,469.5 million, equivalent to 84.3% of THE. In contrast, OOP spending was 31% of THE in UMI countries and 30% in the WHO European region in 2017.[45]

TABLE 3 • Public health spending in Armenia, 2014 to 2018

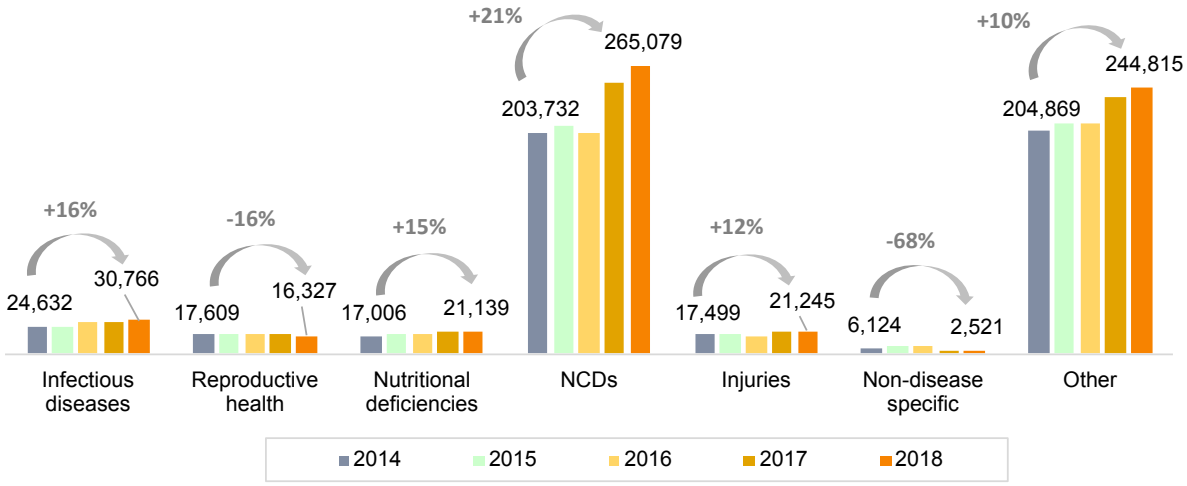
	2014	2015	2016	2017	2018
Public spending on health (million AMD)	76,596.4	85,299.1	87,930.9	81,490.0	79,678.0
Public spending on health as a percentage of THE (%)	15.6	16.7	17.4	14.1	13.2

Sources: 2014-2017 data from 2018 National Health Accounts (NHA); 2018 data from 2020 NHA data tables.

3.2. ALLOCATIONS BY DISEASE GROUP

We examined if health spending patterns align with the disease burden in the population. Overall, NCDs dominate health spending, in line with the disease burden and population health needs. Between 2014 and 2018, health spending was predominantly allocated to NCD services, increasing from 41% to 44% of THE, and representing an inflation-adjusted increase of 21% (Figure 15). Over the same period, inflation-adjusted spending also increased for infectious diseases by 16% and nutritional deficiencies by 15%, whereas funding for reproductive health fell by 16%.

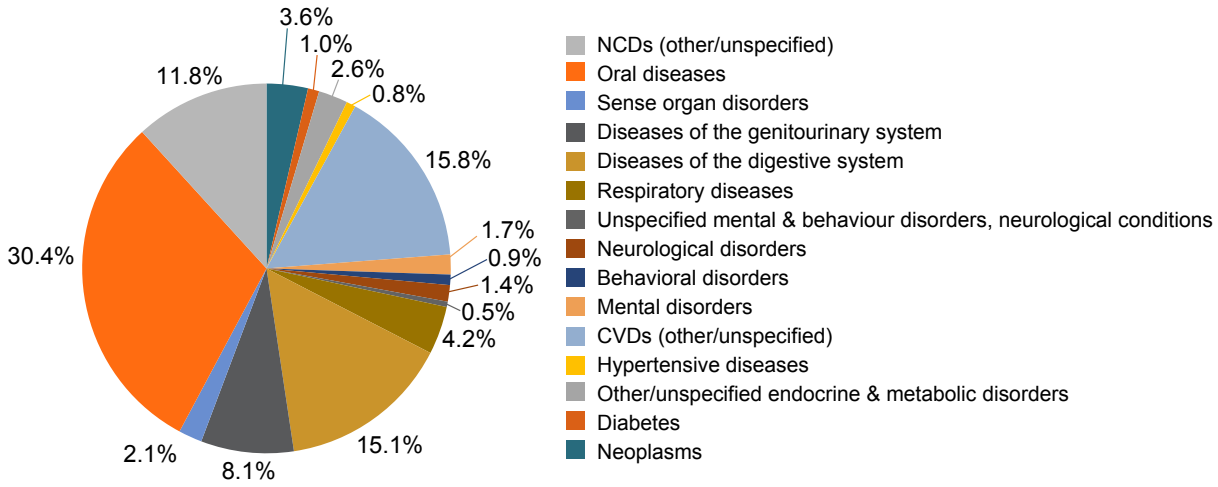
FIGURE 15 • Percent inflation-adjusted change in annual health financing (millions AMD) by disease group, 2014 -2018



Sources: 2018 data from 2020 NHA, SHA, household surveys

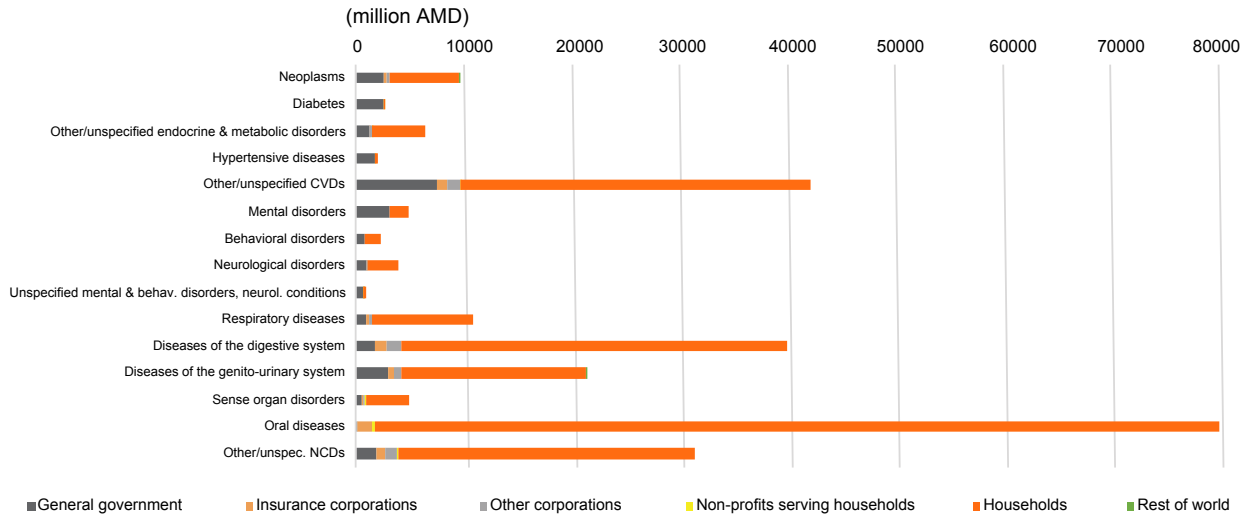
In 2018, most NCD spending was allocated to oral diseases (30.4%), CVDs (15.8%), and diseases of the digestive system (15.1%) (Figure 16). Households were responsible for 84% of spending on NCDs on average (Figure 17). The share of household contribution to THE ranged from 0.1% for diabetes mellitus to 98% for oral diseases, reflecting variation in public funding for these services. As a proportion of THE, public spending was the largest for diabetes mellitus (99%). Household spending as a proportion of THE was also high for digestive system disorders (90%) and cancers (68%) but is much lower for mental health disorders (33%) and hypertensive disorders (11%).

FIGURE 16 • Spending on NCDs in Armenia in 2018



Source: 2018 data from 2020 NHA

FIGURE 17 • Spending on NCDs by financing scheme in 2018



Source: 2018 data from 2020 NHA

CHAPTER 4. OPTIMIZING BBP RESOURCE ALLOCATIONS

KEY POINTS:

- The cardiovascular package received the highest allocation in the actual and optimized 2019 budgets. Following optimization, the musculoskeletal and cancer packages received significant increases in funding given their contribution to averting DALYs through cost-effective interventions.
- Optimizing resource allocation within the 2019 budget would have averted an additional 10,600 DALYs if potential increases in intervention coverage (utilization rates) were limited or 31,400 DALYs with unlimited increases in intervention coverage.
- When a higher budget, 40% above 2019, was optimized, there was an increase in spending on the following packages: cardiovascular, musculoskeletal, cancer, surgery, mental health, palliative care, pandemics and rehabilitation, and an additional 15,000 DALYs were averted.
- At the intervention level, optimizing spending within the 2019 budget led to significant changes in spending patterns, including increased spending on physiotherapy, school-based human papilloma virus vaccination for girls, and long-term management of cardiovascular diseases.

4.1. MATHEMATICAL OPTIMIZATION STEPS

The HIPtool receives as an input for the mathematical optimization, data from the Disease Control Priorities 3rd Edition (DCP3) project on Essential Universal Health Coverage (EUHC) interventions grouped into 21 packages, including services for prevention, diagnosis, treatment, rehabilitation, epidemic preparedness, environmental health, and mass media communication. This analysis involved the mapping of the approximately 3,700 services in the Armenia BBP to the EUHC interventions within the DCP3 project (Figure 18), parametrization of the HIPtool, validation the data inputs, and implementation of the mathematical optimization. The mapping process resulted in 135 Armenian Universal Health Coverage (AUHC) interventions (or groups of services) that were included in the mathematical optimization. The AUHC interventions were organized into 19 DCP3 packages.

FIGURE 18 • Matching the BBP and EUHC interventions

	DCP3/HIPtool	MAPPING PROCESS	Armenia application		DCP3/HIPtool	
	EUHC intervention		BBP services	BBP codes	AUHC intervention	Package
AUHC intervention = EUHC intervention	Appendectomy		Laparoscopic appendectomy (GP)	1100701 2100701 1700015	Appendectomy	Surgery
			Appendectomy	1100700 2100700 1700014		
AUHC intervention = modified EUHC intervention	Universal newborn screening for congenital endocrine/metabolic disorders that have high incidence and for which long-term treatment is feasible in limited resource settings		Screening for hypothyroidism	0901410	Universal newborn screening for congenital endocrine or metabolic disorders	Congenital Disorders
			Determining phenylalanine in blood during screening for phenylketonuria	0901421		
			Service of screening for phenylketonuria	0901422		
			Determining phenylalanine in blood	0901420		
AUHC intervention combining EUHC interventions	Tubal ligation		Gynecology /adult	205000	Gynecological operations	Reproductive Health; Survey
	Surgery for ectopic pregnancy		Gynecology /adult	301294		Maternal & Newborn Health; Survey

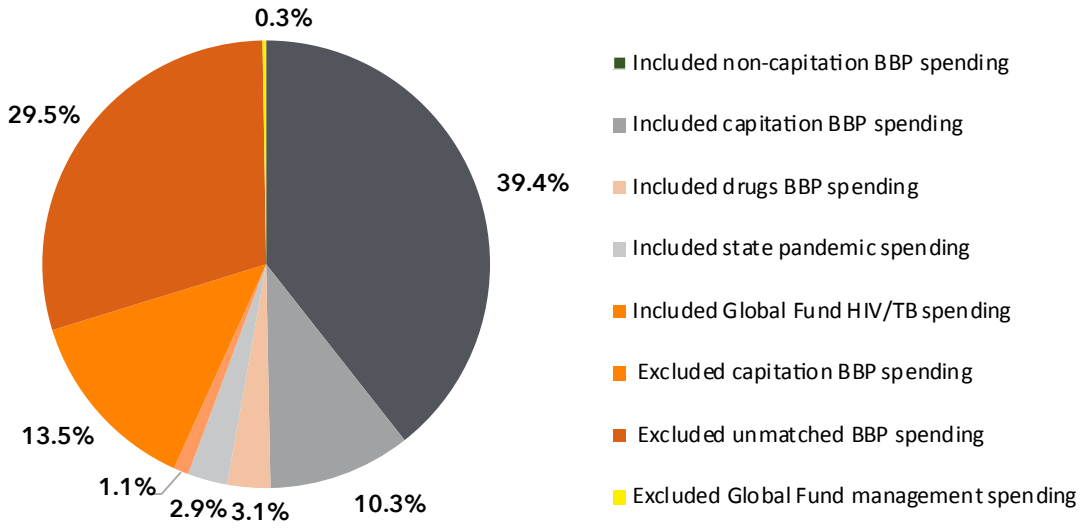
We review the analytical steps to parametrize the HIPtool and validate inputs below. These steps are described in detail in Annex 2.

1. Grouping services in the Armenia BBP into EUHC Interventions and defining AUHC interventions;
2. Estimating the annual AUHC intervention need and eligibility using national clinical guidelines and disease burden data;
3. Estimating the annual effective AUHC intervention coverage, that is the proportion of the Armenian population in need of or eligible for an AUHC intervention that used the intervention;
4. Validating estimates of AUHC intervention effective coverage against claims for services within the BBP and through national expert consultations;

5. Calculation of total annual AUHC intervention spending and spending per person, including spending through capitation, other BBP codes, on public health, and via the Global Fund;
6. Validation of the relationship between disease burden, spending, and impact, and application of a 30% reduction to incremental cost-effectiveness ratios (ICERs) to adjust for actual implementation conditions;
7. Review of equity and financial risk protection scores, where higher equity scores reflect social groups identified in regulation as priority for coverage in Armenia, and higher financial risk protection scores were assigned based on the likelihood of impoverishing or catastrophic health expenditure in the absence of public financing for an AUHC intervention.
8. Aggregation of model outputs for AUHC interventions by DCP3 package for mathematical optimization.

The AUHC interventions represent total spending of AMD 45.9 billion in 2019 (Figure 19). Of this amount, AMD 45.0 billion was government expenditure, and the remainder was HIV/TB intervention funding from the Global Fund, amounting to AMD 885 million. The government expenditure considered in the optimization is equivalent to 56.4% of public health spending in 2019. The optimization excludes expenditure that could not be mapped to the EUHC interventions, including AMD 10.9 billion of capitation spending (out of total capitation spending of AMD 19.2 billion); and AMD 23.9 billion spending on other, unmatched BBP codes (out of AMD 55.7 billion). The optimization also excludes AMD 213 million of Global Fund intervention spending (out of the total of AMD 1.1 billion) allocated to management, monitoring, and evaluation.

FIGURE 19 • State and Global Fund spending considered in the optimization analysis



Sources: SHA, NHA, Global Fund

Chapter 4 summarizes results from the mathematical optimization in three Scenarios. In the first two Scenarios, results are aggregated at the DCP3 package level in which health, equity, and financial risk protection are equally weighted. In Scenario 1, we optimized spending within the 2019 budget to explore the implications of limiting the increases in AUHC intervention coverage or utilization rates on reallocations across interventions. In Scenario 2, we compared optimization in the 2019 budget with a hypothetical budget that is 40% higher to explore the implications of increased public spending on health on reallocations across interventions. The hypothetical 40% increase in public spending for health was defined in discussion with the MoH and represents an increase in the percentage of the government expenditure allocated to health from 5.27% to 8.00%, which is comparable to the ECA regional mean. In Scenario 3, we compared a model with a higher weighting for CE, relative to equity and financial risk protection, to another model with equal weights for these factors. Scenario 3 reviews reallocations at the AUHC intervention, rather than the package level. This analysis is not without limitations arising from the static nature of the HIPtool and challenges arising from the Armenian context (Box 3)

Box 3 • Limitations of the analysis

A. LIMITATIONS OF THE HIPTOOL FOR SPENDING OPTIMIZATION

1. The HIPtool adopts a health system perspective and is unable to capture trade-offs in allocations across sectors. For example, effects such as gains in productivity or school attendance would not be captured.
2. The optimization algorithm simplifies the complex interactions between causes of disability and death and health interventions and does not consider synergies between interventions. The tool has also been designed to use data that is available in most contexts.
3. The HIPtool does not account for disease progression or infectiousness which is of critical importance for diseases like HIV and TB. Instead, it builds on the best projections of the disease burden and studies of intervention effects in terms of DALYs averted.
4. In the tool, outcome consideration is static with a strong emphasis on current health gains. However, most current health gains, particularly derived from preventive interventions, can have long term health value.
5. The analysis does not include an inbuilt time dimension. However, users can introduce a time dimension to the optimization by constraining the increase in intervention coverage to what is feasible in the short versus long term.
6. The version of the HIPtool used in this study was designed for health systems of low- and lower-middle income countries. About 10% of interventions are only applicable to settings with a high infectious disease burden. Countries further along the epidemiological transition and with different health benefits package require modifications to adapt the tool.

B. LIMITATIONS ARISING FROM THE ARMENIAN CONTEXT

1. Armenia's complex BBP was challenging to match to pre-defined intervention categories in the HIPtool. The cross-walking of the two taxonomies did not produce perfect overlaps between BBP codes and HIPtool interventions.
2. The BBP database reflects claims and not patients, while the HIPtool is based on service delivery per patient and year. Hence, assumptions were made to translate claims in the BBP to intervention coverage per patient, including for repeat claims by the same patients. This was facilitated by triangulation of BBP data with NIH morbidity statistics.
3. The per-capita payment system aggregates services at the PHC level within the BBP and made matching individual interventions difficult. Assumptions were made on spending, unit price, and intervention coverage estimations.
4. For BBP codes that overlapped with multiple HIPtool interventions, assumptions were made where there was no data to inform these distributions. This applied to provision of free drugs to adults and children, rehabilitation treatment at hospitals and health resorts, and conservative care in general medicine and surgical units.
5. In Armenia, the population in need of screening and treatment services for a specific condition do not always overlap. Hence, parametrizing AUHC interventions that combined screening and treatment was challenging.
6. Many AUHC interventions are delivered at multiple service delivery levels (e.g. PHC and regional hospitals) in Armenia and could not be assigned to a specific delivery level as specified in the tool. Also, some EUHC interventions are provided on schools or community-based platforms which does not match with the health system funded delivery platforms in Armenia.
7. There is limited local data on CE in Armenia. ICERs from the DCP3 project were used, adjusted to 2019 prices in AMD. For some ICER values which seemed extremely low for the Armenia context, alternative values were identified from the literature. However, the ICER values used may not reflect the true CE of the respective intervention in Armenia.

4.2. SCENARIO 1: CHANGES IN AUHC INTERVENTION COVERAGE LIMITS

In Scenario 1, we identified if there were health gains to optimizing resource allocations within the 2019 budget, with equal weights given to CE, equity, and financial protection. We compared a model that placed limits on potential increases in intervention coverage (limited intervention coverage increases) to a model that did not limit potential increases in intervention coverage (unlimited intervention coverage increases). For the limited intervention coverage increase model, the rise in intervention coverage or utilization rates was restricted to 10%, which was considered realistic for programmatic scale up of an intervention over a one-year horizon. In contrast, the unlimited intervention coverage increase model provided a proxy for potential increases in utilization rates in the long term, where larger resource shifts and major investments may be feasible to maximize health. For interventions with high baseline intervention coverage, we assumed an increase to 95% (if baseline intervention coverage was 90 to 94%) and an increase to 100% (if baseline intervention coverage was 95% or above). However, for three child delivery interventions (C3 for low-risk women, FLH8 for assisted vaginal delivery, and FLH32 for complicated delivery) the baseline intervention coverage exceeded 97% and was held constant. The three diagnostic pathology interventions were also held fixed in terms of spending and intervention coverage.

The CVD package received the highest allocation in 2019 and after the optimization (Figure 20 and Table 4). In both models with limited and unlimited intervention coverage increases, the largest percentage increases in spending were accrued by the musculoskeletal and cancer packages, all of which respond to causes that are significant contributors to the burden of disease. Increasing funding to the palliative care package by 44% was consistent with maximizing health benefits in the limited intervention coverage increase model. However, where there were no limitations on potential intervention coverage increases, the package was unfunded within the 2019 budget as some other, highly CE interventions were prioritized instead. In the absence of higher equity scores for packages targeting priority groups, such as maternal and newborn health, and given the high baseline coverage of some interventions, the optimized models reduced spending on these packages overall.

FIGURE 20 • Scenario 1 –changes in intervention coverage limits

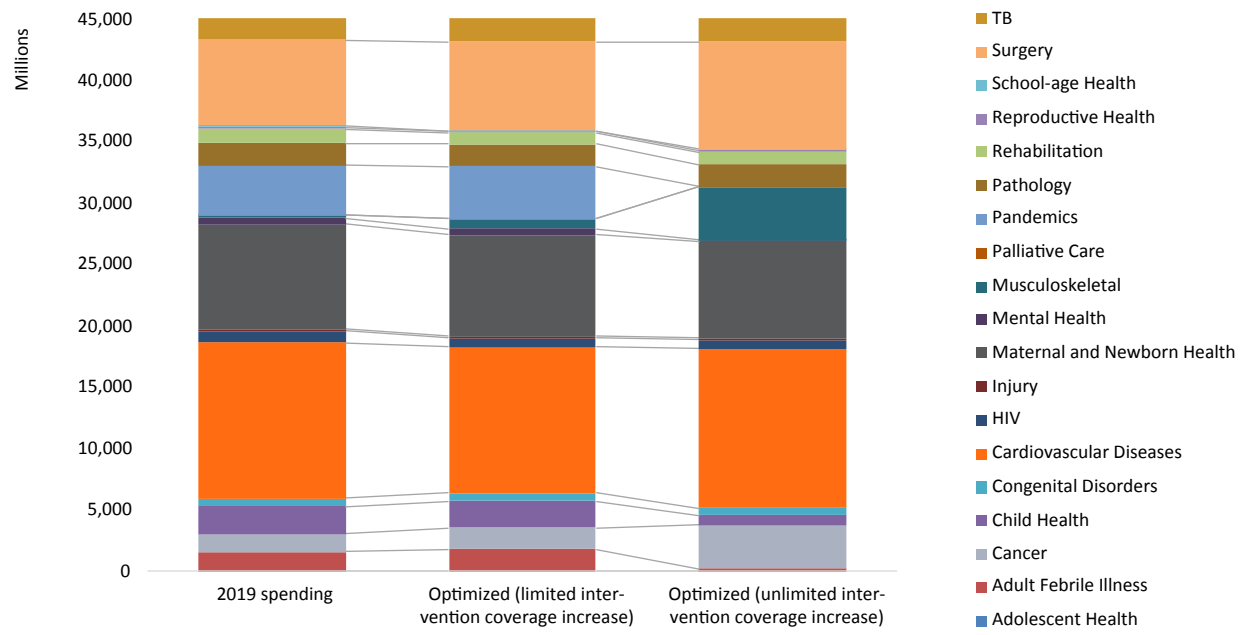


TABLE 4 • Scenario 1 –changes in intervention coverage limits

		Limited intervention coverage increase		Unlimited intervention coverage increase	
DCP3 PACKAGE	**2019 spending**	**Optimized spending**	**Change**	**Optimized spending**	**Change**
Adolescent Health	0	0	-	0	-
Adult Febrile Illness	1,621,509,526	1,803,300,705	11.2%	194,589,759	-88.0%
Cancer	1,404,700,550	1,777,080,768	26.5%	3,574,544,647	154.5%
Child Health	2,301,608,907	2,186,884,278	-5.0%	816,656,073	-64.5%
Congenital Disorders	643,181,101	614,309,368	-4.5%	605,081,707	-5.9%
Cardiovascular Diseases	12,680,248,794	11,946,908,597	-5.8%	12,983,195,468	2.4%
HIV*	935,071,431	675,548,184	-27.8%	669,523,014	-28.4%
Injury	143,199,342	160,822,184	12.3%	160,822,184	12.3%
Maternal and Newborn Health	8,581,023,934	8,280,198,387	-3.5%	7,899,053,886	-7.9%
Mental Health	490,134,063	520,669,370	6.2%	118,312,782	-75.9%
Musculoskeletal	236,526,953	776,344,574	228.2%	4,336,491,966	1733.4%
Palliative Care	8,929,721	12,834,016	43.7%	-	-100.0%
Pandemics	4,032,111,075	4,243,860,621	5.3%	-	-100.0%
Pathology	1,827,255,057	1,827,255,057	-	1,827,255,057	-
Rehabilitation	1,190,748,627	942,061,686	-20.9%	981,085,724	-17.6%
Reproductive Health	152,325,645	83,188,785	-45.4%	172,156,489	13.0%
School-age Health	83,559,801	42,498,107	-49.1%	50,278,747	-39.8%
Surgery	6,969,359,219	7,337,633,383	5.3%	8,842,350,744	26.9%
TB*	2,569,772,698	2,639,868,170	2.7%	2,639,868,170	2.7%
Grand Total	**45,871,266,445**	**45,871,266,240**	**0.0%**	**45,871,266,417**	**0.0%**

Note: Change is relative to estimated 2019 spending (baseline)
* Note the specific limitations of the static HIPtool for infectious disease program allocations

The estimated health impact of these reallocations is shown in Figure 21. From a baseline of 120,000 averted DALYs in 2019, the limited and unlimited intervention coverage increase models averted an additional 10,600 DALYs (9% higher than 2019) and 31,400 DALYs, respectively (26% higher than 2019). In the limited coverage model, there was an increase in averted DALYs. This increase occurs even in packages without increasing spending due to re-allocations across interventions within packages (Table 5). Removing restrictions on the increases in coverage was associated with a fall in averted DALYs in some packages with decreased spending, including among priority groups, such as the package for maternal and newborn health. This scenario illustrates the importance of balancing considerations for health and budgetary impact with equity and the social importance of ensuring coverage among specific groups.

FIGURE 21 • Scenario 1 – health impact of reallocated spending

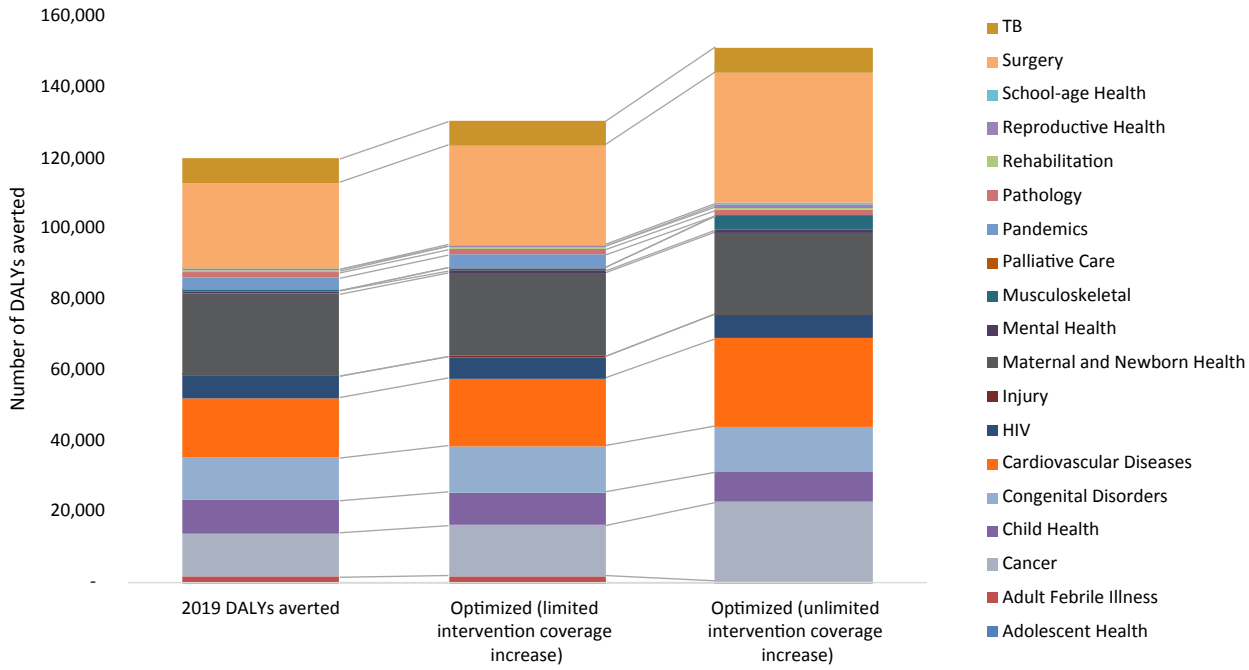


TABLE 5 • Scenario 1 – DALYs averted across packages

	2019 (baseline)	Limited intervention coverage increase		Unlimited intervention coverage increase	
DCP3 PACKAGE	**DALYs averted**	**Optimized DALYs averted**	**Change**	**Optimized DALYs averted**	**Change**
Adolescent Health	-	-	-	-	-
Adult Febrile Illness	1,802	1,960	8.7%	568	-68.5%
Cancer	12,397	14,366	15.9%	22,412	80.8%
Child Health	9,156	9,427	3.0%	8,500	-7.2%
Congenital Disorders	12,157	13,042	7.3%	12,856	5.7%
Cardiovascular Diseases	16,912	18,969	12.2%	24,822	46.8%
HIV	6,158	6,185	0.4%	6,737	9.4%
Injury	149	167	12.4%	167	12.4%
Maternal and Newborn Health	23,087	23,325	1.0%	22,995	-0.4%
Mental Health	596	743	24.8%	863	44.8%
Musculoskeletal	404	896	121.8%	3,977	884.1%
Palliative Care	8	11	43.7%	-	-100.0%
Pandemics	3,489	3,672	5.3%	-	-100.0%
Pathology	1,485	1,485	-	1,485	-
Rehabilitation	601	815	35.7%	849	41.3%
Reproductive Health	373	390	4.6%	820	119.8%
School-age Health	82	95	16.3%	290	254.6%
Surgery	24,233	28,113	16.0%	37,085	53.0%
TB	6,932	7,026	1.4%	7,026	1.4%
Grand Total	**120,020**	**130,687**	**8.9%**	**151,449**	**26.2%**

Note: Change is relative to estimated 2019 (baseline)

4.3. SCENARIO 2: CHANGES IN PUBLIC SPENDING ON HEALTH

In Scenario 2, we explored the implications of increased public spending on health for optimizing allocations in the package. We compared optimal allocations in the 2019 budget and a hypothetical higher budget, that was funded at 37.9% above the 2019 level. The higher budget was decided in discussion with the MoH as a hypothetical increase of the allocation to health from 5.8% to 8.0% of the 2019 state budget. This increase was defined by benchmarking public spending on health in Armenia to comparator countries in the region. In all the models, equal weights were given to CE, equity, and financial protection and there were no limits to potential increases in intervention coverage. However, for three child delivery interventions (C3 for low-risk women, FLH8 for assisted vaginal delivery, and FLH32 for complicated delivery) the baseline intervention coverage exceeded 97% at baseline and was held constant. The three diagnostic pathology interventions whose intervention coverage were held fixed in Scenario 1, had their spending and intervention coverage scaled up by 37.9% in the higher budget.

The CVD package receives the highest allocation in the actual 2019 budget, optimized 2019 budget, and optimized higher budget. With increased funding under the higher budget, packages with no or low funding in the optimized 2019 budget were also scaled up, including mental health, palliative care, pandemics, rehabilitation (Figure 22). Prioritized packages under the 2019 budget also received more funding under the higher budget, including the packages for surgery, musculoskeletal disorders, and cancers. In absolute terms, the additional funding under the optimized higher budget, compared to the optimized 2019 budget, was as follows: cardiovascular package (AMD 5.4 billion), the musculoskeletal package (AMD 4.6 billion), surgery (AMD 2.7 billion), rehabilitation (AMD 2.6 billion) and cancer (AMD 2.4 billion) if the higher budget was available (Table 6).

FIGURE 22 • Scenario 2 – changes in public health spending

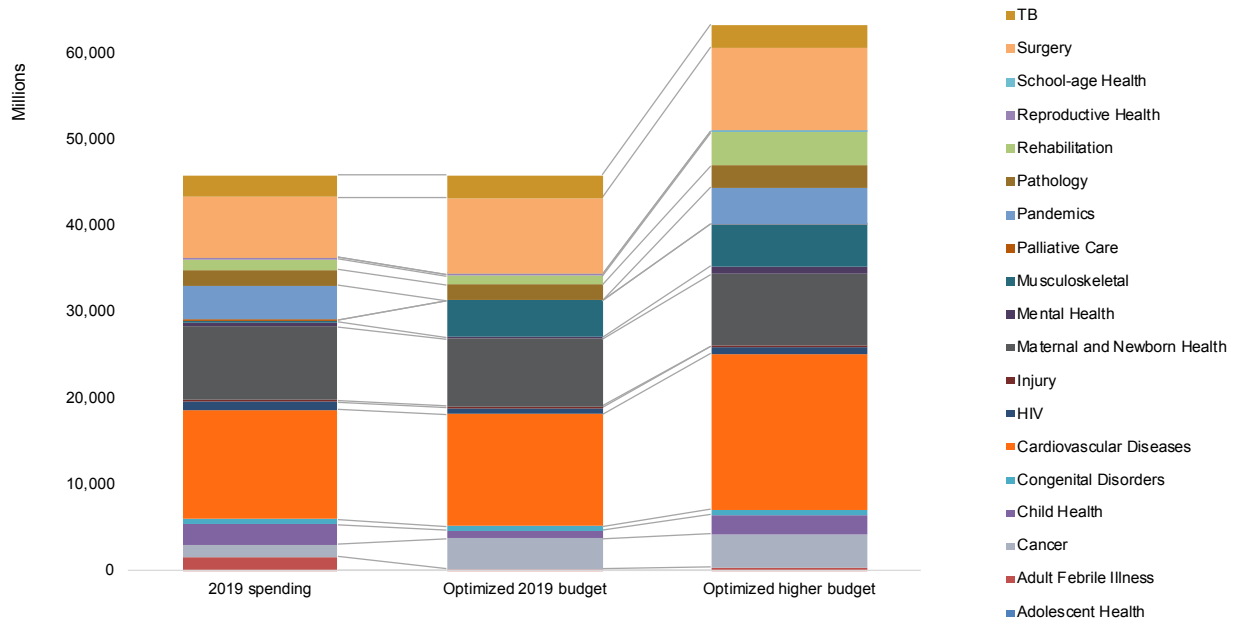


TABLE 6 • Scenario 2 – implications of changes in public health spending

		Unlimited intervention coverage increase			
DCP3 PACKAGE	**2019 spending (AMD)**	**Optimized 2019 spending**	**Change**	**Optimized higher spending**	**Change**
Adolescent Health	0	-	-	0	-
Adult Febrile Illness	1,621,509,526	194,589,759	8.7%	415,907,801	-74.4%
Cancer	1,404,700,550	3,574,544,647	15.9%	3,783,377,662	169.3%
Child Health	2,301,608,907	816,656,073	3.0%	2,216,612,453	-3.7%
Congenital Disorders	643,181,101	605,081,707	7.3%	605,081,707	-5.9%
Cardiovascular Diseases	12,680,248,794	12,983,195,468	12.2%	18,094,448,434	42.7%
HIV*	935,071,431	669,523,014	0.4%	785,063,464	-16.0%
Injury	143,199,342	160,822,184	12.4%	160,822,184	12.3%
Maternal and Newborn Health	8,581,023,934	7,899,053,886	1.0%	8,280,198,387	-3.5%
Mental Health	490,134,063	118,312,782	24.8%	971,213,986	98.2%
Musculoskeletal	236,526,953	4,336,491,966	121.8%	4,857,897,451	1953.8%
Palliative Care	8,929,721	-	43.7%	33,368,442	273.7%
Pandemics	4,032,111,075	-	5.3%	4,240,948,403	5.2%
Pathology	1,827,255,057	1,827,255,057	-	2,519,784,724	37.9%
Rehabilitation	1,190,748,627	981,085,724	35.7%	3,804,568,660	219.5%
Reproductive Health	152,325,645	172,156,489	4.6%	172,156,489	13.0%
School-age Health	83,559,801	50,278,747	16.3%	50,278,747	-39.8%
Surgery	6,969,359,219	8,842,350,744	16.0%	9,624,879,079	38.1%
TB*	2,569,772,698	2,639,868,170	1.4%	2,639,868,170	2.7%
Grand Total	**45,871,266,445**	**45,871,266,417**	**8.9%**	**63,256,476,244**	**37.9%**

Note: Change is relative to estimated 2019 spending
* Note the specific limitations of the static HIPtool for infectious disease program allocations

Compared to the optimized 2019 budget, optimized allocations within the higher budget averted an additional 15,000 DALYs (Table 7). At the higher budget, all but one package (adult febrile illness) had higher averted DALYs than under the optimized 2019 budget. Funding allocated to the package fell by 74.4% relative to the estimated 2019 baseline spending. The 37.9% higher budget, allocated optimally, averted an additional 38.7% DALYs above the actual allocations in 2019. An additional 26.2% of DALYs were averted within the 2019 budget if optimally allocated (Figure 23).

FIGURE 23 • Scenario 2 – health impact of reallocated spending

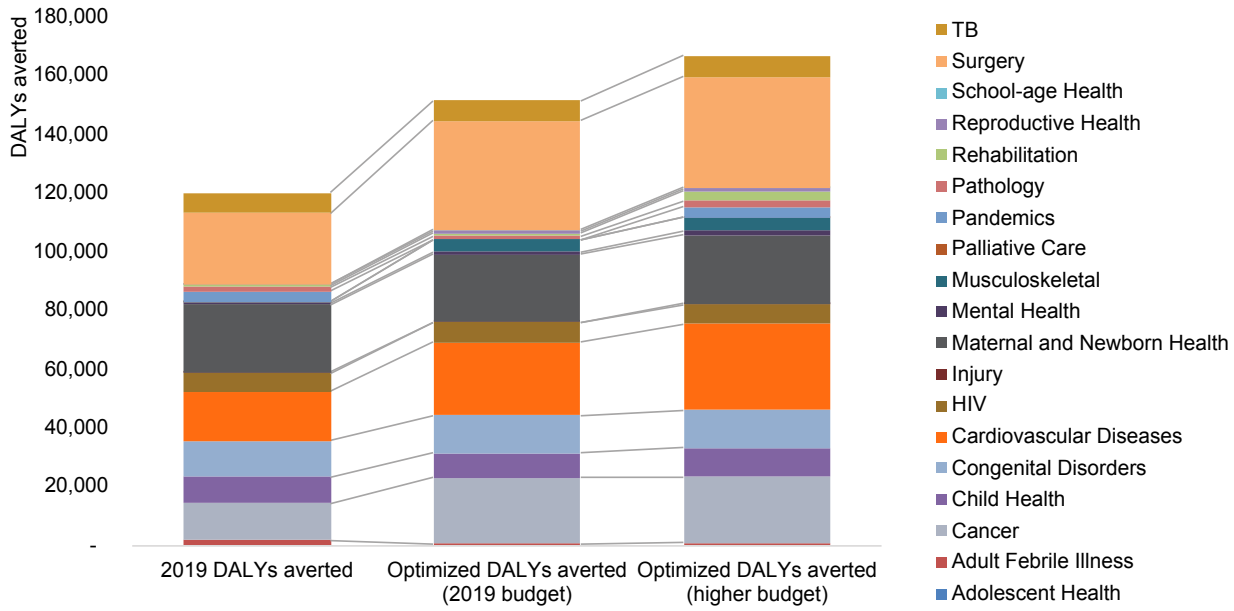


TABLE 7 • Scenario 2 – DALYs averted across packages

		Unlimited intervention coverage increase			
DCP3 PACKAGE	**DALYs averted**	**Optimized DALYs averted**	**Change**	**Higher budget: Optimized DALYs averted**	**Change**
Adolescent Health	-	-	-	-	-
Adult Febrile Illness	1,802	568	-68.5%	759	-57.9%
Cancer	12,397	22,412	80.8%	22,581	82.1%
Child Health	9,156	8,500	-7.2%	9,796	7.0%
Congenital Disorders	12,157	12,856	5.7%	12,856	5.7%
Cardiovascular Diseases	16,912	24,822	46.8%	29,188	72.6%
HIV	6,158	6,737	9.4%	6,837	11.0%
Injury	149	167	12.4%	167	12.4%
Maternal and Newborn Health	23,087	22,995	-0.4%	23,325	1.0%
Mental Health	596	863	44.8%	1,589	166.7%
Musculoskeletal	404	3,977	884.1%	4,428	995.8%
Palliative Care	8	-	-100.0%	29	273.7%
Pandemics	3,489	-	-100.0%	3,670	5.2%
Pathology	1,485	1,485	-	2,047	37.9%
Rehabilitation	601	849	41.3%	3,292	448.1%
Reproductive Health	373	820	119.8%	820	119.8%
School-age Health	82	290	254.6%	290	254.6%
Surgery	24,233	37,085	53.0%	37,762	55.8%
TB	6,932	7,026	1.4%	7,026	1.4%
Grand Total	**120,020**	**151,449**	**26.2%**	**166,461**	**38.7%**

Note: Change is relative to estimated 2019 (baseline)

4.4. SCENARIO 3: CHANGES IN RELATIVE CE, EQUITY, AND FINANCIAL RISK PROTECTION WEIGHTS

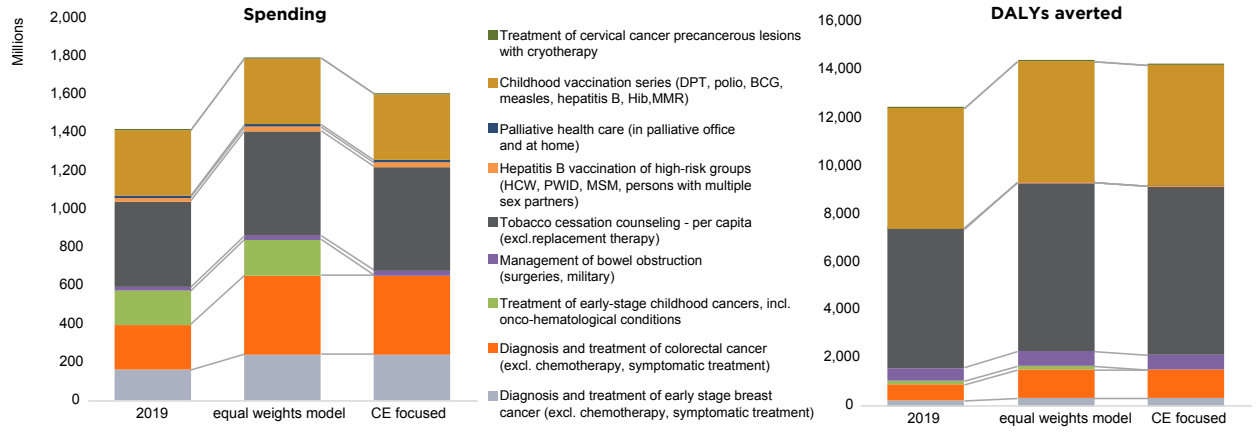
In Scenario 3, we identified if there were health gains to optimizing resource allocations within the 2019 budget, varying the weights given to CE, equity, and financial protection. Akin to Scenarios 1 and 2, in the equal weights model, the weights were 0.33: 0.33: 0.33. In this analysis, we illustrate the implications of increased weighting to CE (CE-focused model), and thus, reducing priority for equity and financial risk protection (0.80: 0.10: 0.10). All models included limits on potential increases in intervention coverage. For most interventions, the rise in intervention coverage was restricted to 10%, considered realistic over a one-year horizon. However, for interventions with high baseline coverage, we assumed an increase to 95% (if baseline intervention coverage was 90 to 94%) and an increase to 100% (if baseline intervention coverage was 95% or above). For the three child delivery interventions (C3 for low-risk women, FLH8 for assisted vaginal delivery, and FLH32 for complicated delivery) the coverage exceeded 97% at baseline and was held constant. Coverage was again held fixed for the three diagnostic pathology interventions. In this scenario, we discuss intervention-level changes in resource allocations. Public health spending and DALY impact of interventions which belonged to more than one DCP3 package were split equally across packages.

4.4.1. Cancer and Palliative Care Interventions

In the optimized, equal weights model, the optimization algorithm allocated most spending to tobacco cessation counseling at the PHC level and childhood vaccination. A proportion is allocated to the cancer package (Figure 24). Relative to 2019 spending, optimization led to a doubling of spending on the diagnosis and treatment of colorectal cancer. Optimization also led to a 50% increase in spending on (i) diagnosing and treating early-stage breast cancer, (ii) cryotherapy for precancerous cervical lesions, and (iii) palliative health care in palliative offices and at home. All interventions gained funding in the optimized spending, except the treatment of early-stage childhood cancers in the CE-focused model.

Spending on tobacco cessation counseling and childhood immunization resulted in the most averted DALYs in the 2019 baseline and the optimized allocation. For tobacco cessation counseling, 5,790 DALYs were averted in the 2019 baseline and 7,020 in the optimized allocation. For childhood immunization, 5,000 were averted in the 2019 baseline and 5,040 in the optimized allocation. Increased spending on diagnosing and treating colorectal cancer also resulted in higher averted DALYs (680 at baseline and 1,200 in the optimized allocation). The cancer diagnosis and treatment interventions did not include chemotherapy and symptomatic treatment, which may lower the estimates of averted DALYs. Relative to the model with equal weights, the CE-focused model reduced funding for and averted DALYs that accrue to the treatment of early-stage childhood cancers (Figure 24).

FIGURE 24 • Optimized resource allocations to cancer and palliative care package

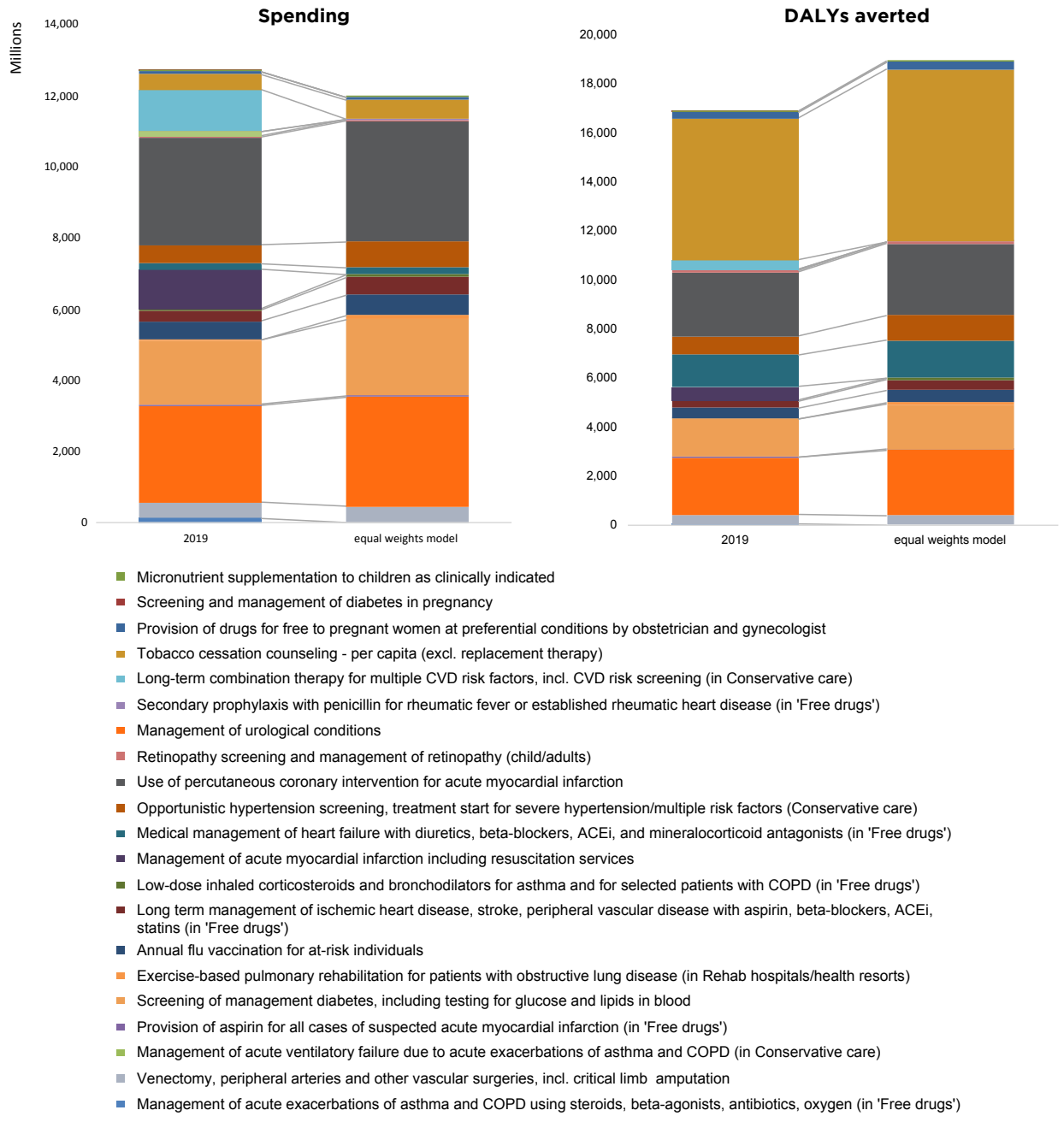


4.4.2. Interventions for CVDs

In the optimized, equal weights model, the allocation to exercise-based pulmonary rehabilitation for patients with obstructive lung disease was four times higher than the estimated spending in the 2019 health budget. Optimization also led to a doubling of the spending on the long-term management of CVDs with selected medicines, low-dose steroids and bronchodilators for asthma and chronic obstructive pulmonary diseases, and the secondary prevention of rheumatic fever and rheumatic heart disease with penicillin (Figure 25). There was approximately 50% higher spending on the provision of aspirin for suspected acute myocardial infarction, screening for hypertension in adults, and initiation of treatment among individuals with severe hypertension or multiple risk factors. Interventions with decreased funding in the optimized model were (i) the management of acute exacerbations of asthma and COPD; (ii) management of acute myocardial infarction including resuscitation, (iii) management of urological conditions; (iv) long-term combination therapy for multiple CVD risk factors including risk screening; and (v) the screening and management of diabetes in pregnancy. The model reduces funding for these interventions due to the low level of public spending on health and the relatively higher cost-effectiveness of other interventions in the CVD package.

The increase in averted DALYs following optimization was primarily due to tobacco cessation counseling, responsible for an estimated 60% of additional DALY impact in the optimized allocation (1,230 of the additional 2,060 DALYs averted). Smaller increases in averted DALYs accrued to screening for hypertension in adults and long-term management of CVDs with selected medicines. The reallocations and averted DALYs in the CE-focused model were like the model with equal weights.

FIGURE 25 • Optimized resource allocations to CVDs interventions

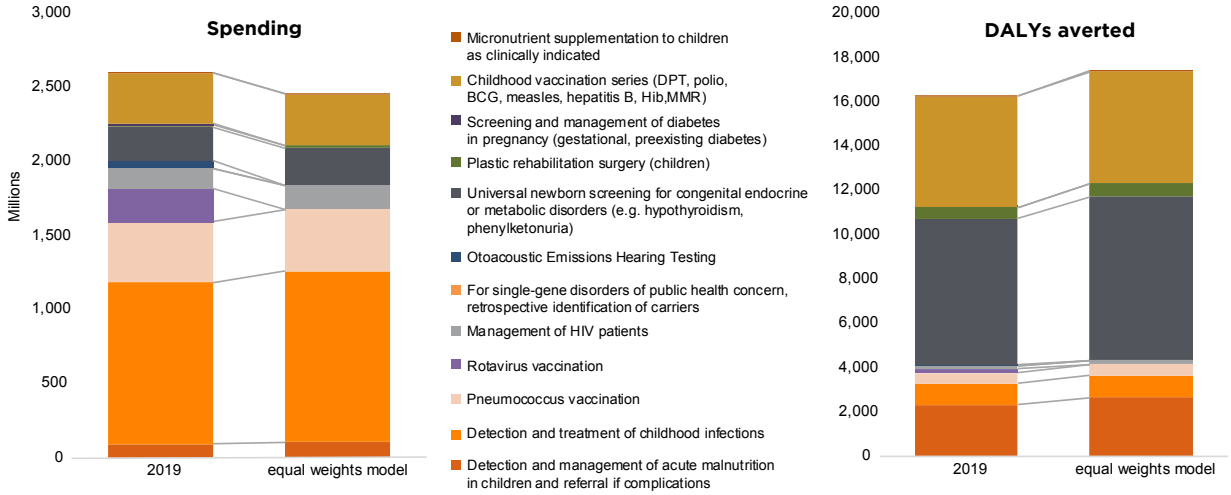


4.4.3. Child Health Interventions

In the optimized, equal weights model, there was a 10-20% increase (relative to the actual 2019 health budget) in spending on plastic rehabilitation surgery for children, micronutrient supplementation to children, detection and management of acute malnutrition in children, and referral for complications, management of pediatric HIV, and universal newborn screening (Figure 26). In contrast, otoacoustic hearing emissions testing and rotavirus vaccination were not supported in the optimized funding allocation.

The interventions that averted the most DALYs were universal newborn screening for congenital, endocrine, or metabolic disorders (42% of all DALYs averted), childhood vaccinations (29%), and the detection and management of acute malnutrition in children and referral if complications (15%). In the CE-focused model, rotavirus vaccination was part of the optimal investment mix (unlike the model with equal weights), highlighting this intervention's high CE.

FIGURE 26 • Optimized resource allocations to child health interventions



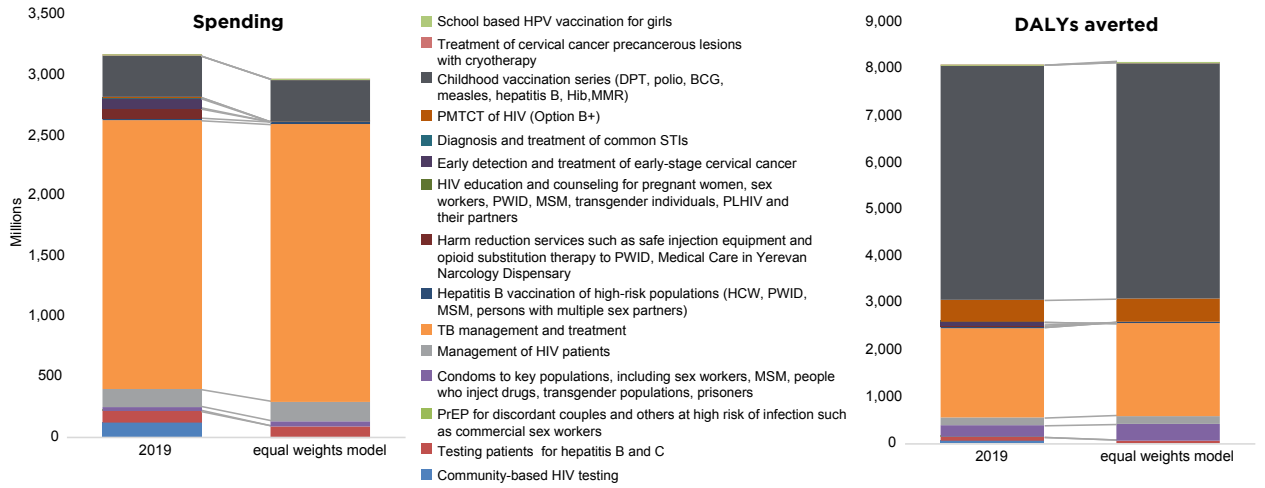
4.4.4. Interventions for HIV, TB, and Other Infections

Given the health sector-wide scope of this study, we included HIV and TB in the analysis, but acknowledge that optimal infectious disease spending is best modeled with tools including a dynamic disease transmission component. In the optimized, equal weights model, there was a six-fold increase in spending on school-based human papillomavirus vaccination for girls for cervical cancer prevention, relative to estimated spending in the 2019 health budget (Figure 27). There was also a 10-20% increase in spending on (i) cryotherapy for precancerous cervical lesions; (ii) provision of condoms to critical populations; (iii) the management of HIV patients; and (iv) Hepatitis B vaccination of high-risk populations. Increased investment in the management of HIV patients and HIV prevention services for critical populations was also recommended by the 2019 Optima HIV analysis.[46] Some interventions funded in the actual 2019 budget did not have funding allocated in the model with equal weights, including community-based HIV testing, harm reduction services for people who inject drugs, and early detection and treatment of early-stage cervical cancer. Again, this was primarily driven by the low level of public spending on health.

The interventions that averted the most DALYs were childhood vaccinations, particularly BCG due to reductions in the TB burden and management of TB cases. Two interventions in the

CE-focused model were not in the optimal investment mix in the equal-weights model: HIV education and counseling for pregnant women and key populations (20% higher spending than 2019 estimate) and early detection and treatment of early-stage cervical cancer (50% higher spending than 2019).

FIGURE 27 • Optimized resource allocations to HIV, TB, and other infections



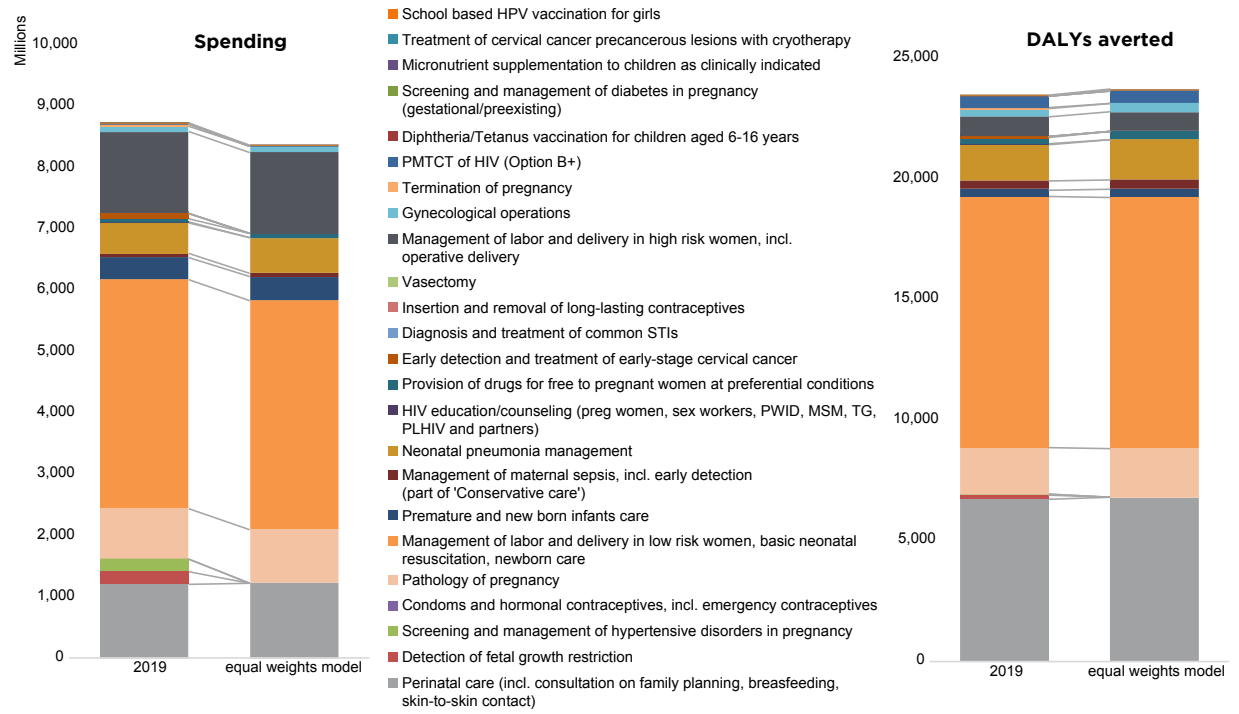
* Note the specific limitations of the static HIPtool for infectious disease program allocations

4.4.5. Maternal, Newborn, and Reproductive Health Interventions

There was a six-fold increase in spending on school-based human papillomavirus vaccination for girls in the optimized, equal-weights model. There was a 50% increase in spending on cryotherapy for precancerous cervical lesions. Also, the model allocated a 10-20% increase in spending on (i) the provision of free medication to pregnant women; (ii) clinically-indicated supplementation for children; (iii) neonatal pneumonia management; and (iv) gynecological operations (Figure 28). Interventions that did not have funding allocated in the equal-weights model included detecting fetal growth restriction, screening and management of hypertensive disorders in pregnancy, and termination of pregnancy. While public health budget and cost-effectiveness played a role in reducing funding for these interventions, high baseline intervention coverage for reproductive, maternal, and neonatal health packages was also a factor.

The model allocated the most spending to labor and delivery management in low-risk women, including basic neonatal resuscitation. A high number of averted DALYs accrued to perinatal care. In the CE-focused model, three interventions were included in the optimal mix (but were excluded in the equal-weights model): HIV education, early detection and treatment of cervical cancer, and pregnancy termination. There was no spending data available for vasectomy and the insertion and removal of long-lasting contraceptives.

FIGURE 28 • Optimized resource allocations to maternal, newborn, and reproductive health interventions

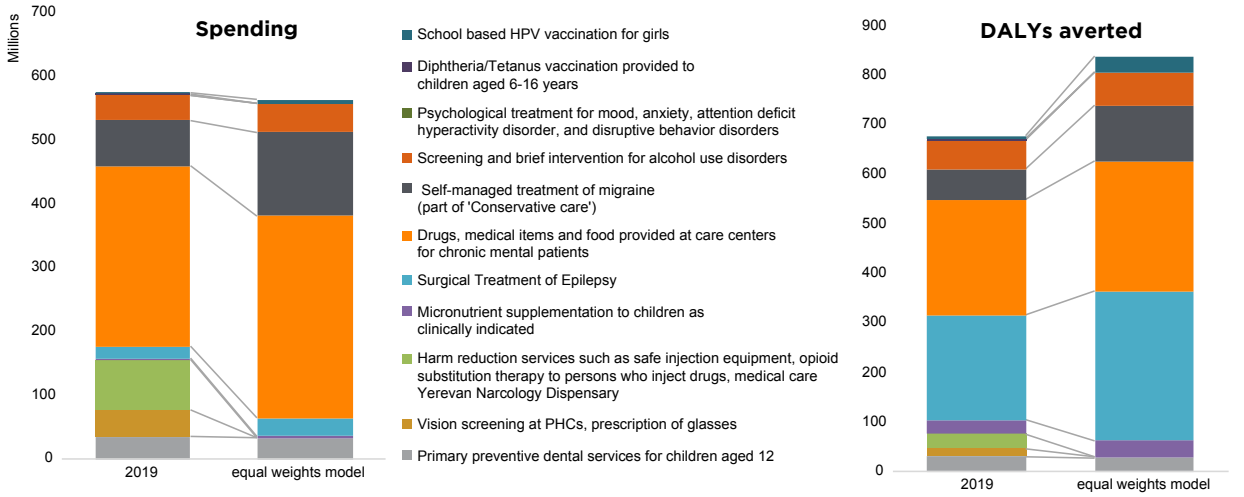


4.4.6. Mental and School-age Health Interventions

In the optimized, equal weights model, there was a six-fold increase in spending on human papillomavirus vaccination for girls (Figure 29). There was also a 50-100% increase in spending on the self-management of migraine and surgical treatment of epilepsy. The model also included a 10-20% increase in spending on (i) clinically indicated micronutrient supplementation in children; (ii) screening and brief intervention for alcohol use disorders; and (iii) medicines and food at care centers for chronic mental patients. The primary interventions that did not receive funding in the equal-weights model were vision screening at PHCs with glasses prescriptions and harm reduction services for people who inject drugs, due to resource shifts to migraine care.

The optimized spending allocated the highest amounts to medicines and food at care centers for chronic mental patients. The most averted DALYs accrued to spending on surgical treatment of epilepsy and self-managed treatment of migraine. There was relatively higher spending on primary preventive dental services for children than the equal-weights model in the CE-focused model, and there was no spending on medicines and goods at care centers for chronic mental patients. No spending data was available for psychological treatment for mood, anxiety, attention deficit hyperactivity disorder, and disruptive behavior disorders.

FIGURE 29 • Optimized resource allocations to mental and school-age health interventions

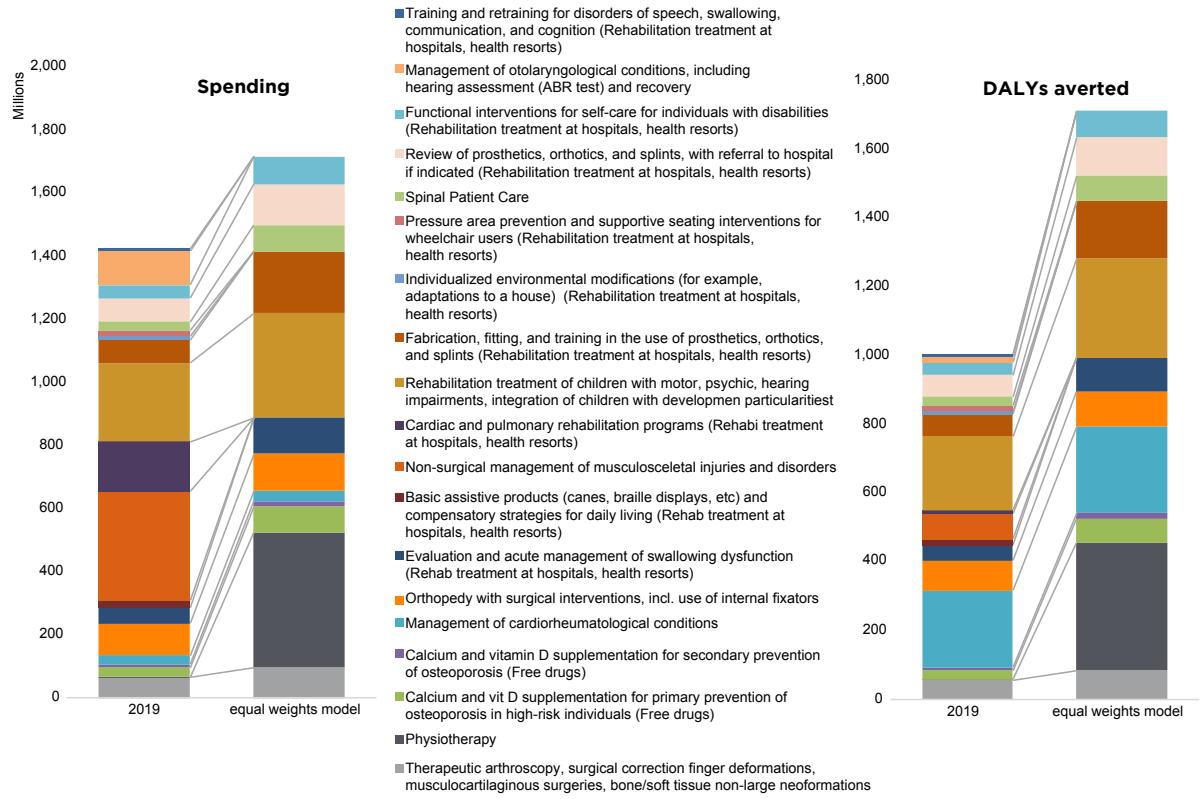


4.4.7. Musculoskeletal and Rehabilitation Interventions

In the optimized, equal-weights model, the spending on physiotherapy increased 200-fold (Figure 30). There was also a two to three-fold increase in spending on spinal patient care; calcium and vitamin D supplementation for primary prevention of osteoporosis in high-risk individuals; fabrication, fitting, and training for prosthetics, orthotics, and splints; evaluation and acute management of swallowing disorders; and functional interventions for self-care of individuals with disabilities. There was a 50-100% increase in the spending allocated to (i) calcium and vitamin D supplementation for secondary prevention of osteoporosis; (ii) review of and referral for prosthetics, orthotics, and splints; and (iii) therapeutic arthroscopy, surgical correction of finger deformities, and surgery on muscle and cartilage. Due to these increases in spending, several interventions did not receive allocations in the equal-weights model, including (i) non-surgical management of musculoskeletal injuries and disorders; (ii) cardiac and pulmonary rehabilitation at hospitals and health resorts; and (iii) management of otolaryngological conditions, including hearing assessment and recovery.

In the optimized model, the highest spending amounts were allocated to (i) physiotherapy; (ii) rehabilitation of children with motor, psychic, and hearing impairments; and (iii) the integration of children with development particularities. The management of cardio-rheumatological conditions averted the most DALYs in the 2019 baseline (223 DALYs). Still, physiotherapy averted most DALYs in the equal-weights model (371 DALYs), followed by rehabilitation treatment of children with motor, psychic, hearing impairments (288 DALYs). In the CE-focused model, two interventions were funded that were not included in the optimal intervention mix in the equal-weights model: pressure area prevention and supportive seating interventions for wheelchair users and training and retraining for disorders of speech, swallowing, communication, and cognition.

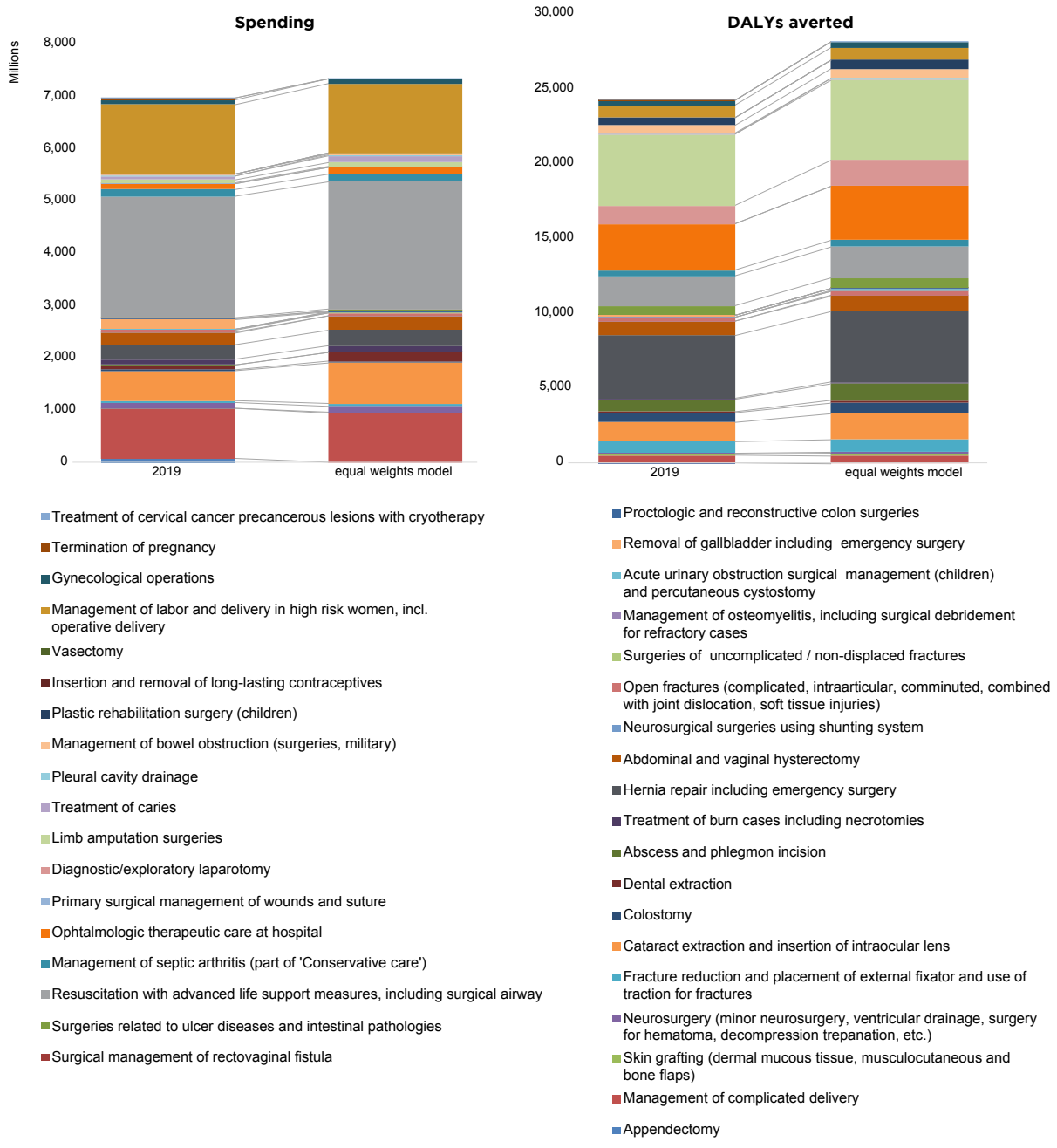
FIGURE 30 • Optimized resource allocations to musculoskeletal and rehabilitation intervention



4.4.8. Surgery Interventions

In the optimized, equal weights model, there was two to three times higher spending on surgical management of rectovaginal fistula, treatment of caries, and dental extraction, relative to estimated spending in the 2019 public health budget (Figure 31). There was also 50% higher spending on (i) neurosurgical shunts; (ii) cryotherapy for precancerous cervical lesions; (iii) diagnostic or exploratory laparotomy; (iv) abscess incision; (v) management of osteomyelitis; (vi) cataract extractions; and (vii) insertion of an intraocular lens. The model also allocated 20% higher spending to (i) acute urinary obstruction management in children; (ii) percutaneous cystotomy; (iii) plastic rehabilitation surgery; and (iv) ophthalmologic hospital care**.** In contrast, the model reduced spending on gallbladder removal, including emergency surgery, appendectomy, and surgical termination of pregnancy, as the scaled up interventions were more cost-effective and consumed increasing shares of the budget. The highest estimated spending was for resuscitation with advanced life support measures, while the most averted DALYs were from limb amputation and hernia repair surgeries. The CE-focused model included services for pregnancy termination in the optimal investment mix, unlike the equal-weights model.

FIGURE 31 • Optimized resource allocations to surgery interventions



CHAPTER 5. CONCLUSIONS

KEY POINTS:

- There are important lessons from the analysis for funding priorities consistent with making progress towards UHC in a financially sustainable manner in Armenia.
- To improve population health, there is a need for higher funding for the highly cost-effective interventions in the musculoskeletal and cancer packages, which address a considerable burden of disease.
- Increased public health financing is necessary to improve funding for cost-effective interventions. With a 40% higher budget, additional funding was allocated to cardiovascular diseases, surgery, mental health palliative care, rehabilitation, and pandemic management.
- Pooling hitherto vertical program funding with BBP spending provides opportunities to further improve efficiency and continue pursuing the health financing transition.
- The BBP revision process should be outlined in legal documents that specify the criteria against which alternative interventions will be considered, the frequency for revisions, and the steps, including an obligatory requirement for consultations with key stakeholders.
- Reforms to the BBP revision process should be undertaken in tandem with broader reforms to purchasing mechanisms, including ensuring an independent and accountable SHA, adoption of a strategy for quality-based purchasing decisions, and selective provider contracting.

This analysis demonstrates how a model that aims to maximize health within the available budget can inform decision-making on the funding of services within the Armenia BBP. The work also indicates how accounting for societal preferences like equity and financial risk protection can shape funding allocations. The study involved partnerships between policymakers, technical staff in public agencies, and experts in epidemiology, clinical medicine, health economics, and mathematical modeling.

Using the HIPtool to optimize resource allocations in the health budget has limitations, including the inability to account for trade-offs across sectors and not accounting for interactions between health interventions. HIPtool does not account for any dynamics in disease transmission and therefore has important limitations for the modeling of infectious diseases like HIV and TB. There were difficulties matching services, unit prices, and intervention utilization rates in the complex BBP structure to the interventions in the HIPtool and limited local data on the CE of interventions in the Armenian context. Given these limitations (reviewed in Box 3), the model outputs on allocative changes should be considered directional. Similar analysis can be used as one of several inputs in discussion on maximizing value for health spending.

We conclude with lessons from the analysis for public spending on health service delivery in Armenia. While these lessons focus on health services, the assessment of drivers of the disease burden in Chapter 2 illustrate that there is also important role for intersectoral policies that reduce the population-level exposure to behavioral and environmental risk factors for NCDs. These policies are discussed extensively in the DCP3 report[47] and include fiscal measures (e.g. tobacco and alcohol taxes), regulations (e.g. for building safety, food additives or traffic measures), and education (e.g. school curricula). The World Bank team is providing technical support to estimate fiscal space for health from taxes on tobacco and alcohol, to inform efforts to increase domestic resource mobilization for health.

Below are five important lessons for public spending on health services consistent with making progress towards UHC in a financially sustainable manner in Armenia.

5.1. LESSON 1: INCREASE RELATIVE FUNDING FOR HIGH-IMPACT CURATIVE AND PREVENTIVE INTERVENTIONS

Up to 2030, CVDs will remain the leading cause of morbidity and mortality in Armenia, driven by a high prevalence of metabolic risk factors. Consistent with this finding, in the 2019 and optimized budgets, the cardiovascular package received the most funding. However, there are relatively low utilization rates for some services that address NCDs, including for interventions

in the musculoskeletal package (30%), contributing to preventing and managing the high prevalence of neck and back pain. There may also be opportunities to finance the scale up of population-level preventive interventions to reduce exposure to risk factors for NCDs, including tobacco exposure control. Given the financial barriers to health care access, improving population health is consistent with higher funding for the highly cost-effective interventions in the musculoskeletal and cancer packages, which address a considerable burden of disease. We estimated that optimizing resource allocations within the 2019 budget can increase the DALYs averted by up to 30,000 DALYs. We also identified other underfunded interventions despite the high potential to reduce morbidity and mortality, including (i) human papillomavirus vaccination for schoolgirls to prevent cervical cancer; (ii) exercise-based pulmonary rehabilitation for patients with obstructive lung disease; (iii) colon cancer management; and (iv) medicines and the long-term management of CVDs.

5.2. LESSON 2: INCREASE PUBLIC HEALTH SPENDING ON HEALTH

In relative and absolute terms, public spending on health in Armenia is low. The share of the public sector contribution to THE is less than one-third of the average in UMI countries and Europe. This analysis illustrated how the limited public spending on health available restricts investments in cost-effective interventions, which target prioritized groups. Optimizing spending within the 2019 budget led to lower allocations for palliative care, mental health, maternal and newborn health, and child health. With a 40% higher budget, additional funding was allocated to CVDs, surgery, mental health palliative care, rehabilitation, and pandemic management. The budget increase, combined with optimal resource allocation, translated to an additional 15,000 DALYs averted, over and above the DALYs averted through optimized 2019 budget allocations. This finding demonstrates the need for increased public health financing to ensure access to essential health interventions in Armenia.

5.3. LESSON 3: POOL SPENDING ON THE BBP AND VERTICAL PROGRAMS

The optimization analysis pooled spending on the BBP with funding for vertical programs that have been hitherto funded through development partners, including Gavi and the Global Fund. This allows us to explore possibilities for improving health spending efficiency through reallocations, following health financing transitions, when national stakeholders have increased autonomy over spending priorities. A model can help identify potential efficiency gains, but care must be taken to maintain investment in programs which control infectious diseases

such as HIV and TB. Optimizing allocations led to significant increases to funding for the TB package and immunization interventions at both the 2019 and higher budget levels indicating areas where further value-for-money could potentially be gained if resources were available. These changes reflect the assumptions underlying the model, including the relative weights for CE, equity, and financial protection. As the state budget assumes funding for priorities funded by donors, it would be necessary for vertical programs' resources to be pooled with other health service funding. Allocations should not default to historical patterns but adapt as a reflection of population health needs and overall health system priorities. This analysis optimized spending within the public health budget. Given the high share of OOP spending in THE in Armenia, it would be informative to optimize allocative efficiency across THE, pooling public and private health spending. However, accurate information on OOP spending at the AUHC intervention level are not available.

5.4. LESSON 4: IMPLEMENT STRUCTURED AND CONSULTATIVE BENEFIT PACKAGE REVISIONS

Modeling the allocative efficiency of health interventions using the HIPtool can inform consultations on benefit package revisions in Armenia in the short-term, despite the limitations of the tool and available evidence. In a recently published report, the World Bank team identified essential elements of such a structured and consultative process for benefit package revision, that aligns with good practice in other countries, such a Thailand.[48] We recommend that the BBP revision process be outlined in legal documents that specify the criteria against which alternative interventions will be considered, the frequency for revisions, and the steps. It is critical that these steps include an obligatory requirement for consultations with key stakeholders, including provider associations and patients. Akin to the HIPtool analysis, institutional arrangements for the technical assessments to inform benefit package revisions should be specified in legal documents, including assessments of the burden of disease, CE, budgetary impact, intervention efficacy, and service delivery readiness to provide the intervention. This function may reside outside the government, in a research institute.
To further build capacity for evidence-informed revisions to the BBP, the government may commission studies to build a national database on intervention unit costs and CE, which are key inputs into technical assessments for benefit package revisions. An example in this regard is the Center for the Evaluation of Value and Risk in Health at Tufts University which hosts a registry of CE analysis for health interventions.

5.5. LESSON 5: STRENGTHEN STRATEGIC PURCHASING MECHANISMS

As discussed in Chapter 1, despite previous reforms, purchasing in Armenia is largely passive due to the fragmented and overlapping institutional roles and responsibilities, politically-driven revisions to the BBP, as well as the limited attention to quality of care in provider selection, payment mechanisms, and monitoring service provision. In addition to implementing a structured and consultative process for revising the BBP discussed above, the World Bank team has provided recommendations in a recently published report[49] to ensure purchasing decisions align provider and service user behaviour with improved health care use, quality, and efficiency. We propose that the legal status for SHA be redefined, ensuring independence from the MoH, clear decision rights and external oversight, and restricting the role of private insurers to health services outside the BBP. We also recommend the adoption of an annual strategy for quality-based purchasing, including monitoring of key indicators of the quality of care, publication of provider performance, and introduction of payment mechanisms that reward better quality of care, such as add-on payments. Where possible, provider performance on quality should also inform the selection of providers for funding under the state budget. Efforts to improve the efficiency of resource allocations should ideally be accompanied by reforms to improve technical efficiency in the health sector, including through service delivery reorganization.

ANNEX 1. HIPTOOL TECHNICAL SPECIFICATIONS

AN 1.1: OVERVIEW

The HIPtool leverages the IHME GBD framework, the DCP interventions framework, and the EUHC packages, tailored to the specific country. The analysis can identify the cost and evidence-based impact of an optimized national package of health services or interventions. The analysis can also specify the health interventions outside of the optimized national package that may be cost-effective and effective. The tool also estimates how available funding changes affect the interventions included in an optimized national benefits package.

The tool maximizes DALYs averted, equity, or financial risk protection. The HIPtool can be useful for Ministries of Health seeking to make the economic and social case for funding increases or re-allocations, depending on policy objectives and the available budget. This Annex reviews the data requirements, tool parameters, and optimization model.

AN 1.2: DATA REQUIREMENTS

The HIPtool is pre-populated with country-specific demographic and disease burden data, which can be replaced with data from other sources. The demographic data is derived from the United Nations Population Division estimates, while disease burden data is sourced from the IHME GBD database. The causes of death and disability are identified using the primary cause name, health category, population prevalence by year, number of people affected by year, DALYs by year, and mortality by year. The number of people affected can be derived by population prevalence and vice versa.

In the tool, health interventions are identified using intervention name, targeted disease, delivery platform, unit cost per person covered, cost per DALY averted, current and maximum coverage of the intervention, equity score, and financial risk protection score. Where possible, country-specific estimates are used. All default values are visible to the user, editable, and fully documented. The format allows for use of data from other sources, such as Tufts CE Analysis Registry (for cost per DALY averted) and WHO CHOICE (for unit costs). In addition, the user has the option to customize the list of interventions for a given country context.

AN 1.3: TOOL PARAMETERS

Each intervention in HIPtool is linked to one or more causes of disease in the IHME GBD framework. The linking of interventions to GBD causes of disease was carried out with guidance from WHO experts. The burden of disease data, including 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 the burden of disease is defined as:

$$O = S / \left(\frac{ICER}{Q} \right)$$

Where:

- O is the impact or outcome expressed as the disease burden averted in DALYs;
- S is the total spending on an intervention expressed in US Dollars;
- $ICER$ is the incremental CE ratio;
- Q the quality factor that reflects realistic implementation of interventions (assumed to be 70 percent reduction in CE).

Each intervention is defined by a maximal effective coverage that reflects the constraints of scaling up an intervention and parameterises the upper bounds of intervention spending for the optimization process. Maximal effective coverage is defined as:

$$EC_M = \left(\frac{T_C}{N_C} \right) * EC$$

Where:

- EC_M is the maximal effective intervention coverage;
- T_C is the target nominal intervention coverage;
- N_C is the current nominal intervention coverage;
- EC is the effective intervention coverage, which depends on the intervention impact and disease burden, as shown:

$$EC = \left(\frac{O}{b} \right)$$

Where:

- O is the impact or outcome expressed as the disease burden averted in DALYs;
- b is the disease burden expressed in DALYs.

Interventions have health equity and financial risk protection scores assigned to them by default, sourced from the DCP3, which can be modified.

The default health equity scores are defined in terms of the heath-adjusted age at death (HAAD), with higher scores assigned to interventions that address causes at younger ages. Three HAAD cut-offs are used. If an intervention addresses a cause of death or disability 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 receive a score of 2; while interventions addressing causes with a HAAD more than 50 years receive a score of 1. The tool allows for the HAAD cut-offs to be tailored to consider other factors, including socio-economic status, geographic location, or gender.

Financial risk protection scores for interventions are based on the likelihood of impoverishment (LOI) in the absence of public financing; the urgency of need of the intervention; and the average age of death and level of disability. The scores assign higher weights to interventions that address high disability causing diseases and improve the health of working age individuals. The LOI in the absence of public health financing varies between countries and is based on unit cost data.

AN 1.4: OPTIMIZATION

Optimizations can be run in the constrained or weighted mode. The constrained mode optimizes health impact, in terms of DALYs averted, with constraints imposed on equity and financial risk. By default, equity and financial risk protection stay the same or improve with the optimized package compared to baseline. The weighted mode instead performs a user-specified weighted optimization of health impact, equity, and financial risk protection. The default weights are 60 percent, 20 percent, and 20 percent, respectively. The weights are normalized relative to the maximum and minimum possible outcomes for each measure.

Two additional constraints may be implemented by the user. First, funding for a given intervention may remain constant and be excluded from the optimization; or the user may specify that funding cannot scale up or down faster than a given rate, such as 30 percent per year. If we define the funding for each intervention as a budget vector $\mathbf{B}$, the health outcome (DALYs averted) corresponding to this budget as $O(\mathbf{B})$, the total equity as $E(\mathbf{B})$, and the total financial risk protection as $F(\mathbf{B})$, 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);
- Intervention coverage is as a function of budget $\mathbf{B}$.

The model performs the following constrained optimization of health outcomes:

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

Where:

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

Alternatively, the model may perform a weighted optimization as follows:

$$\max \left(W_O O(\mathbf{B}) + W_e E(\mathbf{B}) + W_f F(\mathbf{B}) \right) \text{ subject to } \sum \mathbf{B} = constant$$

Where:

- W_O, W_e and W_f are user-specified weights for health outcomes, equity, and financial risk protection, respectively.

ANNEX 2. HIPTOOL PARAMETRIZATION AND VALIDATION

In this Annex, we review the steps to parametrize and validate the optimization of resource allocations across AUHC interventions using the HIPtool. The data and worksheets are here.

AN 2.1: MATCHING THE BBP AND EUHC INTERVENTIONS

Certain characteristics of the BBP introduced complexity in matching with the EUHC interventions and packages. For example, some codes in the BBP are for groups of services that are reimbursed per capita (or person), grouped by geography, such as polyclinics in Yerevan or mountainous areas. The unit cost and utilization rates of individual services within these codes are not specified. Beyond the BBP, service data was sourced from the MoH (diabetes treatment and immunization), Global Fund (HIV and TB), and NHA (health system interventions).

The matching process was a collaboration between the SHA and World Bank staff. The process yielded a total of 135 interventions that represented underlying BBP service codes, for the optimization analysis in the HIPtool. These 135 AUHC interventions are conceptually linked to DCP3 packages. The steps taken to match services in the Armenian health system to the EUHC are summarized below. The data and worksheets are here.

1. **Review of the pre-populated 218 EUHC interventions for relevance:** This led to the removal of 21 EUHC interventions, for infectious diseases, which are not provided in the Armenian health system. This step left 197 EUHC interventions for the analysis.
2. **Listing of active BBP services in 2019:** The list of the approximately 3,700 BBP services was exported from the ArMed e-health system. The BBP identifies services provided to specific social groups at no charge or on preferential terms. This list was restricted to 2,700 active services that were not removed or replaced in 2019. All service names were translated to English.
3. **Matching of active BBP services to relevant EUHC interventions:** Each BBP service has a 7-digit service code. The 2,700 active BBP services were evaluated for their matches to the 197 relevant EUHC interventions. The final list of EUHC interventions were adapted to the Armenian setting (AUHC interventions). The scenarios encountered and matching process is described below.

i. Single BBP service matches single EUHC intervention – E.g. Pneumococcus vaccination

ii. Multiple BBP services match single EUHC intervention - E.g. An EUHC intervention, "Cataract extraction and insertion of intraocular lens", reflects multiple ophthalmological services in the BBP: 1101515, 1610410, 2101515, 1101521, 2101521, 1101531, 2101531, 0302003, 0362003, 0602003, 0612003, 1101526, 2101526, 1101542, 2101542, 1101525, 2101525, 1101526, 2101526, 1101545, and 2101545.

iii. Multiple BBP services match a modified EUHC intervention - E.g. instead of EUHC's "Assessment, provision and training in the use of assistive products, including assistive devices for hearing", the intervention was labelled "Management of otolaryngological conditions, including hearing assessment (ABR test) and recovery" to reflect Armenia's services better and preserve the intervention type.

iv. Multiple BBP services match multiple EUHC interventions – This was addressed by combining two or more related EUHC interventions into one AUHC intervention and grouping BBP services under this AUHC intervention. E.g. the three EUHCs related to HIV testing (C28, C29 and HC28) were combined into an AUHC intervention labelled "Community-based HIV testing" and linked to the BBP HIV testing codes 0930012, 0930013, 0930060, 0930010, 0930011, 0930014, and 0930015.

v. Single BBP service matches multiple EUHC interventions – This was the case for the following BBP codes: i) The BBP's "Conservative care in general medicine (including infectious) and surgical units" matches six EUHC interventions (C48, FLH41, FLH5, HC36, HC45, RH4); ii) The BBP's "Rehabilitation treatment at hospitals and health resorts for adults and children" matches ten EUHC interventions (C47, C52, C54, C55, C56, C57, C58, FLH53, FLH54, HC65); iii) The BBP's "Provision of drugs for free at preferential conditions by family doctor and narrow specialist at PHCs/ambulatories" matches eight EUHC interventions (FLH22, FLH25, HC37, HC38, HC41, HC43, HC44, HC55); and BBP's "Provision of drugs for free at preferential conditions (children<18)" was mapped to seven interventions (C9, C14, FLH11, FLH12, FLH26, HC12, HC42).

vi. Single BBP service may apply to different EUHC interventions – This was the case for many diagnostic tests which are not disease- or intervention-specific. The HIPtool allows for "Pathology" interventions at different levels of the health system. Diagnostic tests were grouped by unit cost. The three pathology interventions defined for Armenia were: i) Clinical, biochemical blood analyses, bacteriological examination, hormonal, genetic and serological tests, Doppler, ECG, Holter examinations and others costing <30,000 AMD; ii) MRI, CT with or without

contrast, Fluorescence, Radionuclide diagnostic tests, and others costing 31,000-95,000 AMD; iii) Open biopsies, angiographies (aorta, cerebral, coronarography) and others costing >96,000 AMD.

vii. EUHC interventions not matching any service in the BBP – E.g. the EUHC intervention "Insertion and removal of long-lasting contraceptives". New AUHC interventions were included to model the value for money, even though they are currently outside BBP spending.

viii. BBP service not matching any EUHC intervention – E.g. BBP services linked to the diagnosis and management of prostate cancer. The number of interventions classified as EUHC interventions in the DCP3 process are limited and does not include all the services in the BBP. Such BBP services not matching any of the EUHC interventions were therefore excluded from the optimization analysis with HIPtool.

AN 2.2: ESTIMATING INTERVENTION NEED AND ELIGIBILITY

The population 'in need' of an AUHC intervention was estimated as the number of individuals who require an AUHC intervention annually due to their condition. The population in need was estimated using available disease incidence and prevalence data. The population 'eligible' for an AUHC intervention was the number of individuals who should be targeted by the intervention annually based on national clinical guidelines, which account for demography and risk behaviors (e.g. tobacco smoking). If the guideline recommended the intervention to be delivered less frequently than once a year, the number of eligible individuals was scaled down proportionally (e.g. diabetes screening every three years). Data sources used include IHME GBD, 2016 demographic and health survey, 2016 health systems performance assessment, 2018 STEPwise approach to surveillance (STEPS) survey, morbidity statistics from the NIH, the national vaccination schedule, BBP claims, and estimates of groups covered through the state defined by national regulations, including socially vulnerable and special groups (SVSGs) children, pensioners, and the disabled.

AN 2.3: ESTIMATING EFFECTIVE INTERVENTION COVERAGE

In this study, the effective coverage of an AUHC intervention was defined as the percentage of the Armenian population that were in need and/or eligible for the intervention who received

the intervention in a given year. For example, we estimated an effective intervention coverage of 24% for palliative health care among the whole Armenia population in need. In line with our definition, 24% of Armenians that needed palliative care due to their condition or fit the demographic and risk profile for these services in clinical guidelines. This was calculated based on: a) an estimated 80% of individuals in need of palliative care among SVSGs received the intervention, b) 29.5% of the population having been classified as SVSGs in 2018, and c) assuming non-SVSG individuals had a similar level of palliative care needs). In some cases, individuals mapped to multiple categories that conferred eligibility or need for a service, as in SVSG and children below 18 years for rectal and reconstructive colon surgery. Here, the team made assumptions on the degree of overlap between categories to arrive at the effective coverage. Estimates of effective intervention coverage drew on data on the disease burden, BBP claims, NIH morbidity reports, demographic and other surveys.

AN 2.4: VALIDATING ESTIMATES OF EFFECTIVE INTERVENTION COVERAGE

We validated our estimates of effective intervention coverage against the number of BBP claims. The number of people covered by (using) an intervention was estimated from the eligible population and effective intervention coverage. This number should equal the people obtaining the service in a year. The estimate was checked against BBP claims for plausibility. Assumptions were made for the possibility of multiple claims by a single individual in consultation with SHA staff. Privacy regulations on patient-level data limited detail on the identity of individuals accessing specific services. Corrections were informed by triangulating data sources as described and consultations.

AN 2.5: CALCULATION OF AUHC INTERVENTION SPENDING

We calculated the total public health spending for each AUHC intervention as the sum of five amounts: non-capitation spending under the BBP, capitation spending, spending on drugs for children and adults, spending by the Global Fund on HIV and TB, and other spending. These estimates drew on the ArMed e-health system for BBP and medication spending, MoH reports for vaccine and diabetes medication spending, and Global Fund Financial reports. Data from the 2018 NHA was used to validate some of the estimates.

1. **Non-capitation BBP spending:** The SHA's HP-011, SC-011 and HP-001 financial reports were generated from ArMed e-health system for 1st January to 31st December 2019 to estimate spending under the BBP, outside capitation. The annual spending for each BBP code

was extracted. For each AUHC intervention, the total spending on BBP services (outside capitation) was calculated as the sum of spending across all the BBP codes grouped under the intervention.

2. **Capitation spending:** Capitation spending was allocated across nine AUHC interventions (C8, HC30, HC31, HC35, HC46, HC53, HC40, HC64, and HC9) based on the number of consultations per year, estimated target population, intervention coverage and unit cost. Data on MoH spending in 2019 on vaccines was included under the related AUHC interventions.
3. **Spending on drugs for children and adults:** Eight AUHC interventions were matched to BBP spending for the provision of drugs for free for selected conditions at the PHC level (FLH22, FLH25, HC37, HC38, HC41, HC43, HC44, and HC55). Seven AUHC interventions were matched to BBP spending for the free provision of medication for selected conditions among children below 18 years of age (C9, C14, FLH11, FLH12, FLH26, HC12, and HC42).
4. **Spending by Global Fund on HIV and TB:** The 2019 spending for HIV by the Global Fund was matched to seven AUHC interventions on HIV (C6, C28, C29, C30, C31, HC13, and HC22). The 2019 spending for TB by the Global Fund were combined into one AUHC intervention on TB diagnosis and care.
5. **Other spending:** Spending on epidemiological surveillance, risk, and disease control programs was matched to six AUHC pandemic interventions (P7, P8, P9, P10, P11, and P12).

There were six AUHC interventions that had no reported public sector spending but received funding through the private sector. These interventions were: 1) Psychological treatment for mood, anxiety, attention-deficit hyperactivity disorder, and disruptive behavior disorders; 2) Management of refractory febrile illness including etiologic diagnosis at reference laboratory; 3) Retrospective identification of carriers in settings where specific single-gene disorders are a public health concern, e.g. Familial Mediterranean Fever; 4) Insertion and removal of long-lasting contraceptives; 5) Vasectomy; and 6) Condoms and hormonal contraceptives, including emergency contraceptives.

AN 2.6: CALCULATION OF AUHC INTERVENTION SPENDING PER PERSON

To calculate the average AUHC intervention spending per person, the total spending per AUHC intervention was divided by the number of people covered. This estimate is different from the sum of unit prices of BBP codes matched to an AUHC intervention, due to adjustments for capitation spending, subsidized drugs, and Global Fund spending. The average intervention spending per person also accounted for changes in BBP code price during the year, differences

in prices for BBP codes mapped to an AUHC intervention, variation in reimbursements for services in a single disease episode (e.g. first surgery reimbursed 100% and second at 60%), and differences in reimbursements across health facilities. For pandemic intervention spending, the average spending per person was calculated as the total spending divided by the Armenian population in 2019. Where the average AUHC intervention spending per person could not be identified from the prices of matching BBP codes or otherwise, the unit prices pre-populated in the HIPtool were used, adjusted to health worker salaries in Armenia.

AN 2.7: VALIDATION OF RELATIONSHIP BETWEEN BURDEN, SPENDING, AND ICER

The data template provides, through the effective intervention coverage sheet, a check on whether the relationship between the burden, spending, and ICERs is sound. For 27 of the 135 AUHC interventions, this relationship showed up as problematic. This was due to incomplete linkage of all the disease burden the intervention could address, or the CE of the intervention being too low. The problem was addressed by better linkage of all relevant burden in the "EUHC-GBD causes targeted" sheet and the identification of an alternative, valid ICER which was higher than the pre-populated ICER. In three cases (C5, FLH37, and FLH4), these corrections did not entirely resolve the problem, and the burden estimate was edited. For example, for C5, the burden of disease was revised to 10 DALYs from 1 DALY. All ICER values were updated to 2019 values. A default 30% reduction was applied to all ICERs given real-life service delivery conditions.

AN 2.8: REVIEW OF EQUITY AND FINANCIAL RISK PROTECTION SCORES

The equity scores (1 – 3) were defined to reflect social groups identified in regulation as priority for benefits coverage through the state in the Armenian health system. Hence, the highest score (3) was assigned to AUHC interventions that targeted pregnant and lactating mothers, children and disabled populations, and individuals suffering from poverty-related diseases such as malnutrition and TB. A score of 2 was assigned to AUHC interventions for social groups that may experience stigma, such as the review of and referral for prosthetics, orthotics, and splints, while AUHC interventions targeting the general population targets received the lowest score (1). Two independent reviewers agreed on the final scores.

The financial risk protection scores (1 – 6) were based on the likelihood of impoverishing or catastrophic health expenditure in the absence of public financing for an AUHC intervention.

They were composed of 1-5 points linked to the local unit price, and an additional 1 point if expenditure was likely recurrent beyond one year due to the chronicity of disease. The unit price bands were as follows: Band 1: <3,000 AMD, Band 2: 3,000-12,000 AMD, Band 3: 12,001-50,000 AMD, Band 4: 50,001-180,000 AMD, Band 5: 180,001+ AMD.

AN 2.9: FINALIZING WORKSHEETS AND RUNNING HIPTOOL

The maximum allowable intervention coverage levels were set as specified in Chapter 4. The intervention upload sheet was created with the standard columns that can be read by the HIPtool – active, short name, platform, causes of burden [maximum intervention coverage], ICER, unit cost, spending, financial risk protection, and equity. Loading the worksheet describing the burden of disease and the intervention upload worksheet allowed for the optimization models to be run. The scenarios considered are described in Chapter 4.

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