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STATE-OF-THE-ART REVIEW

Resource Needs for Addressing Noncommunicable Disease in Low- and Middle-Income Countries
Current and Future Developments

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Abstract

Low and middle income countries are faced with a range of challenges related to providing efficient and affordable health care. With non-communicable diseases (NCD) on the rise, there is a growing need to be able to estimate resource requirements, costs and expected impact associated with various investment strategies related to prevention and control of NCD. In this article, recently developed costing and health impact models for non-communicable disease are reviewed, with a view to drawing out their main findings as well as methodological limitations. A key shortcoming is that earlier modelling efforts have taken a vertical approach to costing, when in reality a more integrated, horizontal approach is needed in order to effectively plan for scaled-up investment and system development. We subsequently describe how the integration of an NCD module into the joint United Nations OneHealth tool will enable low- and middle-income countries to bring NCD into an integrated process for national strategic health planning.

THE NEED TO STRENGTHEN HEALTH FINANCING

Low- and middle-income countries (LMIC) are grappling with a range of challenges related to providing efficient and affordable health care. With changing epidemiology and population structures, noncommunicable diseases (NCD) are on the rise. At the same time, only 19 of 68 countries with the highest burden of child and maternal mortality are on track to reach Millennium Development Goal (MDG) 4 to reduce child mortality, and at current rates of progress, few of these countries will reach MDG5 to reduce maternal mortality [1].

In order to move toward universal coverage, countries must raise sufficient funds, reduce the use of direct payments to finance services, and improve efficiency and equity of health service delivery [2]. Current health expenditure levels in many low-income countries are not sufficient to attain the standards of health increasingly expected by the population. A recent analysis carried out for the high-level Taskforce on Innovative International Financing for Health Systems estimated that 49 low-income countries would on average (unweighted) need to spend about US$60 per capita by 2015 to reach populations with a basic package of health services [3]—a significant increase from current levels of health spending—on average US$32 per capita. This estimate included medicine costs for some chronic diseases (such as cardiovascular disease [CVD], diabetes, chronic obstructive pulmonary disease, and asthma) but did not include

a full assessment of the resources needed to deal with NCD.

ESTIMATING RESOURCE NEEDS FOR NCD: RECENT DEVELOPMENTS

In parallel with the countdown to the 2015 MDG targets, recent years have seen growing awareness and concern about the escalating burden of NCD and injuries worldwide not just from the public health perspective but also from the economic viewpoint. Lives lost to diseases such as cancer, CVD, and diabetes—together with the often long-standing disability associated with them—have a direct economic impact on households and communities, both through the uptake of health services and goods (which diverts expenditure away from other possible uses) and through reduced levels of income or labor productivity. At the macroeconomic level, a recent study by the World Economic Forum and the Harvard School of Public Health estimated that cumulative losses in the national product of LMIC over the period 2011–2025 would amount to more than US$7 trillion dollars if a concerted international response to this burden were not mounted [4]. The recent High-Level Meeting on Non-Communicable Diseases and subsequent Political Declaration [5] provide governments and other stakeholders with a clear mandate for enhanced action and investment.

A key issue for debate—both for delegates at the High-Level Meeting and for subsequent rollout by countries—concerns the policies and strategies that could or should form the backbone of a renewed commitment to address NCD. There is growing evidence for and consensus about the specific intervention strategies that can effectively tackle leading causes of NCD and their underlying risk factors [6,7]. These interventions include population-level measures (especially strategies to reduce consumption of tobacco, alcohol, and salt, including improved awareness of healthy lifestyles, increased excise and tobacco taxes, and enhanced regulation) and individual-level treatment and prevention (such as the prevention of heart disease and stroke or the early detection and treatment of cancer).

Several criteria influence the selection of such global or national priorities for NCD prevention and control, including the current and projected burden of disease; the cost-effectiveness, fairness, and feasibility of implementing interventions; and political considerations. In particular, cost-effectiveness information can help to identify which interventions offer the greatest value for the money; such evidence has now been assembled at the international level for all key contributors to—or risk factors for—NCD [8–13].

In addition to evidence on the effectiveness and cost-effectiveness of different policy or treatment options, information is also needed on the feasibility and acceptability of interventions, including their financial feasibility or affordability. In preparation for the UN High-Level Meeting on NCD, the World Health Organization (WHO) identified a core set of evidence-based "best buy" interventions that met these criteria [6,14]. A best buy is a concept that extends beyond economic efficiency or cost-effectiveness. It is an intervention for which there is compelling evidence that it is not only highly cost-effective but is also feasible, low-cost, and appropriate to implement within the constraints of the local health system. Table 1 summarizes these best buys. Interventions that do not meet all of these criteria—but which offer good value and have other attributes that recommend their

Table 1. Core set of NCD best buy interventions	
Risk factor/disease	Best buy interventions
Tobacco use	Tax increases; smoke-free indoor workplaces and public places; health information and warnings; bans on tobacco advertising, promotion and sponsorship
Harmful alcohol use	Tax increases, restricted access to retailed alcohol, bans on alcohol advertising
Unhealthy diet and physical inactivity	Reduced salt intake in food, replacement of trans fat with polyunsaturated fat, public awareness about diet and physical activity (via mass media)
CVD and diabetes	Counseling and multidrug therapy (including blood sugar control for diabetes mellitus) for people with medium-high risk of developing heart attacks and strokes (including those with established CVD), treatment of heart attacks (myocardial infarction) with aspirin
Cancer	Hepatitis B immunization to prevent liver cancer, screening and treatment of pre-cancerous lesions to prevent cervical cancer

Reprinted, with permission, from WHO [21].
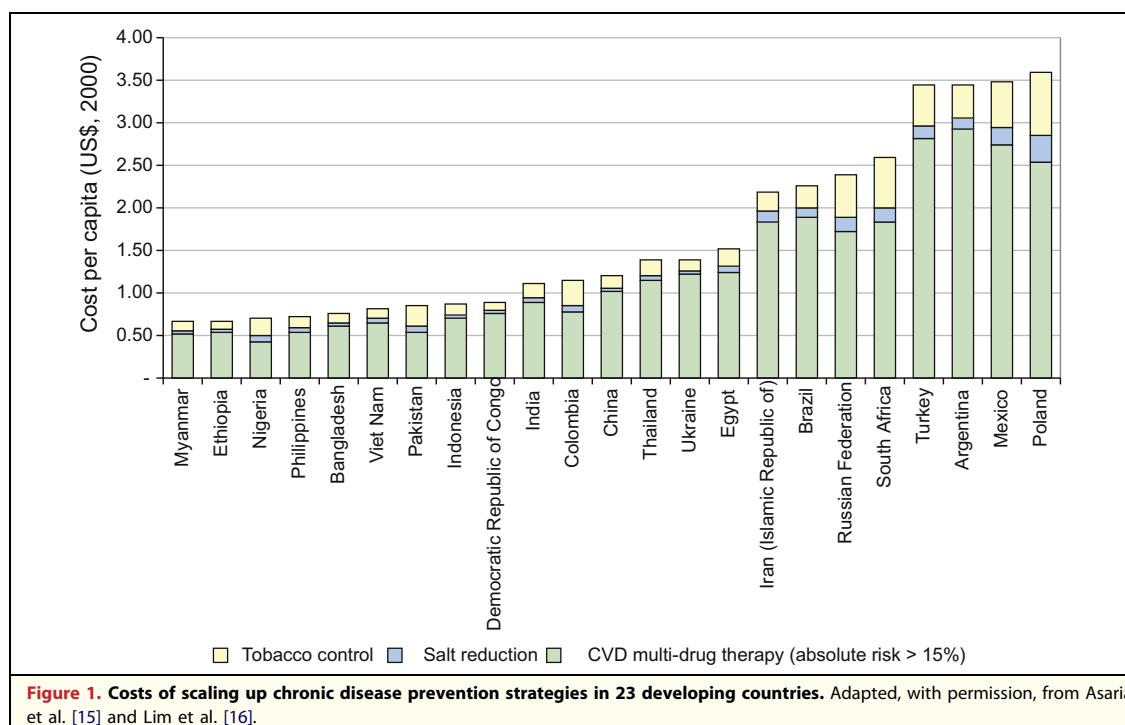CVD, cardiovascular disease.

Figure 1. Costs of scaling up chronic disease prevention strategies in 23 developing countries. Adapted, with permission, from Asaria et al. [15] and Lim et al. [16].

use—can be characterized as "good buys." Policy makers can consider best buys as a core set of interventions for priority scale-up and good buys as an expanded set of interventions to be made available when resources allow.
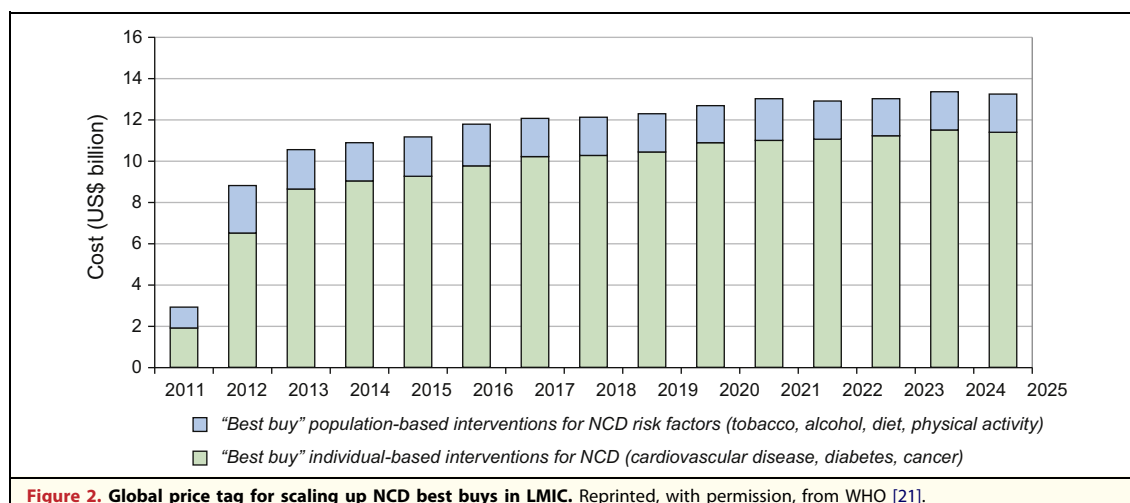
Once a set of best buys has been identified, the question arises as to the financial resources that would be required to implement them. A chronic disease series published in 2007 by *Lancet* focused on a subset of these priority interventions, including price and nonprice demand reduction strategies for tobacco use, salt reduction strategies, and combination drug therapy for individuals at an elevated risk of experiencing a CVD event [15,16]. Estimates generated through this work indicated that in 23 large developing economies (which account for 80% of the burden of chronic disease in LMIC), an estimated 32 million deaths could be averted over 10 years due to these interventions alone, at a cost of US$6 billion per year. As reported in Figure 1, the average annual investment needed ranges from well below US$1 to more than US$3 per capita (with most of that expenditure going on individual-based drug therapy for persons with more than a 15% risk of experiencing a CVD event over the next 10 years). Country-specific costs inevitably vary considerably, depending on the disease prevalence or risk factor exposure, current and future demographic composition, as well

as the unit costs associated with different elements of a health intervention (such as salaries, healthcare visits, and diagnostic tests).

In addition to 32 million deaths averted from 2006 to 2015 in these 23 large developing countries [15,16], losses in economic output would also be reduced by US$8 billion over the same period [17].

The main drawbacks of this earlier analysis were that it was restricted to a very limited number of interventions and countries, meaning that no complete estimate was available for ascertaining the expected costs of scaling-up a broader set of effective population-based and individual healthcare interventions for NCD and their major risk factors. This information gap was seen as a serious impediment to appropriate resource mobilization and financial planning at the global and national levels.

In response to this information gap, WHO has developed a financial planning tool for scaled-up delivery of a defined set of chronic disease intervention strategies. It is a tool for medium-term planning that can be used to provide forecasts of financial resource needs at the global, national, or subnational levels and is based on methods used to derive global "price tags" for scaling up interventions related to attainment of the MDG, including human immunodeficiency virus/acquired immunodeficiency syndrome, tuberculosis, malaria, and child health.

Figure 2. Global price tag for scaling up NCD best buys in LMIC. Reprinted, with permission, from WHO [21].

To inform the dialogue around financial resource needs at the international level, the WHO NCD costing tool was used to generate a global price tag for scaled-up delivery of NCD best buys in LMIC [14]. Key data sources for this costing exercise included UN Population Division statistics, global burden of disease and risk-factor surveillance estimates, international treatment guidelines, and WHO cost databases. The period of scaling-up was set as 2011–2025, by which time desired levels of treatment coverage (80% in the base case) were assumed to be reached. Full implementation of population-based strategies is expected to occur more rapidly (after approximately 5–6 years). Analysis was performed for 42 LMIC (with populations in excess of 20 million), which between them account for 90% of the NCD burden in developing regions of the world (and 77% of the global NCD burden).

The total cost of implementing the full set of best buy interventions across all LMIC over the period 2011–2025 is estimated to be US$170 billion, at an average of US$11.4 billion per year (Fig. 2); population-based measures that address tobacco and harmful alcohol use, as well as unhealthy diet and physical inactivity, account for a very small fraction of the total price tag (US$2 billion per year—less than US$0.40 per person). Expressed in per capita terms, these costs amount to an annual investment of under US$1 in low-income countries, US$1.50 in lower-middle-income, and US$3 in upper-middle-income countries. These values are largely commensurate with the earlier estimates shown in Figure 1, even though a number of additional measures are included in this global price tag analysis. A key reason behind

that finding is the much higher threshold value used for providing multidrug therapy for those at an elevated CVD risk (30% vs. 15%); in addition, the resource needs associated with certain program elements of tobacco control were revised downward following in-depth consultation and resource profiling.

The primary use of the WHO NCD costing tool is ultimately directed at the national level. The tool has been developed in Microsoft Excel (Redmond, Washington) and is designed to be used by country investigators responsible for NCD program planning or development. Key analytical steps required by national users include: definition of the intervention package; estimation of current versus target levels of need and coverage in the population; and calculation of year-on-year resource costs required over a specified period to reach desired coverage. The tool generates estimates of total and incremental costs of scaled-up provision, broken down by category of intervention (e.g., population-wide interventions versus individual healthcare interventions), cost category (e.g., human resources, physical capital), activity (e.g., regulation versus individual treatment), and time (e.g., costs at different levels of policy formulation).

To optimize the flexibility and usefulness of the WHO NCD costing tool at the national level, the set of interventions from which policy makers and planners can choose may need to go beyond the initial subset of best buys identified by WHO (e.g., tobacco cessation, brief advice for heavy drinkers, early detection of breast cancer). Accordingly, resource-need profiles and cost estimates for other interventions have been integrated into the tool to give countries a better sense of the resource

implications associated with the delivery of a more comprehensive public health response to NCD. It should be noted, however, that the purpose of the tool is to aid financial planning for scaling up interventions that have been prioritized; it is not a cost-effectiveness or priority-setting tool.

Although useful and usable as an instrument for evidence-based national planning in the area of NCD control and prevention, the currently available WHO NCD costing tool is limited in a number of key respects:

- The tool is restricted to a discrete number of diseases and risk factors, meaning that other NCD conditions accounting for a significant portion of the global burden of disease—such as other renal and liver diseases, gastrointestinal diseases, neurological diseases (other than stroke) and mental disorders—have been excluded.
- The tool does not provide estimates of the health impacts associated with the combined implementation of the best buy strategies, in particular the number of premature deaths avoided as interventions are scaled-up. This information gap represents a key piece of analysis that would need to be undertaken to demonstrate the return on the large-scale investments indicated. Related to this point, cost estimates do not take into account the impact of preventive measures on subsequent disease rates, such as the impact of tobacco control measures on future rates of ischemic heart disease or stroke; rather, disease rates have been assumed to be constant throughout the scale-up period. As a consequence, estimated costs of scale-up might be expected to be overestimated (however, it is also the case that in countries with positive population growth and/or increased life expectancy, more people will be exposed to NCD risk factors, thus mitigating the extent of overestimation).
- The tool does not take into account the costs of overcoming system-wide constraints, such as an inability to train and retain health professionals.

A HEALTH SYSTEMS APPROACH: THE ONEHEALTH TOOL

Even though it is important to undertake program-specific analysis, as described for NCD, LMIC need to take into account the full disease burden and health system in order to set priorities for the national health sector. Recent years have seen a plethora of tools developed to assist national planning for specific diseases or programs [18]. The re-emergence of vertical program planning has been reinforced by some of the global health
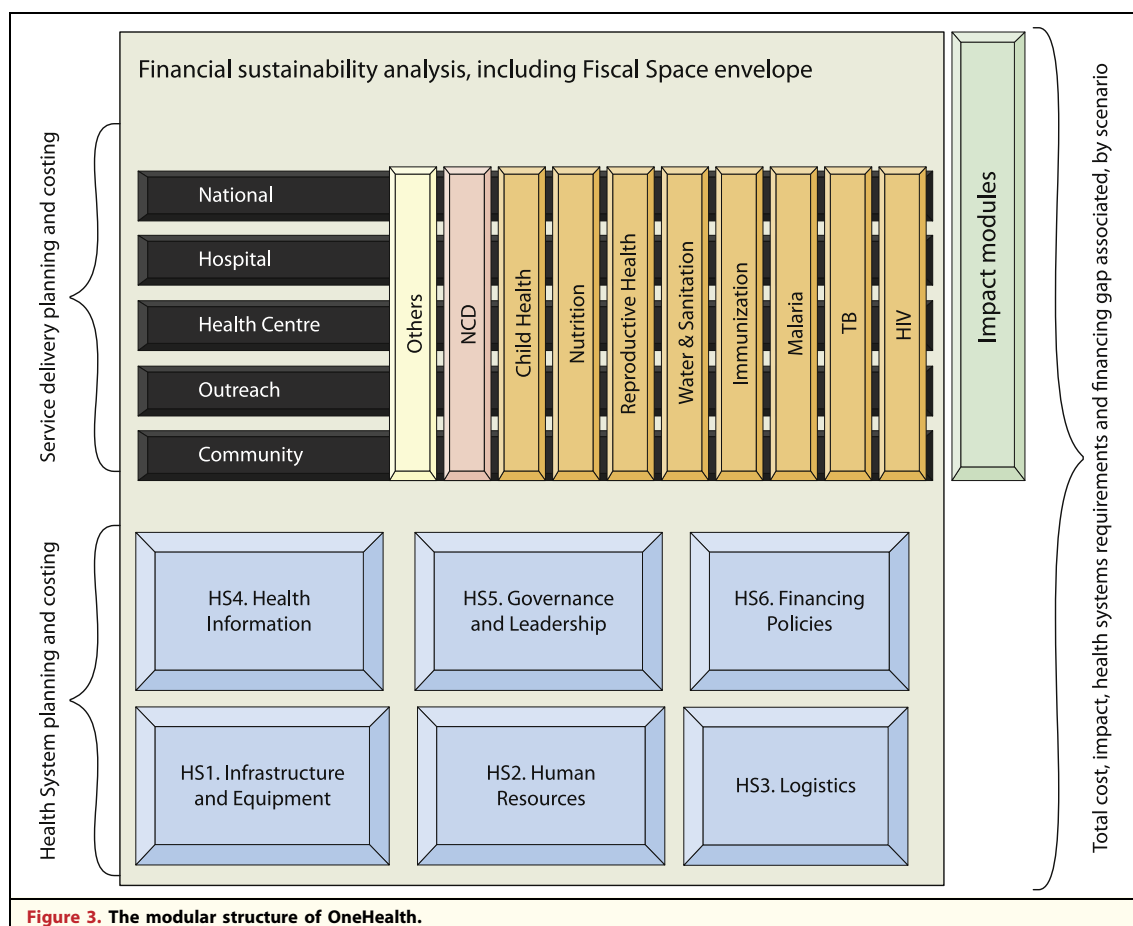
initiatives, where evidence indicates that disease-specific and health program-specific funding has undermined governments' abilities to build national health systems [19]. Although many countries have seen substantial increases in external development assistance for health in recent years, they may lack the capacity and bargaining power to effectively channel these toward national priorities [19,20].

Poor health outcomes in low-income countries can be explained by underinvestment in health systems. It is essential to ensure that systems are strengthened to take on not just the MDG, but also the growing burden of NCD. The average number of physician, midwifery, and nursing personnel in low-income countries is 9.5 per 10,000 [21], compared with an estimated critical minimum threshold of 22.8 per 10,000 [22]. The analysis carried out for the high-level Taskforce on Innovative International Financing for Health Systems estimated that out of the additional resources estimated to be required, 74% represent investments in the health system [3]. Still, only a small share of current official development assistance for health is estimated to go toward health systems [23].

To summarize, progress toward universal coverage is suffering from underinvestments in the health system, coupled with disease-specific initiatives that too seldom take an integrated approach to planning for population health. Unfortunately, what is seen today in many countries are delinked planning cycles for individual programs, which are not synchronized across the health sector, as can be seen by an examination of the WHO Country Planning Cycle Database [24].

To combat these challenges and facilitate systems-focused national planning, the UN Inter-Agency Working Group on Costing, established in 2008, has taken on the task to strengthen country analysis of health-sector requirements and their related costs, through the development of an integrated planning model—the OneHealth tool [25].

The OneHealth tool aims to support integrated planning processes in countries, by bringing together disease-specific program and health systems planning. The tool was born out of a review of existing tools for strategic planning and costing, which found that existing tools did not adequately allow for sector-wide scenario analysis [18]. The OneHealth tool to date includes detailed planning modules for programs related to the MDG, such as nutrition, child health, and malaria, as well as modules for health

Figure 3. The modular structure of OneHealth.

systems planning (e.g., human resources, logistics, infrastructure) (Fig. 3). It aims to facilitate planning that incorporates health promotion, prevention, treatment, and disease management.

The objective is to ensure that the development of national health plans is carried out within a framework of health system capacity assessment, taking into account financial sustainability and outcomes-based planning. As such, OneHealth incorporates modules for conducting a financial space assessment to look at fiscal sustainability, as well as modules for estimating the predicted health impact of scaling up interventions over time (mortality and morbidity). The tool incorporates preexisting UN epidemiological reference group models, such as the Lives Saved Tool [26], the AIDS Impact model for human immunodeficiency virus/acquired immunodeficiency syndrome interventions [27–29], and the FamPlan model, which computes the relationship between family planning and total fertility rate [30,31].

The key strength of OneHealth is its ability to pull different programmatic areas together and to enable a consolidated analysis across health sys-

tems, health impact, and financial space. These three areas need to be considered jointly for the entire health sector. Looking at these areas for just one program brings limited added value. For example, the health impact achieved by scaling up breast-feeding promotion for child health can have a substantial impact on future NCD burden. The scale-up of immunization against human papillomavirus can similarly reduce the need for screening and treating women with cervical cancer. The analysis of benefits across national programs and over time is highly beneficial to inform priority setting.

At the same time, realistic planning needs to take into account health system capacity. Scaling up services by a factor of 50% or even by 10% over the next 5–10 years may require substantial investments in the medicines supply chain, in health worker availability and deployment, and in the establishment of management and supervisory processes. The purpose of OneHealth is to provide national planners with a tool that enables them to make an informed analysis and to set realistic targets for the medium term (3–10 years).

FUTURE DEVELOPMENTS: AN NCD MODULE FOR ONEHEALTH

The first version of OneHealth, released in early 2012, does not yet include planning modules for NCD prevention and control. Therefore, the next step is to incorporate NCD into the tool, drawing on current developments in modeling resource requirements and expected impacts of NCD-related strategies.

Whereas NCD is not one of the MDG, it is increasingly being raised as a priority at the country level. Ministry of Health counterparts who have been exposed to OneHealth to date have expressed high satisfaction with the capability of the tool to support integrated planning, but they have also underlined the need to incorporate planning for NCD into the tool. Ongoing work to ensure that future versions of OneHealth include modules for planning and costing for chronic diseases will allow LMIC to bring NCD into an integrated process for national strategic health planning.

As part of the development of a NCD module within OneHealth, special attention will need to be given to modeling of composite as well as disaggregated health gains brought about by interventions. Such an analysis of health impacts provides the information required to assess the sizeable returns on investment generated through the scale-up of prioritized NCD control and prevention strategies. Illustrating these positive impacts is in line with the overall objectives of OneHealth, which is to demonstrate the costs and potential impact associated with different investment scenarios.

The added value of including an NCD component into OneHealth includes:

- Costing of priority health interventions for NCD, including population-based strategies as well as clinical interventions. OneHealth comes equipped with defaults for standard treatment protocols that the country-level user can adjust as needed to adapt to the national context.
- An assessment of the health system implications of the planned scale-up and the related resource costs, such as translating the number of required outpatient visits into numbers of full-time health workers.
- Facilitated integration of program- or disease-specific plans into broader national health plans.
- Ensuring the use of consistent approaches for planning and costing for NCD, across national programs, UN agencies, and partners.
- Modeling the predicted health impact of scaling up NCD interventions, within an overall envelope of health service scale-up.

CONCLUSIONS

LMIC are faced with a range of challenges related to providing efficient and affordable health care. With NCD on the rise, there is a growing need for Ministries of Health to be able to estimate resource requirements, costs, and expected impact associated with various investment strategies related to prevention and control of NCD. Several models have been developed to date to allow for costing and assessing health benefits of NCD interventions, but have not been brought together with an analysis of other programs and diseases. The integration of an NCD module into the joint UN OneHealth tool will allow LMIC to bring NCD into an integrated process for national strategic health planning.

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