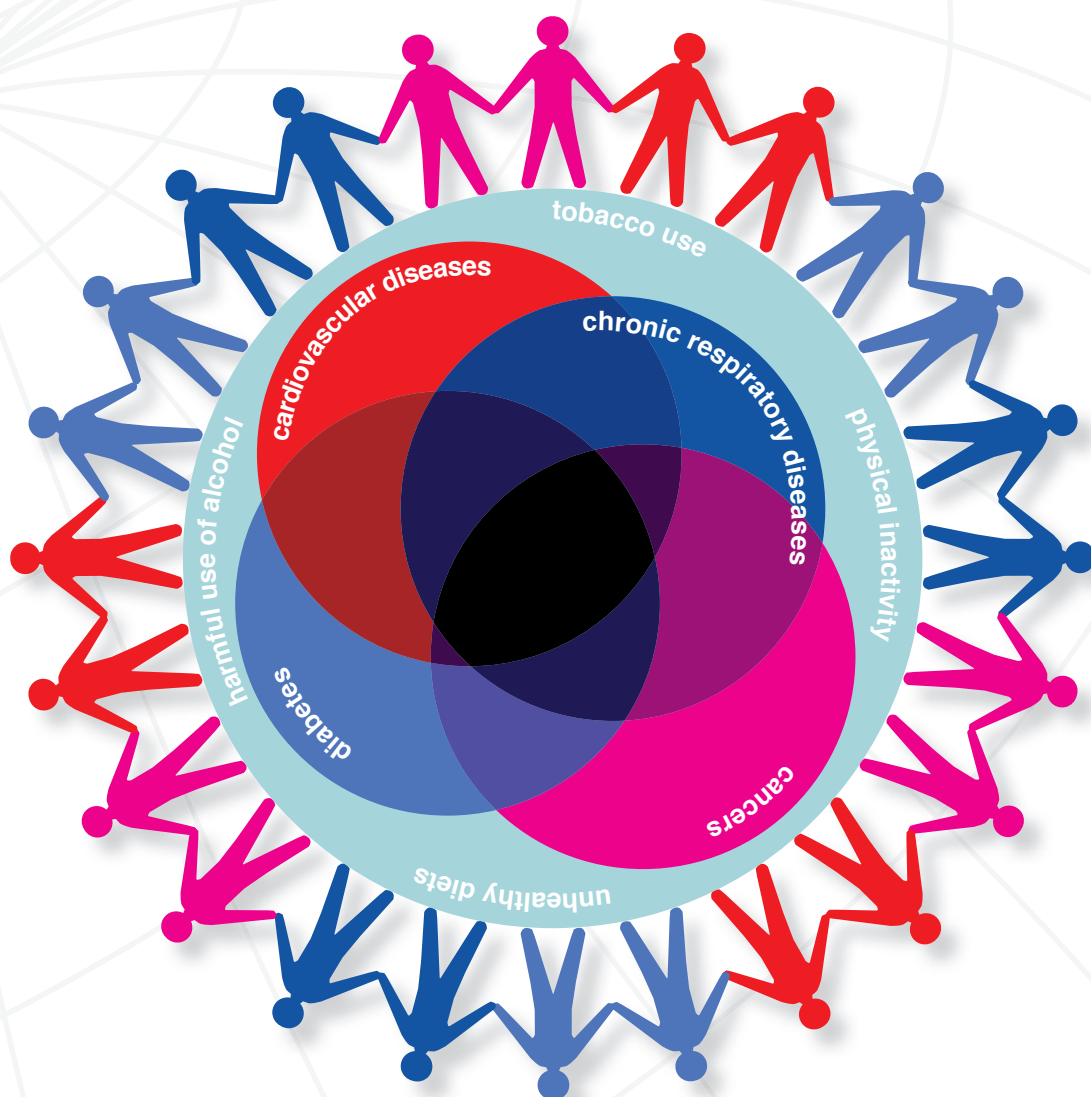


Scaling up action against noncommunicable diseases: How much will it cost?



World Health
Organization

WHO Library Cataloguing-in-Publication Data

Scaling up action against noncommunicable diseases: how much will it cost?

1.Chronic disease - prevention and control. 2.Chronic disease - economics. 3.Chronic disease - mortality.
4.Cost of illness. 5.Developing countries. I.World Health Organization.

ISBN 978 92 4 150231 3

(NLM classification: WT 500)

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Contributions were gratefully received from Tim Armstrong, Nick Banatvala, Doug Bettcher, Francesco Branca, Nathalie Broutet, Shola Dada, Trish Fraser, Michael French, Ioana Popovici, Anne-Marie Perucic, Armando Peruga, Vladimir Poznyak, Jurgen Rehm, Dag Rekve, Luminita Sanda, Leanne Riley, Cecilia Sepulveda, Karen Stenberg, Andreas Ullrich, Judith Watt, WeiWei Wang, Godfrey Xuereb and Ayda Yurekli.

The feedback and comments on a draft version of the report by David Bloom, Eva Jane-Llopis, Trish Fraser, Rachel Nugent, Neena Prasad, Ebrahim Shah and Judith Watt are warmly acknowledged.

The support and contribution of the American Cancer Society to this work is gratefully acknowledged. For tobacco costing, the contributions of Dr Ioana Popovici of Nova Southeastern University and Professor Michael French of the University of Miami were funded by Bloomberg Philanthropies and the World Lung Foundation, while the time and contributions of Judith Watt was funded by the Framework Convention Alliance.

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Printed in France

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Summary

This paper describes a new financial planning tool developed by the World Health Organization (WHO) to assist low- and middle income-countries in scaling up a core set of interventions to tackle noncommunicable diseases (NCDs), such as heart disease and stroke, diabetes, cancer and chronic lung disease.

NCDs currently kill 36 million people per year, and the burden continues to escalate, particularly in low- and middle-income countries. These countries often lack resources and capacity to tackle these diseases, and therefore need to adopt an incremental approach as they move to address the gaps in NCD prevention and control.

To prevent disability and death, it will be important to act on two levels - through population-wide measures to reduce exposure to risk factors such as tobacco use, and through interventions targeting individuals who already have NCDs or are at high risk for developing them. A wide range of health interventions is available for both purposes. One challenge is to assess which interventions will bring the most benefit for the lowest cost - in other words, what are the 'best buys'. A further challenge is to assess the cost of their scaled-up implementation.

The WHO tool aims to help countries make that assessment. It is a tool for financial planning (over the period 2011-2025) that can be used to forecast resource needs at national and sub-national levels. The tool can enhance traditional budgeting mechanisms in countries and provide new information to development agencies about the resources needed to tackle the growing burden of NCDs.

The tool has been used to produce a 'price tag' for a combined set of population-based and individual-level 'best buy' NCD interventions that have been identified as priority actions by WHO. The average yearly cost for all low- and middle-income countries is estimated to be US\$ 11.4 billion (an overall cost of US\$ 170 billion over the period 2011-2025).

The cost per head of population is low. It represents an annual investment of under US\$ 1 in low-income countries, US\$ 1.50 in lower middle-income countries; and US\$ 3 in upper middle-income countries. Expressed as a proportion of current health spending, the cost of implementing such a package amounts to 4% in low-income countries, 2% in lower middle-income countries and less than 1% in upper middle-income countries.

Population-based best buy interventions address tobacco and harmful alcohol use, as well as unhealthy diet and physical inactivity in low- and middle-income countries. The cost for these approaches US\$ 2 billion yearly. In low-income and lower middle-income countries, the median cost per head of population amounts to less than US\$ 0.20 per year, while for upper-middle income countries the median value is close to US\$ 0.50. These amounts represent less than 1% of total per capita spending on health.

Individual-based best buy interventions are delivered in primary health care settings and include, for example, counselling and drug therapy for persons with or at high risk of cardiovascular disease, plus measures to prevent cervical cancer. For these interventions the cost averages more than US\$ 10 billion yearly. Over the scale-up period 2011-2025, the annual cost per head of population falls below US\$ 1 in low-income countries, less than US\$ 1.50 in lower-middle income countries and averages US\$ 2.50 in upper-middle income countries.

Note: It is important to mention that the tool used for this study required a number of data sources and assumptions to be made about which interventions are scaled up, at what pace and to what level of coverage. These may not coincide with a particular country's intentions or health system capacities and not all countries will agree with the various assumptions used to develop the estimates of costs of the interventions package reported in this document. However, the tool has been developed in such a way that it can be used by country investigators to estimate costs based on their specific epidemiological, economic and political contexts as well as their policies and capacity of their national programmes in implementing the key prevention and control measures.

1. Introduction

1.1 Policy context and rationale

Concern is growing about the escalating global burden of noncommunicable diseases (NCDs) such as cardiovascular diseases, cancer, diabetes and chronic respiratory diseases. The concern is not just epidemiological but also economic. NCDs, which are often accompanied by long-standing disabilities, have a direct economic impact on households and communities, both through the uptake of health services and goods that diverts expenditure, but also on levels of income or labour productivity (Abegunde et al. 2007; WHO, 2005).

Despite the scale of these adverse consequences, NCDs have been neglected in international health and development initiatives. UN A/64/265 resolution ‘Prevention and control of noncommunicable diseases’ (UN, 2010) provides a high-level political mandate to develop an international policy framework for the prevention and control of NCDs. Key to this strategy is the generation of evidence on effective interventions that are affordable for developing regions.

There is growing evidence for and consensus about interventions that can tackle the leading NCDs and their underlying risk factors: tobacco use, unhealthy diet, physical inactivity and harmful use of alcohol (WHO, 2011a). On a population level, these measures include reducing consumption of tobacco, alcohol and salt; improving awareness of healthy lifestyles; increasing excise and tobacco taxes and enhancing regulation. Interventions for individuals focus on prevention and treatment e.g. primary and secondary prevention of heart disease and stroke, as well as early detection, diagnosis, treatment and follow-up for cancers, diabetes, asthma and chronic obstructive pulmonary disease (WHO, 2010a).

Part of the evidence for increasing investment and implementation of priority interventions is economic. Cost-effectiveness information can help identify which interventions offer greatest value for money. Many economic studies have been conducted on NCD prevention and control, but a large proportion of these studies are from high-income countries, making comparisons and generalization problematic. However, a small sub-set of comparative analyses have been carried out for low- and middle-income countries, mainly through the Disease Control Priorities project (www.dcp2.org) and WHO’s CHOICE programme (www.who.int/choice), which provide a sufficient, if imperfect, evidence base for setting priorities in these contexts (see Appendix 1c).

Along with evidence on the effectiveness and cost-effectiveness of policy and treatment options, information is needed on their feasibility, affordability and acceptability. Some work has been conducted on the costs of scaling up NCD interventions, such as population-based strategies to reduce tobacco use and dietary salt intake, plus combination drug therapy for people at elevated risk of a cardiovascular event within the next 10 years (estimated for 23 large, low- and middle-income countries for the period 2006-2015) (Asaria et al. 2007; Lim et al. 2007). Cost-effective NCD interventions have been proposed at a WHO meeting for individuals in resource-constrained settings (WHO 2010a). More recently, the Global Status Report on Noncommunicable Diseases 2010 provided concrete recommendations on cost-effective interventions that are affordable in all countries - actions that should be undertaken immediately to accelerate results in terms of lives saved, diseases prevented, and costs avoided (WHO, 2011a). Feasibility and costing studies have also been conducted using a primary health care approach in resource-constrained settings (Mendis et al. 2010; Soliman et al. 2010; Ndindjock et al. 2011; Mendis et al. 2011).

What has been missing is a complete estimate of the costs of scaling up a core set of effective population-based and individual health-care interventions for NCDs and their major risk factors. This gap has represented a serious impediment to resource mobilization and financial planning at global and national levels. The current study has been carried out with a view to addressing it.

1.2 Scope, purpose and objectives

The aim was to develop a financial planning tool for scaling up delivery of a set of cost-effective population-based and individual-level health care interventions in low- and middle-income countries. This tool can be used to forecast financial resource needs at national or sub-national level and also to generate a price tag at global level. It will enhance traditional budgeting mechanisms in countries and provide information to development agencies and international institutions on the resources needed to address the growing burden of NCDs. The tool does not, however, assess the health impact or effects of interventions as a result of scaling-up, nor is it a cost-effectiveness evaluation tool.

Initial development of the tool was a collaboration between the Noncommunicable Disease and Mental Health (NMH) and Health Systems and Services (HSS) Clusters at WHO headquarters in Geneva. NMH holds the policy brief in this area and provided information for the intervention package and evidence-based protocols; HSS provided expertise in costing methods and tool development. Throughout this process, institutional partners were consulted to obtain country-level data and advice on the content and structure of the tool .

The impetus for this project is the UN High-Level Meeting on NCDs in September 2011. The deliverables are:

- Construction of a resource needs/costing tool
- Generation of a multi-country database containing values for all model parameters
- Documentation of methods and results, including an estimate of the cost of implementation of the NCD intervention package, based on the 'best buys' interventions recommended in WHO's Global Status report 2010.

The tool requires a number of data sources. Assumptions have thus been made regarding the interventions being scaled up, pace of scale-up and level of coverage achieved. These may not coincide with a particular country's intentions or health system capacities. The tool has therefore been developed in such a way that it can be readily used by country investigators, and adapted to the specific epidemiological, economic and political context.

2. Methods

2.1 Principles and practice of costing the scale-up of health services

The NCD costing tool is based on a methodology used to derive global price tags for scaling up interventions related to the Millennium Development Goals (MDGs), including HIV/AIDS, TB, malaria and child health (see for example Johns et al. 2007; Kiszewski et al. 2007; Stenberg et al. 2007).

These methods have also been applied to NCDs and mental health (Asaria et al. 2007; Lim et al. 2007; Chisholm et al. 2007), including an estimation of the costs and effects of scaling up strategies to reduce tobacco use and dietary salt intake, plus combination drug therapy for individuals at elevated risk of a cardiovascular disease (CVD) event.

Principles underlying the methodology are summarized in Box 1. The purpose is to identify the actual budgetary resources needed to implement efficient policies, as opposed to assessment of the economic value of resources used in an intervention, which might also include resources that have no financial value, such as voluntary care. In short, the methods and purpose of a costing tool are not the same as those of a cost-effectiveness tool.

Box 1. Costing principles

Financial versus economic costing: Costs reflect actual expenditures that need to be mobilized - from a broadly defined health-system perspective. Financial costs incurred but not usually paid for by the health system, notably travel costs of patients and families, are not included. Costs such as travel time and lost productivity, which have an economic if not a financial value, were likewise excluded.

Total versus incremental costing: The total cost for a given year is calculated for the entire population in need at the specified level of coverage, and is not adjusted for existing expenditures. For incremental costing, it is assumed that expenditure associated with current interventions continues to be made available. This means that only resources and expenditures required above current spending levels are included.

Separate costing of variable and fixed costs: Variable costs, including treatment, depend on the number of patients in need and the projected level of coverage. By contrast, capital costs (e.g. equipment and buildings) do not vary with each patient treated. In addition, programme costs incurred above the level of service delivery, such as district or national training and supervision, were estimated, including assessment of the capacity of each country's current health system to manage and monitor scale-up.

Use of country-specific data: Prices for 'non-traded' goods and need for services may vary greatly among countries, so country-specific data should be used to build costing estimates.

The cost of scaling up an intervention can be determined by using the following parameters:

- population (of the country or region)
- prevalence and incidence (of the disease or risk factor in question)
- coverage (the proportion of population in need that is exposed to or receiving the intervention)
- resource quantities (needed to implement the intervention; e.g. human resources, medicines, equipment)
- prices or unit costs (for each resource item or entity; e.g. salaries, drug prices).

Multiplication of the first two parameters (population times prevalence) defines the population at risk or in need, while multiplication of the final two parameters (resource use times price) provides the cost per case treated or person exposed to the intervention. The remaining parameter, coverage, provides the main mechanism by which scale-up takes place over time. Box 2 illustrates how these different parameters contribute to estimating the costs of scaling up.

Box 2. Example of how to estimate the cost of scaling-up an intervention

A 20% rate of prevalence of smoking in an adult population of one million would yield a target population in need of 200 000 individuals. All these individuals could benefit from a brief intervention offered in primary care that, say, costs US\$1 per treated case to deliver.

If coverage of the brief intervention was currently only 10%, the total annual cost for delivering the intervention would be US\$20 000 (200 000 times US\$1 times 10%); once scaled up to a higher desired level of coverage (such as 50%), the total cost will have increased five-fold to US\$100 000. The difference between the current and target level of coverage gives the incremental cost of scaling-up the intervention (a total of US\$80 000).

Total or incremental costs can be divided by the total number of people in the population to give a cost per capita (in this instance, the annual cost per capita would rise from US\$ 0.02 to US\$ 0.10, an increment of US\$0.08).

Analytical steps require:

- definition of the intervention package
- estimation of the current intervention versus levels of need and coverage in the population
- calculation of the year-on-year resource costs required over a specified period to reach desired coverage.

The tool can produce estimates of total and incremental costs of scaled up provision, broken down by:

- category of intervention (e.g. population-wide interventions versus individual health-care interventions);
- cost category (e.g. human resources, physical capital)
- activity (e.g. regulation versus individual treatment)
- time (e.g. costs at five and 10 years).

The tool will allow country users to change default values, timelines or scale-up patterns. As mentioned earlier, 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.

2.2 Selection of diseases, risk factors and intervention strategies

Selection of diseases (and risk factors)

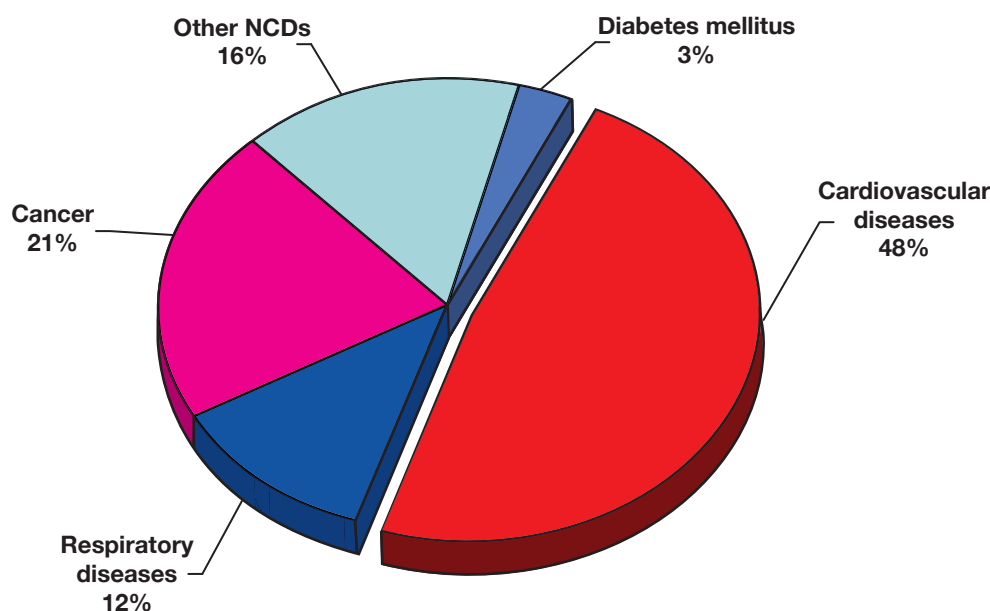
A critical question to address in a costing exercise is its scope: which diseases, risk factors and interventions are to be included.

The reference point adopted for this study is the 2008-2013 Action Plan for the WHO Global Strategy for the Prevention and Control of Noncommunicable Diseases (WHO, 2008a), which focuses on four diseases: cardiovascular disease (CVD), cancer, diabetes and chronic respiratory disease. These diseases are responsible for the majority of deaths caused by NCDs (Figure 1) and are largely caused by four shared behavioural risk factors: tobacco use, harmful alcohol use, physical inactivity and unhealthy diet. Prevention of renal disease is included within the analytical framework through its link to CVD and diabetes, as is the prevention of alcoholic liver disease via reduction in harmful use of alcohol.

By restricting analysis to these diseases and risk factors, other NCD conditions that account 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. It will be important to bear this in mind when considering results. In the case of mental

disorders, estimates of the cost of scaling up interventions have already been made for low- and middle-income resource settings (Chisholm et al. 2007).

Figure 1. Distribution of global NCD by cause of death, both sexes



(Source: WHO, 2008b)

Selection of interventions for prioritized scale-up

Many interventions exist for prevention and control of NCDs. Even the wealthiest countries, however, have to make choices about which of these are implemented, because resources for health are finite - and in most countries, very limited. A number of criteria inform these decisions, including the current and projected burden of diseases (or their underlying risk factors, such as tobacco use), the cost-effectiveness, fairness and feasibility of implementing interventions and political considerations¹.

In preparation for the 2011 UN High-level meeting on NCDs, WHO has identified a set of evidence-based 'best buy' interventions that meet these criteria (WHO, 2011a; WHO, 2011b). A best buy is a concept that extends beyond economic efficiency or cost-effectiveness. It is an intervention with compelling evidence for cost-effectiveness that is also feasible, low-cost and appropriate to implement within the constraints of the local health system. Interventions that do not meet all of these criteria - but which offer good value and have other attributes that recommend their 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.

Appendices 1a and 1b provide summary tables of interventions identified as best buys after the application of priority-setting criteria (avoidable burden, cost-effectiveness, implementation cost and feasibility). Appendix 1c provides data sources used for populating the cost-effectiveness dimension. Table 1 provides a summary list of two categories of interventions: population-based measures addressing NCD risk factors; and individual-based interventions addressing NCDs within the context of primary care.

¹ Cost-effectiveness summarizes the efficiency with which an intervention produces health outcomes. A 'highly cost-effective' intervention is defined as one that generates an extra year of healthy life (equivalent to averting one disability-adjusted life year) for a cost that falls below the average annual income or gross domestic product (GDP) per person in the country or region in question.

Table 1. Summary of interventions included in the core scaling-up costing scenario

	Core intervention set: Best buys
Population-based interventions addressing NCD risk factors	<ul style="list-style-type: none"> • <u>Tobacco use</u>: Tax increases; smoke-free indoor workplaces and public places; health information and warnings about tobacco; bans on advertising and promotion • <u>Harmful alcohol use</u>: Tax increases on alcoholic beverages; comprehensive restrictions and bans on alcohol marketing; restrictions on the availability of retailed alcohol • <u>Unhealthy diet and physical inactivity</u>: Salt reduction through mass media campaigns and reduced salt content in processed foods; replacement of trans-fats with polyunsaturated fats; public awareness programme about diet and physical activity
Individual-based Interventions addressing NCDs in primary care	<ul style="list-style-type: none"> • <u>Cancer</u>: Prevention of liver cancer through hepatitis B immunization; prevention of cervical cancer through screening (visual inspection with acetic acid [VIA]) and treatment of pre-cancerous lesions • <u>CVD and diabetes</u>: Multi-drug therapy (including glycaemic control for diabetes mellitus) to individuals who have had a heart attack or stroke, and to persons with a high risk (> 30%) of a CVD event in the next 10 years; providing aspirin to people having an acute heart attack

This set of NCD best buy interventions forms the basis of the cost analysis presented here.

2.3 Assessment of epidemiological need and intervention coverage

Identification of the population in need

Comparable country-specific estimates of the prevalence of tobacco use, obesity and insufficient physical inactivity were drawn from the Global Status Report on Noncommunicable Diseases 2010 (WHO, 2011a). Estimates of the prevalence of harmful alcohol use were derived by triangulating aggregate adult per capita consumption with multi-country survey data on the distribution of alcohol use (by age and sex), using a statistical model developed by Rehm et al. (2010).

The prevalence of tobacco use, high blood pressure, raised cholesterol and raised blood glucose was also used to estimate - by age and sex - the proportion of the population at varying levels of total risk of experiencing a (fatal or non-fatal) CVD event during the next 10 years. WHO sub-regional values from the Comparative Risk Assessment study (WHO, 2009) were used to generate disaggregated estimates of risk exposure by age and sex, which are unavailable at country level. Rates of incidence or prevalence for CVD, diabetes, cancers and respiratory disorders were taken from WHO regional estimates produced by the Global Burden of Disease study (WHO, 2008b).

Scale-up period and country selection

The period of scaling up was set at 2011-2025, which is consistent with the set of targets indicators that are being drawn up for consideration by WHO Member States. The focus of analysis was on low- and middle-income countries but the tool can also be used in high-income countries.

Analysis was carried out for 42 low- and middle-income countries (each with more than 20 million people). These account for 90% of the NCD burden in developing regions of the world, and 77% of the global NCD burden. The 42 countries were grouped by income, as shown in Table 2. Estimates of total costs for all low- and middle-income countries were approximated by multiplying results for the 42 countries - which account for 90% of the population in developing regions - by a factor of 1.11 (100% / 90%).

Table 2. Low- and middle-income countries included in the analysis

Low-income countries (13)	Afghanistan; Bangladesh; Côte d'Ivoire; Democratic People's Republic of Korea; Democratic Republic of the Congo; Ethiopia; Kenya; Myanmar; Nepal; Nigeria; Sudan; Uganda; United Republic of Tanzania
Lower middle-income countries (13)	Egypt; Ghana; India; Indonesia; Iraq; Morocco; Pakistan; Philippines; Sri Lanka; Ukraine; Uzbekistan; Viet Nam; Yemen
Upper middle-income countries (16)	Algeria; Argentina; Brazil; Colombia; China; Islamic Republic of Iran; Kazakhstan; Malaysia; Mexico; Peru; Romania; Russian Federation; South Africa; Thailand; Turkey; Bolivarian Republic of Venezuela

Coverage levels and scale-up patterns

To calculate the additional resources required to reach the 2025 target, current coverage rates need to be established. For most strategies and countries included in the analysis, intervention-specific data on current effective coverage are not available. What is known, however, is that current effective intervention coverage is very low. Even for tobacco control, analysis has demonstrated that - with the exception of monitoring - the world's population covered by demand reduction measures of the WHO Framework Convention on Tobacco Control in 2008 was below 10% (WHO, 2011a).

The exception to this is hepatitis B immunization, for which country-specific data collated by WHO and UNICEF indicate high levels of (third-dose) coverage (WHO, 2010b). In 33 of the 42 countries in this study, coverage already exceeds 80%. Accordingly, expenditures for this intervention do not pose an additional resource requirement - except in the few countries where coverage continues to fall below this high coverage level.

For all other best buy individual interventions delivered in primary care settings, a default rate of 5% was adopted for current coverage. The target coverage level for these interventions was set at 80% for 2025. Individual countries may choose to adopt different target coverage levels when applying the model, depending on their policies, plans and resources.

The pace at which countries are able to scale up services also differs according to prevailing levels of infrastructure, human resource capacity and financial security as well as other competing priorities. Figure 2 illustrates three distinct patterns of scale-up, which were applied to countries as follows:

- exponential scale-up (used for low-income countries): after an initial slow degree of health system development, coverage speeds up exponentially as the target year approaches
- s-curve scale-up (used for lower middle-income countries): after a brief period of slow expansion, coverage escalates at a linear rate
- front-growth scale-up (used for upper middle-income countries): this pattern assumes that much of the capacity to scale up is already in place, meaning that coverage can escalate rapidly within the short to medium term.

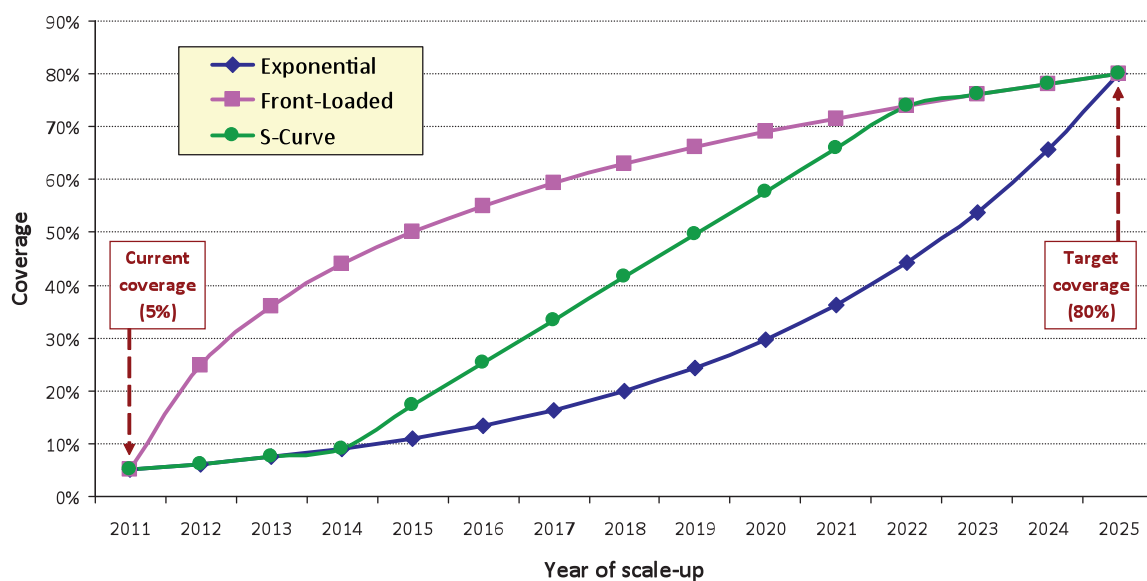
For population-based measures (such as changes in fiscal policy, new regulations or mass media campaigns), a different approach was required. For these interventions, four stages of policy implementation were used to identify resource needs over time:

- planning stage (Year 1)
- policy development (Year 2)
- partial implementation (Years 3-5)
- full implementation (Year 6 onwards)

For countries with low levels of policy implementation, it was assumed that all stages of policy implementation would need to take place; for the very few countries already operating at a high level, only the resource costs of sustaining full implementation were included.

The current performance of countries with respect to tobacco control policy was assessed using data collated as part of the WHO report on the global tobacco epidemic (WHO, 2011c), which contains country-specific scores for each of the MPOWER package components (see Appendix 2a). Similarly for alcohol control policy, data were extracted from a recent global survey on alcohol and health (see Appendix 2b). For diet and physical activity, country-specific performance data were not available; given the very low levels of policy implementation for these two NCD risk factors, all countries were assumed to require all four stages of policy implementation.

Figure 2. Patterns of intervention scale-up



2.4 Estimation of resource needs and unit costs

For individual interventions delivered in primary-care settings, the resource components consist of human resources, medicines, laboratory services and diagnostic and therapeutic procedures. Estimation of the quantity of these resources needed is based on treatment guidelines and clinical protocols, in particular the WHO guidelines for assessment and management of cardiovascular risk and the PEN package guidance (WHO, 2007; WHO, 2010a; see Appendix 3 for the PEN protocol for the integrated management of hypertension and diabetes, and Box 3 for the resource profile related to multi-drug therapy for individuals at >30% CVD risk).

Box 3. Resource use profile for multi-drug therapy (individuals at >30% CVD risk)Screening stage:

- Primary care visits: one five-minute visit (all cases)
- Laboratory tests: urine sugar analysis (all cases); blood glucose, cholesterol, urinalysis (30% of cases)

Treatment stage:

- Primary care (counselling, risk assessment): four annual visits, five minutes each (all cases); four annual visits, 20 minutes each (all cases with diabetes)
- Medicines (daily dose, % cases): hydrochlorothiazide (25 mg, 95%), enalapril (20 mg, 60%), atenolol (75 mg, 50%), amlodipine (5 mg, 60%), simvastatin (15 mg, 100%) and where applicable, metformin (2000 mg, 100% of cases with diabetes; for the majority of cases, the actual dose required may vary between 1000-2000 mg per day).

For population-based measures, a resource needs matrix was developed, consisting of the four stages of policy development described earlier and six categories of resource use: human resources; training; meetings; mass media; supplies and equipment; and other resources. Box 4 illustrates activities that were considered necessary at different stages of policy development when identifying resource needs for certain tobacco control measures. Table 3 provides more generic examples of activity-based resources that were quantified.

Box 4. Tobacco control actions, by stage of policy development**Smoke-free policies**

- Year 1 – Evidence base is prepared; public consultation launched
- Year 2 – Legislation and regulations drafted; enforcement plan and training programme designed; media strategy developed
- Year 3 – Public and employer information campaign launched; legislation passed; inspections and test-case prosecutions initiated
- Ongoing – Regular inspections, enforcement and media advocacy maintained

Pack warnings

- Year 1 – Evidence base is prepared; public consultation launched
- Year 2 – Legislation and regulations drafted; enforcement plan and training programme designed; media strategy developed
- Year 3 – Public and retailer information campaign launched; legislation passed; inspections and test-case prosecutions initiated
- Ongoing – Regular inspections, enforcement and media advocacy maintained
- Warnings rotated every two years

Advertising ban

- Year 1 – Evidence base is prepared; public consultation launched
- Year 2 - Legislation and regulations drafted; enforcement plan and training programme designed; media strategy developed
- Year 3 – Public and retailer information campaign launched; legislation passed; inspections and test-case prosecutions initiated
- Ongoing – Regular industry monitoring and media advocacy maintained

Table 3. Resource needs matrix for population-based NCD prevention measures

Stage of policy development	Human resources	Training	Meetings	Mass media	Supplies and equipment	Other
Planning (Year 1)	Programme management; administration	Strategy / policy analysis	Stakeholders		Office equipment	Baseline survey
Development (Year 2)	Advocacy; law	Legislation	Intersectoral collaboration	Awareness campaigns		Opinion poll
Partial implementation (Years 3-5)	Inspection	Regulation	Monitoring	Counter-advertising	Vehicles, fuel	
Full implementation (Year 6 onwards)	Enforcement		Evaluation			Follow-up survey

A further dimension of the resource needs matrix relates to the level of administration (central, provincial or district). To derive comparable estimates of resource needs across interventions, a standardized country of 50 million people was assumed (split into 10 provinces of 5 million and 10 districts of 0.5 million persons). An example of the human resource needs estimated for this population is provided in Appendix 4a (for smoke-free policies). These standardized estimates were adjusted to reflect the actual population size and administrative composition of each country (see Appendix 4b for an example of how human resource needs for smoke-free policies were calculated for an actual country with a population of 160 million split into seven provinces and 64 districts).

The same process was used for the other resource categories. The cost of training and meetings was based on the frequency of meetings and workshops within a year, their average duration, the number of national and sub-national participants (plus associated support staff), and the size of the meeting venue. For mass media, TV and radio advertising, newspaper advertisements, wall posters and information leaflets were included. Estimates were based on the number and intensity of media slots, for example four, two-week series per year, each consisting of 10 one-minute TV and radio slots per week.

Unit costs for resource items were taken from the WHO-CHOICE database (www.who.int/choice/costs), which contains country-specific estimates for primary care visits of different durations, salaries, per diem allowances (for training and meetings), media costs and consumable items, including fuel and office supplies. Generation of these estimates was based on an econometric analysis of a multinational dataset, using gross national income per capita (plus other explanatory variables) to predict unit costs in different WHO Member States (for more information, see Adam et al. 2003; Johns et al. 2003, 2008). Drug prices were taken from the International Drug Price Indicator guide, with adjustments made for the cost of carriage, insurance and freight, as well as country distribution (multipliers taken from the WHO-CHOICE database). All prices are expressed in US dollars for 2008 (no account is taken of inflation).

Resource-use profiles and unit cost values can be amended by countries interested in applying the costing tool to their own contexts.

3. Results

3.1 Cost of scaling up 'best buy' interventions for NCD risk factors

Tobacco control

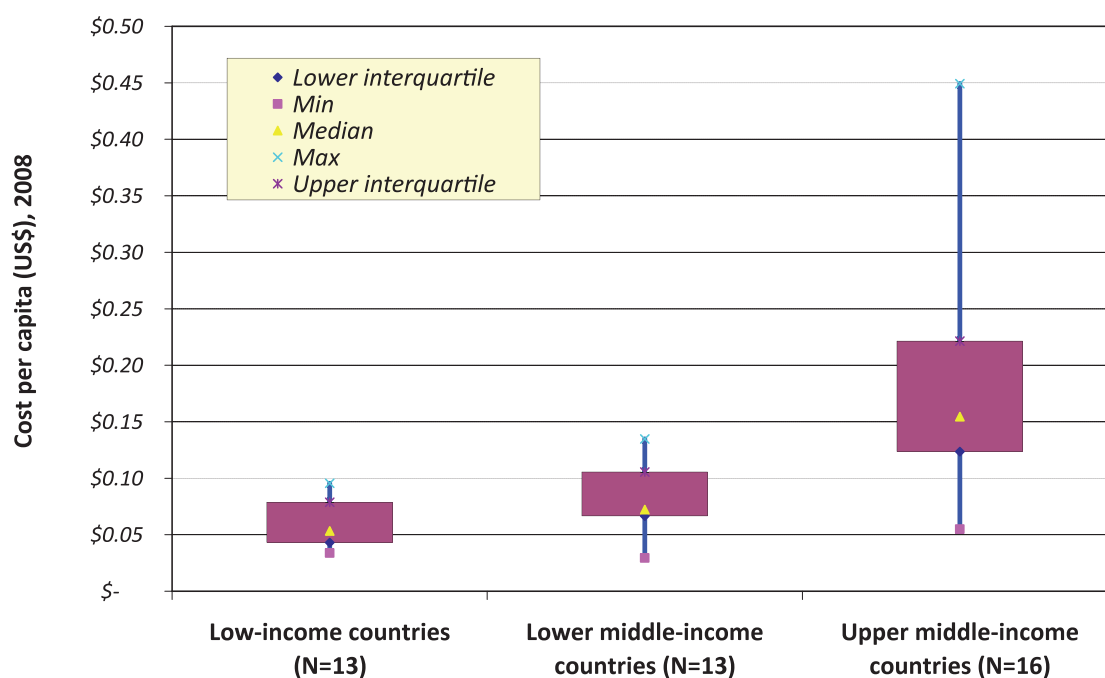
The total annual cost of four population-based demand reduction best buy measures of the Framework Convention on Tobacco Control - including overall programme management and media support - is projected to be US\$0.6 billion for all low- and middle-income countries, or US\$0.11 per capita (Table 4). The largest cost is related to media campaigns.

Table 4. Estimates for the average annual cost of tobacco control best buy interventions in all low- and middle-income countries (US\$ 2008)

Intervention	Total annual cost (US\$)	Annual cost per person (US\$)	Share of cost (%)
Program Strategy Development	\$ 64,252,725	\$ 0.011	10%
Smoke-free policies	\$ 87,953,502	\$ 0.016	14%
Raise tobacco taxes	\$ 28,506,069	\$ 0.005	5%
Package warnings	\$ 40,705,857	\$ 0.007	7%
Advertising bans	\$ 45,062,561	\$ 0.008	7%
Media campaigns	\$ 353,639,300	\$ 0.062	57%
Total	\$ 620,120,015	\$ 0.110	100%
Resource category	Total annual cost (US\$)	Annual cost per person (US\$)	Share of cost (%)
Human resources	\$ 232,474,950	\$ 0.041	37%
Training	\$ 20,056,233	\$ 0.004	3%
Meetings	\$ 8,277,164	\$ 0.001	1%
Mass media	\$ 337,984,848	\$ 0.060	55%
Supplies and Equipment	\$ 16,694,112	\$ 0.003	3%
Other programme costs	\$ 4,692,708	\$ 0.001	1%
Total	\$ 620,120,015	\$ 0.110	100%

As shown in Figure 3, implementation costs vary by income level; the median cost per capita ranges from as little as US\$0.05 in low-income countries to US\$0.15 in upper-middle income countries. After initial planning in Year 1, the annual cost does not vary appreciably over the remaining scale-up period; that is, a constant investment is needed, first to develop or reframe policies, and in later years to maintain a comprehensive level of enforcement.

Figure 3. Median cost per capita of scaling up tobacco control best buy interventions in low- and middle-income countries (US\$ 2008)



Alcohol control

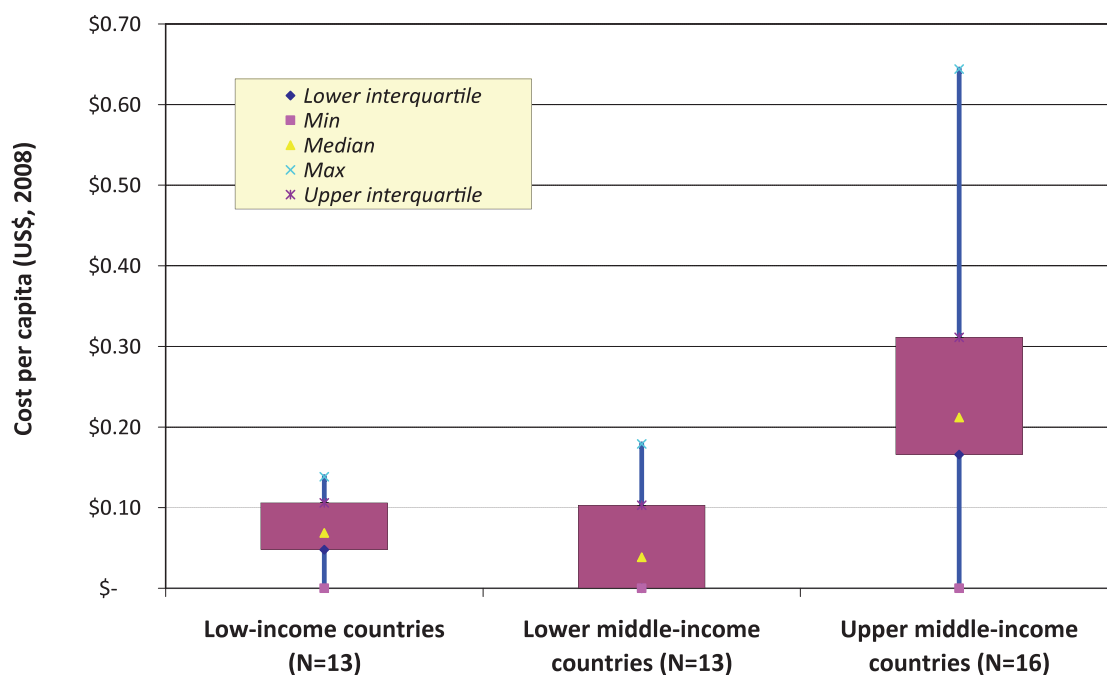
Results for alcohol control are similar to those for tobacco control, with total costs per year amounting to US\$0.78 billion (Table 5).

Table 5. Estimates for average annual cost of alcohol control best buy interventions in all low- and middle-income countries (US\$ 2008)

Intervention	Total annual cost (US\$)	Annual cost per person (US\$)	Share of cost (%)
Restrict access to retailed alcohol	\$ 344,980,900	\$ 0.061	44%
Enforce bans on alcohol advertising	\$ 36,386,931	\$ 0.006	5%
Raise taxes on alcohol	\$ 24,546,845	\$ 0.004	3%
Monitoring	\$ 54,538,088	\$ 0.010	7%
Advocacy support / partnerships	\$ 318,360,099	\$ 0.056	41%
Total	\$ 778,812,863	\$ 0.138	100%
Resource category	Total annual cost (US\$)	Annual cost per person (US\$)	Share of cost (%)
Human resources	\$ 287,908,847	\$ 0.051	37%
Training	\$ 17,661,797	\$ 0.003	2%
Meetings	\$ 5,525,637	\$ 0.001	1%
Mass media	\$ 448,131,507	\$ 0.079	58%
Supplies and equipment	\$ 18,217,176	\$ 0.003	2%
Other programme costs	\$ 1,367,899	\$ 0.000	0%
Total	\$ 778,812,863	\$ 0.138	100%

These costs are driven by human resource needs for programme management and enforcement of alcohol-related laws and policies as well as media-related expenses. The greater variability around the typical (median) cost of implementation (see Figure 4) results from large underlying differences in the prevalence of alcohol use at population level; these interventions were not accounted for in countries with an adult prevalence of harmful alcohol use below 1%.

Figure 4. Median cost per capita of scaling up alcohol control best buy interventions in low- and middle-income countries (US\$ 2008)



Improving diet and physical activity

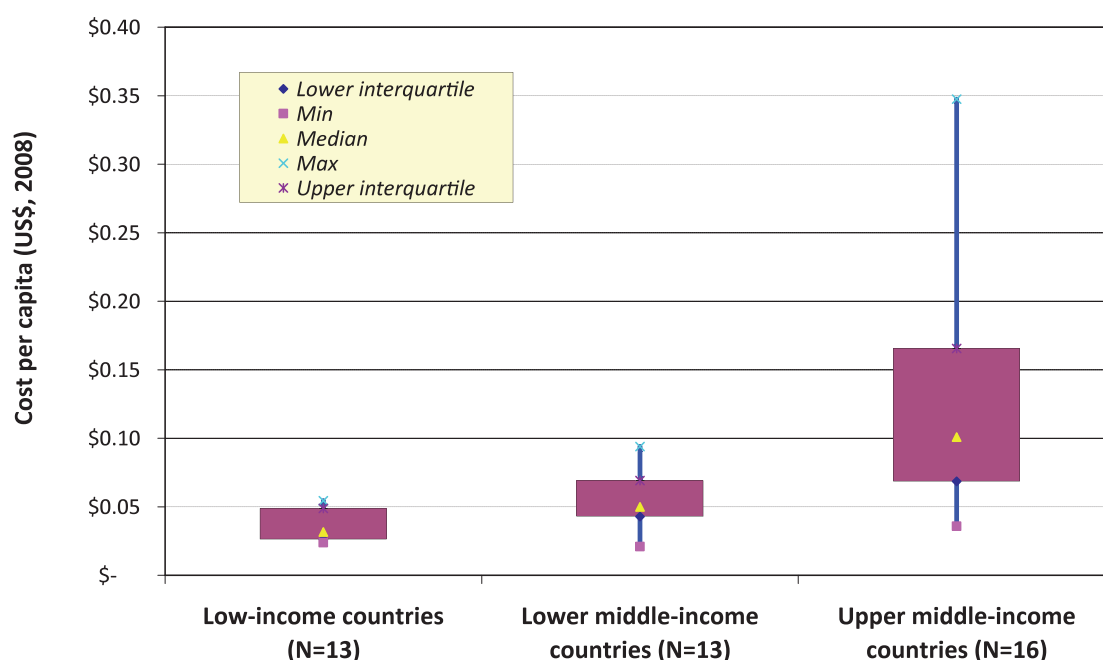
The cost of implementing three best buy interventions for unhealthy diet and physical inactivity is low (less than US\$0.10 per person, or \$435 million per year for all low- and middle-income countries; see Table 6). Again, the largest public health expenditure involved in implementing these strategies is mass media associated with general and salt-specific health promotion and awareness campaigns.

Table 6. Estimates for average annual cost of best buy interventions for addressing unhealthy diet and physical inactivity (US\$ 2008)

Intervention	Total annual cost (US\$)	Annual cost per person (US\$)	Share of cost (%)
Promote public awareness about diet and physical activity	\$ 213,042,290	\$ 0.038	49%
Reduce salt intake	\$ 169,581,224	\$ 0.030	39%
Replace trans fat with polyunsaturated fat	\$ 52,685,944	\$ 0.009	12%
Total	\$ 435,309,458	\$ 0.077	100%
Resource category	Total annual cost (US\$)	Annual cost per person (US\$)	Share of cost (%)
Human resources	\$ 79,324,835	\$ 0.014	18%
Training	\$ 12,255,133	\$ 0.002	3%
Meetings	\$ 4,216,617	\$ 0.001	1%
Mass media	\$ 333,636,765	\$ 0.059	77%
Supplies and equipment	\$ 5,876,108	\$ 0.001	1%
Other programme costs	\$ -	\$ -	0%
Total	\$ 435,309,458	\$ 0.077	100%

A similar income gradient for other NCD risk factors is apparent from Figure 5, which shows that upper-middle income countries can expect to spend at least twice as much as low-income countries, due to the higher costs such as salaries and media expenses.

Figure 5. Median cost per capita of scaling up diet and physical activity best buy interventions in low- and middle-income countries (US\$ 2008)



Combined estimates for cost of scaling up best buy interventions for NCD risk factors

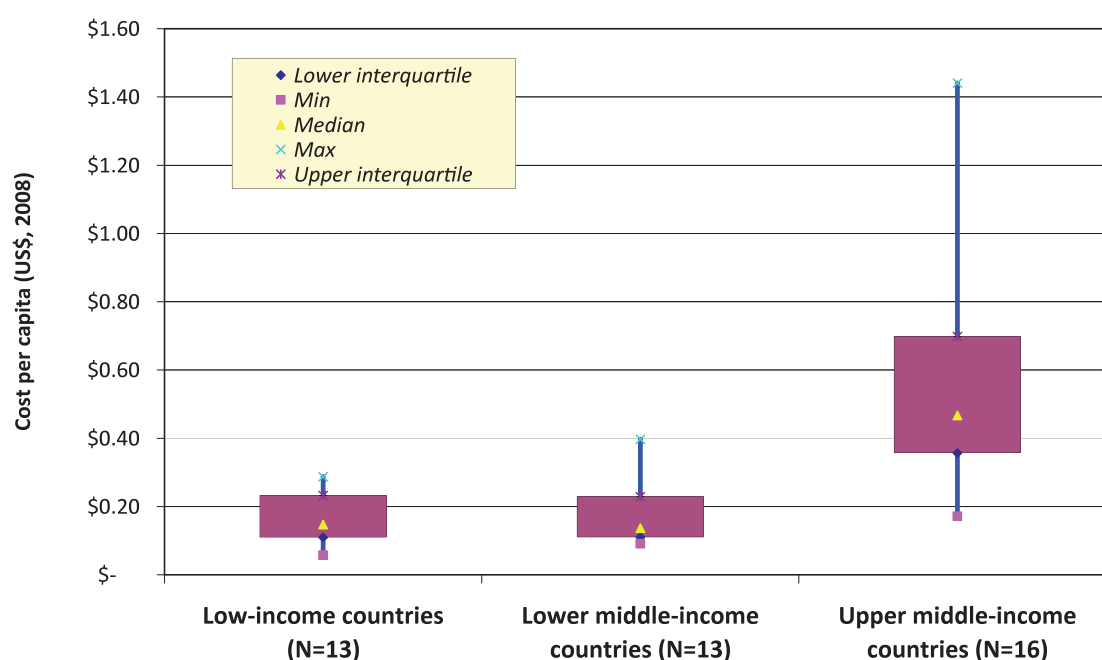
The total cost of resource requirements for all best buy intervention strategies for addressing tobacco and harmful alcohol use, as well as unhealthy diet and physical inactivity approaches US\$2 billion per annum for low- and middle-income countries (Figure 6). After the planning phase in Year 1, costs do not vary substantially from year to year. The small elevations in years 2016 and 2021 reflect the cyclical replacement of office and other equipment, which are assumed to last five years. The higher cost in Year 2 (policy development stage) is due to initial training, legislation and health promotion efforts.

Figure 6. Total estimated cost of scaling up best buy interventions for NCD risk factors in all low- and middle-income countries (US\$ billion 2008)



As shown in Figure 7, the median cost per capita in low- and lower-middle income countries amounts to less than US\$0.20. For upper-middle income countries, the median cost is closer to US\$0.50, exceeding US\$1 per capita in a few cases.

Figure 7. Median cost per capita of scaling up best buy interventions for NCD risk factors in low- and middle-income countries (US\$ 2008)



3.2 Cost of scaling up best buy interventions for NCDs

As discussed earlier, the best buys in primary care identified for individual-based care of NCDs include: multi-drug therapy for people with more than 30% CVD risk, including those with diabetes, established ischaemic heart or cerebrovascular disease; aspirin for people with an acute heart attack; prevention of cervical cancer by screening and referral for treatment of precancerous lesions; and hepatitis B immunization for the prevention of liver cancer. As mentioned before, hepatitis B immunization has already been scaled up in the large majority of countries, and does not therefore require additional resources to be made available, over and above what is already being committed.

Estimated costs cover primary care outpatient visits for consultation, counselling and procedures, auxiliary care, medicines and diagnostic and therapeutic procedures. The drivers of these estimates are population growth projections and the projected increase in treatment coverage.

The cumulative cost of scaling up these individual-level best buy interventions for all low- and middle-income countries is projected to be US\$1 435 billion from 2011-2025. This amounts to an average of US\$9.4 billion per annum, ranging from US\$2 billion in 2011 to US\$ 11.5 billion by 2025 (Figure 8).

Figure 8. Total estimated cost of scaling up individual-based best buy interventions for NCDs in all low- and middle-income countries (US\$ billion 2008)

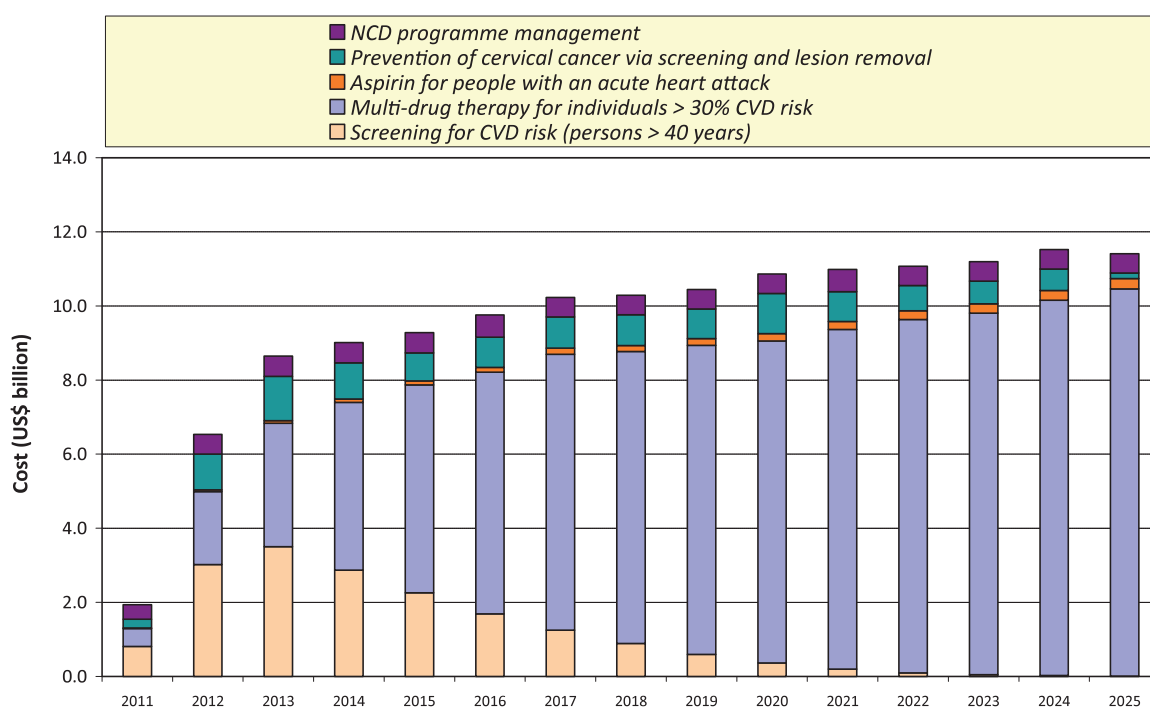
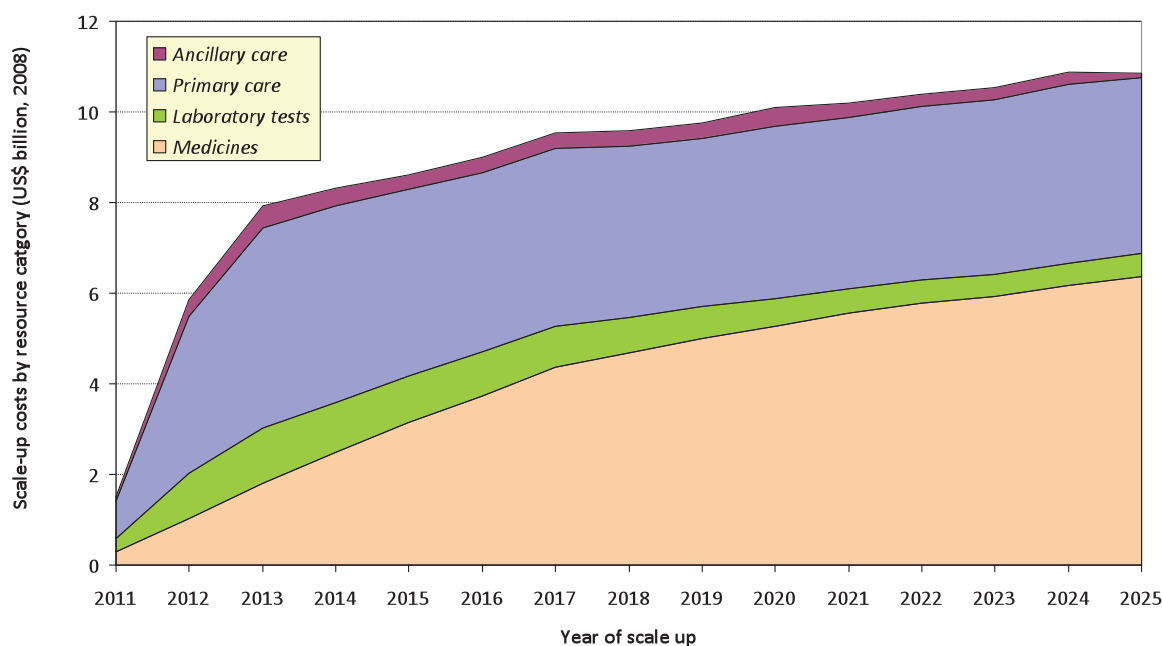


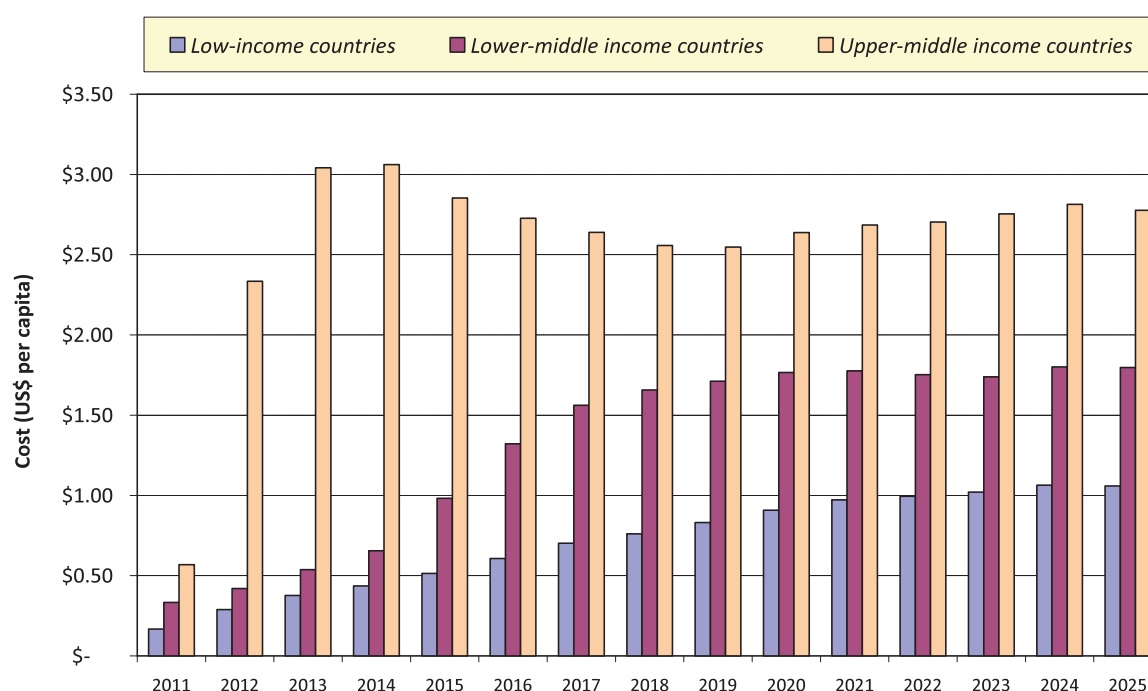
Figure 9 shows the same total cost summary, but displayed by resource category. Human and other resources involved in primary care represents the largest category of cost in the early stages of scale-up, although medicines take an increasing share of total expenditure as treatment of individuals at high CVD risk is scaled up to target coverage levels.

Figure 9. Estimates on cost of scaling up individual-based best buy interventions for NCDs in low- and middle-income countries (US\$ billion 2008), by resource category



As with population-based preventive measures, the estimated cost of scaling up differs according to country income. Figure 10 shows that in low-income countries, the annual per capita cost of implementing individual-based NCD best buys averages less than US\$1; in lower-middle income countries, it averages less than US\$1.50 and in upper-middle income countries it averages US\$2.50.

Figure 10. Mean estimated cost per capita of scaling up best buy interventions for NCDs in low- and middle-income countries (US\$ 2008)



Cardiovascular disease and diabetes

The estimated cost of scaling up cardiovascular disease (CVD) and diabetes best buys in all low- and middle-income countries is over US\$120 billion, with the annual average being a little over US\$8 billion. This includes the cost of screening in primary care to detect individuals at risk of CVD, at a cost of US\$3-5 per person screened. The cost of providing aspirin for people with acute heart attack at the primary care level (including visits, diagnostic tests and drugs, but excluding post-referral costs) ranges from US\$13-15 per treated case (Table 7). By comparison, the annual cost per case of multi-drug therapy to those at high risk of a CVD event ranges from US\$70 in low-income countries to US\$105 in upper-middle countries.

As shown in Figure 8, providing aspirin to individuals with acute heart attack represents by far the smallest component of cost throughout the scale-up period. The multi-drug therapy intervention becomes the largest element as treatment coverage rates increase from their currently low base to a target level of 80%.

Cancer

The estimated cost of scaling up the prevention of cervical cancer is US\$11.3 billion for the period 2011-2015. Estimates include the cost of one-off screening among women aged between 35-45 years using visual inspection with acetic acid (VIA), and treatment of precancerous lesions using

cryotherapy for screen-positive cases. The cost per case is shown in Table 7. Other screening tests and strategies are also available, such as screening women aged 25-49 every three years using VIA or a pap smear test. Such strategies would be expected to have higher costs but may be a preferred option, particularly in countries at higher income levels.

Table 7. Estimates for cost per treated case for individual-based NCD best buy interventions

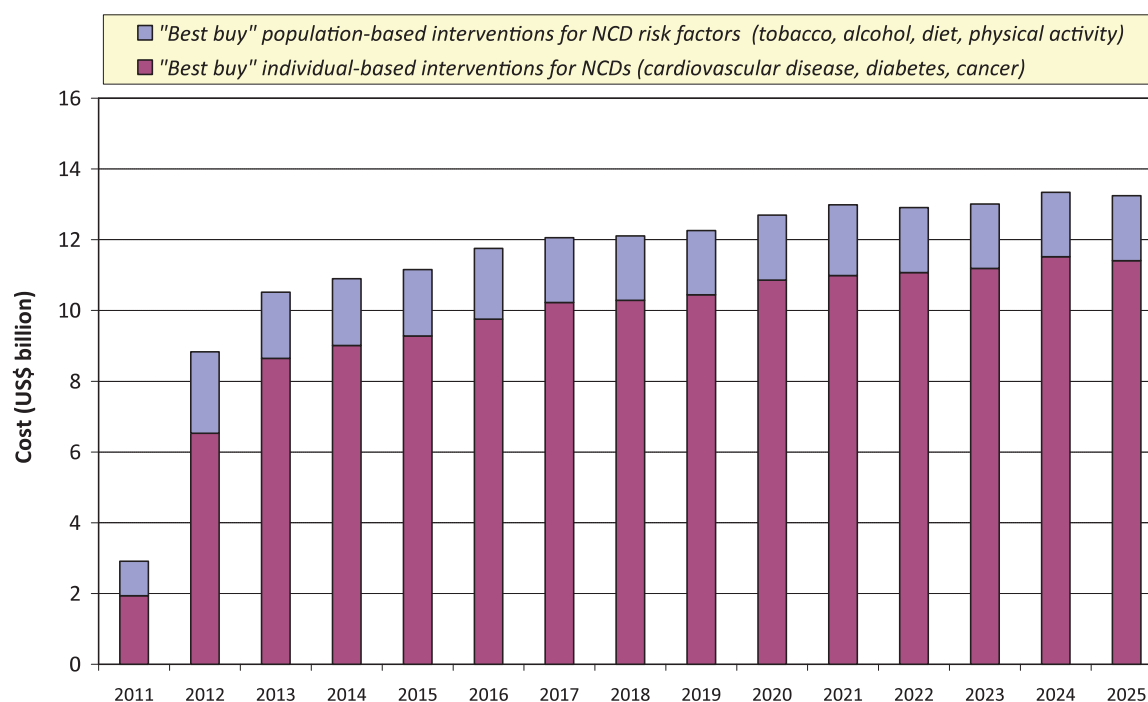
	Low-income countries	Lower middle-income countries	Upper middle-income countries
Screening in primary care for CVD risk (persons > 40 years)	\$ 3.0	\$ 3.9	\$ 5.3
Multi-drug therapy for individuals (> 30% CVD risk)	\$ 70	\$ 84	\$ 105
Multi-drug therapy for individuals (with heart disease)	\$ 69	\$ 85	\$ 108
Multi-drug therapy for individuals (with stroke)	\$ 66	\$ 121	\$ 206
Aspirin for people with an acute heart attack	\$ 13	\$ 13	\$ 15
Prevention of cervical cancer through screening and lesion removal	\$ 26	\$ 46	\$ 56

3.3 Total estimated cost of a best buy package for NCD prevention and control

The combination of population-based and individual-based best buy interventions for NCDs and their underlying risk factors gives rise to a cumulative cost of US\$170 billion over the period 2011-2025, at an average of US\$ 11.4 billion per year (Figure 11). This amounts to an annual per capita investment of under US\$1 in low-income countries, US\$1.50 in lower middle-income and US\$3 in upper middle-income countries.

A large share of these costs relates to the individual-based provision of multi-drug therapy for those with a high CVD risk. Population-based measures aimed at reducing exposure to risk factors for NCDs - tobacco and alcohol use, unhealthy diet and physical inactivity - account for a small fraction of the total price tag (approximately US\$2 billion per annum). Likewise, the cost of NCD programme management, which includes central, provincial and district level staff as well as training courses and media expenses, contributes very little to total cost estimates (US\$0.5 billion per year).

Figure 11. Total estimated cost of scaling up NCD best buy interventions in all low- and middle-income countries (US\$ 2008)



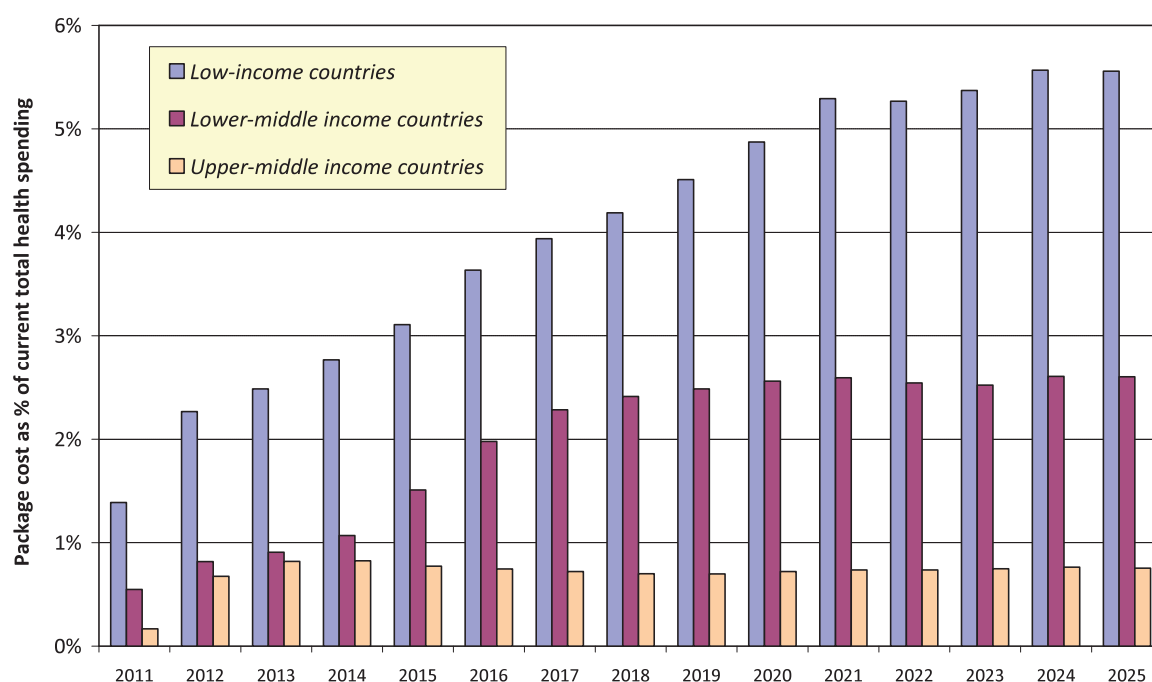
The budgetary implications associated with the implementation of this combined package in different income regions are summarized in Table 8. As a percentage of health-care spending in 2008, the average annual cost of the package represents 4% in low-income countries, 2% in lower middle-income countries and less than 1% in upper middle-income countries. The proportion changes with the year of scale-up; this is shown in Figure 12.

Table 8. Estimated cost of best buy NCD intervention package as a percentage of total health expenditure

	Low-income countries	Lower middle-income countries	Upper middle-income countries
Total health expenditure per head	\$ 22	\$ 74	\$ 412
Best buy NCD package per head (2011-2025 average)	\$ 0.88	\$ 1.45	\$ 2.91
Best buy NCD package as percentage of total health expenditure	4.0%	2.0%	0.7%

For low-income countries, WHO (2010c) estimated for the High-Level Taskforce on Innovative International Financing for Health Systems that the total cost of a set of health services capable of meeting the MDGs amounts to US\$44 per capita in 2009, rising to US\$60 by 2015. These estimates include disease-specific costs for MDG-related conditions and also components of NCD-specific expenditure (medicines), as well as shared health system resources such as human resources and logistics. As a proportion of 2009 total cost estimates, the NCD best buy package described here amounts to approximately 2% (US\$0.88 divided by US\$44).

Figure 12. Total estimated cost of scaling up NCD best buy interventions as a proportion of total health expenditures in low- and middle-income countries



4. Conclusion

4.1 Main findings

This study is an initiative to estimate the resources needed to scale up a set of evidence-based intervention measures for NCD prevention and control. The analysis took as its reference point the 2008-2013 Action Plan for the WHO Global Strategy for the Prevention and Control of Noncommunicable Diseases (WHO, 2008a) and focused on estimating the cost of scaling-up prioritized intervention strategies in low- and middle-income countries over a period of 15 years (2011-2025), by which time all interventions are expected to have reached their target level of coverage.

The main finding of the study is that scaling up a set of best buy intervention across all low- and middle-income countries is estimated to cost approximately US\$11.4 billion per year. This amount is equivalent to an annual investment of less than US\$1 per person living in low-income countries, US\$1.50 per person living in lower middle-income countries, and US\$3 per person living in upper middle-income countries. Expressed as a proportion of current health care spending, the average annual cost of implementing such a package amounts to 4% in low-income countries, 2% in lower middle-income countries and less than 1% in upper middle-income countries.

4.2 Implications for health policy and resource allocation

There are several ways to interpret these costs:

- From a public health perspective, an annual per capita investment of US\$1-3 would appear to be a low price to pay for significantly reducing the enormous burden of disease from major NCDs and their underlying risk factors in lower-income countries.
- From an economic perspective, the sums involved in mounting a scaled up NCD response are very small compared with the massive losses in gross national product or social welfare that would occur if no scaled up action and investment are taken - a scenario that takes into account anticipated trends in exposure to NCD risk factors as well as shifts in the size and structure of populations. An ongoing analysis undertaken for the UN High-Level Meeting on NCDs by the World Economic Forum and the Harvard School of Public Health has estimated that current losses in the national product of low- and middle-income countries over the same period of 2011-2025 will run into trillions of dollars. Confronted with a loss of this magnitude, an annual outlay of US\$10-12 billion appears to be a sensible investment.
- However, the finances required to scale up the NCD response represent a new demand on health budgets, especially in relation to the very low levels of current expenditure on prevention and control of these diseases. While the potential budgetary impact on resources in upper middle-income countries is arguably low - less than a 1% increase for the best buy package - the impact in low-income countries is anticipated to be greater (where the package would require a 4% increase in total health spending). It should be noted that governments generate substantial revenues from taxes on tobacco products and alcoholic beverages, which could serve as an appropriate source of programme funding for NCD prevention and control.
- Scale-up costs presented here can be compared with estimates for scaling up responses to other leading contributors to disease burden in low and lower-middle income countries, including HIV,

TB, malaria and child health (Johns et al. 2007; Kiszewski et al. 2007; Stenberg et al. 2007). For the period 2006-2015, for example, estimated global resources needed per year amount to US\$3.9-5.6 billion (US\$0.73-1.03 per capita) for attaining universal coverage of maternal and newborn health services, and US\$52.4 billion (US\$0.47-1.46 per capita) for scaling up priority interventions in 75 countries for children under five years. When comparing these figures, however, it should be noted that baseline levels of MDG-related disease programme implementation are considerably higher. This means that the incremental cost of achieving coverage goals is diminished. By contrast, current levels of programme implementation or coverage for NCD control and prevention are comparatively low, meaning that the additional investment needed to reach a high level of coverage will be much more substantial. In addition, NCDs is an umbrella term that covers many preventable and treatable conditions (as opposed to a single disease).

The overall implication of these perspectives is that while much can be done to address the needs of populations at risk of NCDs, there are significant financial challenges for lower-income countries. By identifying the costs associated with a set of best buy interventions, this analysis provides options for action that can be considered even in very low-resource settings, including a number of population-based preventive measures that are cheap to initiate and sustain (less than US\$0.20 per capita in low- and lower-middle income countries). Implementation of even this restricted set of measures, including tobacco control and salt reduction, will help to significantly reduce the escalating macroeconomic consequences of NCDs in these countries.

4.3 Study limitations and uncertainties

Financial modelling of the kind presented here inevitably requires a number of assumptions. Some of the main limitations are:

- As outlined in Section 2.1, estimating the cost of scaling up health interventions involves a method that has been repeatedly used and draws on core information domains. Many data variables, including population and prevalence estimates as well as target coverage, are well established. Other data domains, in particular current coverage, programme resource requirements and country-specific processes for drugs or locally produced goods and services, carry a greater degree of uncertainty, either because of lack of up-to-date information (e.g. coverage rates, by country and intervention) or potential measurement error (e.g. predicted salary levels or the cost per primary care visit).
- With respect to current coverage, the simplifying assumption was that coverage for individual-level interventions falls below 10% (a default level of 5% was used). Should current coverage levels be appreciably higher than this, the incremental costs of scaling-up would be that much less (meaning that the reported results are conservative).
- Regarding resources at programme level, including programme management staffing levels, stakeholder meetings, training sessions and media - a standardized template and approach were used to avoid inconsistent costing across programmes; where available, estimates were compared with earlier cost-effectiveness or scaling-up studies that quantify these programme-level resources; many consultations were held with programme experts to generate realistic estimates of actual need at country level. Nevertheless, this is an area where there is little reported empirical evidence, meaning that values are largely based on expert opinion. Accordingly, this will represent a key area for country-level validation and contextualization.
- For unit costs of non-traded goods and services (including salaries and unit costs of primary care visits), we relied on the WHO-CHOICE costing database, which has country-specific predictions that have been updated to 2008 price levels. Again, actual prices in 2008 for a specific country may have differed (up or down) by a small margin; it is not expected that the net effect of this price uncertainty would change baseline results substantially;

- International medicine prices were adjusted for country-specific multipliers for transportation from border of entry to outlets. Data were not available for estimating the extent of mark-ups for medicines used in each country.

Costs of overcoming system-wide constraints, such as an inability to train and retain health professionals, are not addressed. A unified costing tool (OneHealth) is being developed by a multi-agency working group that will accommodate these issues; an NCD module is to be incorporated into this health system planning tool (http://www.internationalhealthpartnership.net/en/working_groups/working_group_on_costing).

The scope of the analysis was restricted to consideration of a set of core best buys for NCD control and prevention that has been identified through an evidence-based process. However, countries may choose to add to or subtract from this list in accordance with local priorities; therefore, a wider set of intervention strategies has been incorporated into the tool for country use (e.g. tobacco cessation, brief advice for heavy drinkers, early detection of breast cancer). In addition, the economic and other evidence underpinning the selection of the best buys is largely based on international and regional analyses and may not fit the circumstances of a particular country; for example, increased taxes on alcoholic beverages are not a highly cost-effective strategy in countries where consumption levels are low but the unrecorded (untaxed) proportion of this consumption is high (Anderson et al. 2009).

A further limitation of the modelling is that 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 ischaemic heart disease or stroke; rather, disease rates have been assumed to be constant throughout the scale-up period. As a consequence, total costs of scale-up presented here might be expected to be overestimated; however, it is also the case that in countries with positive population growth, more people will be exposed to NCD risk factors (such as tobacco or harmful alcohol use), thus mitigating the extent of overestimation. Even in countries with zero population growth, increased life expectancy will increase the population at risk.

Incorporation of these interactions requires the development and application of a sophisticated epidemiological model that includes all the major NCDs and their shared underlying risk factors. Such models, which typically require a microsimulation approach that will handle the many possible interactions that can occur with populations at risk, have been used in cost-effectiveness analyses (including for some of the interventions included in this study; Cecchini et al. 2010); they have also been used to assess the health effects of multi-drug therapy scale-up (Lim et al. 2007). However, it has not been possible within the time and funding constraints of this 2011 study to incorporate such modelling into the multi-intervention, year-on-year scaling-up scenarios used here.

As a result, the analysis 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. Fortunately, earlier scaling-up analysis performed for tobacco control, salt reduction and multi-drug therapy - covering six of the 14 best buy interventions included here - has already demonstrated the enormous public health gain to be realized, namely, 32 million deaths over a 10-year period in 23 large developing countries (Asaria et al. 2007; Lim et al. 2007).

Finally, while this study describes the cost of responding to the burden of NCDs, it does not determine who will pay. That is a question for countries to consider, depending on their income and resource availability, as well as their institutional and infrastructural capacity to scale-up interventions and services. As discussed in the 2010 World Health Report (WHO, 2010d), there are three general mechanisms by which governments can generate resources for health (including renewed action on NCDs):

1. By increasing or ensuring a fair share of government spending on health (in general, or on NCD control and prevention in particular), which is a political process that can be advanced through coordinated action from health ministries and civil society;

2. By identifying new or diversified sources of revenues for health, for example, a national health insurance levy on value-added tax or increased excise taxes on alcoholic beverages or tobacco products;
3. If applicable, by exhorting external donors to meet their international commitments for official development assistance and to provide more predictable, long-term aid.

4.4 Next steps: country-level application and validation

The primary use of the tool is ultimately directed at the national level. The tool has been developed to be used with widely accessible software (Microsoft Excel) and by country investigators responsible for NCD programme planning or development. It is envisaged that a process of country-level adaptation in selected WHO Member States will commence shortly after the UN High-level meeting on the prevention and control of NCDs in September 2011. This process will be beneficial to country users and to the developers, through evaluation of the tool.

To optimize the flexibility and usefulness of the tool at national level, the set of interventions from which policy-makers and planners can choose may need to go beyond the sub-set of best buys assessed here. 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 NCDs. However, given that implementation coverage of best buy strategies is still very modest in most low- and middle-income countries, it is expected that countries may first wish to focus on these best buy strategies before considering the broader financing and health system ramifications of an expanded package of care that can be delivered within primary care settings.

A further step relates to the transfer of the tool's content into OneHealth, which will take the costing analysis to the next level, since it will enable NCD scale-up to be considered within the constraints of broader health system planning at national level. As part of the development of this NCD module within OneHealth, special attention will need to be given to modelling of composite as well as disaggregated health gains brought about by intervention; 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.

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Appendix 1a. Interventions to tackle noncommunicable disease risk factors: identifying best buys

(Source: Global Status Report on noncommunicable diseases, 2010; WHO, 2011A)

Appendices

Risk factor (DALYs, in millions; % global burden) ^a	Interventions / actions (* core set of best buys)	Avoidable burden ^b (DALYs averted, millions)	Cost-effectiveness ^b (US\$ per DALY prevented) [Very = < GDP per person; Quite = < 3 * GDP per person Less = > 3 * GDP per person]	Implementation cost (US\$ per capita) [Very low = < US\$ 0.50 Quite low = < US\$ 1 Higher = > US\$ 1]	Feasibility (health system constraints)
Tobacco use (> 50m DALYs; 3.7% global burden)	Protect people from tobacco smoke * Warn about the dangers of tobacco * Enforce bans on tobacco advertising * Raise taxes on tobacco *	Combined effect: 25-30 m DALYs averted (> 50% tobacco burden)	Very cost-effective	Very low cost	Highly feasible; strong framework (FCTC)
	Offer counselling to smokers			Quite low cost	Feasible (primary care)
Harmful use of alcohol (> 50m DALYs; 4.5% global burden)	Restrict access to retailed alcohol * Enforce bans on alcohol advertising * Raise taxes on alcohol *	Combined effect: 5-10 m DALYs averted (10-20% alcohol burden)	Very cost-effective	Very low cost	Highly feasible
	Enforce drink driving laws (breath-testing) Offer brief advice for hazardous drinking			Quite low cost	Intersectoral action

Unhealthy diet (15-30m DALYs; 1-2% global burden) ^c	Reduce salt intake * Replace trans fat with polyunsaturated fat * Promote public awareness about diet *	Effect of salt reduction: 5 m DALYs averted Other interventions: Not yet assessed globally	Very cost-effective	Very low cost	Highly feasible
	Restrict marketing of food and beverages to children Replace saturated fat with unsaturated fat Manage food taxes and subsidies Offer counselling in primary care Provide health education in workplaces Promote healthy eating in schools		Very cost-effective? (more studies needed)	Very low cost	Highly feasible
			Quite cost-effective	Higher cost	Feasible (primary care)
			Less cost-effective		Highly feasible
Physical inactivity (> 30m DALYs; 2.1% global burden)	Promote physical activity (mass media) *	Not yet assessed globally	Very cost-effective	Very low cost	Highly feasible
	Promote physical activity (communities) Support active transport strategies Offer counselling in primary care Promote physical activity in workplaces Promote physical activity in schools		Not assessed globally	Not assessed globally	Intersectoral action
			Quite cost-effective	Higher cost	Feasible (primary care)
			Less cost-effective		Highly feasible
Infection	Prevent liver cancer via hepatitis B vaccination *	Not yet assessed	Very cost-effective	Very low cost	Feasible (primary care)

^a DALYs (or disability-adjusted life years) are widely used as a measure of premature mortality and ill-health - one DALY can be thought of as one lost year of healthy life. ^b See Appendix 1c for sources of evidence.

^c This estimate is based on the combined burden of low fruit and vegetable intake, high cholesterol, overweight and obesity, high blood glucose, high blood pressure - all diet related - and low physical activity

Appendix 1b. Interventions to tackle major noncommunicable diseases: identifying best buys

(Source: Global Status Report on noncommunicable diseases, 2010; WHO, 2011A)

Disease (% global burden; DALYs ^a)	Interventions / actions (* core set of best buys)	Avoidable burden ^b (DALYs averted, millions)	Cost-effectiveness ^b (US\$ per DALY prevented) [Very = < GDP per person; Quite = < 3 * GDP per person Less = > 3 * GDP per person]	Implementation cost (US\$ per capita) [Very low = < US\$0.50 Quite low = < US\$ 1 Higher = > US\$ 1]	Feasibility (health system constraints)
Cardiovascular disease (CVD) and diabetes (170m DALYs; 11.3% global burden)	Counselling and multi-drug therapy (including glyemic control for diabetes mellitus) for people (≥30 years), with 10-year risk of fatal or nonfatal cardiovascular events ≥ 30% * Aspirin therapy for acute myocardial infarction*	60 m DALYs averted (35% CVD burden) 4 m DALYs averted (2% CVD burden)	Very cost-effective	Quite low cost	Feasible (primary care)
	Counselling and multi-drug therapy (including glyemic control for diabetes mellitus) for people (≥ 30 years), with a 10-year risk of fatal and nonfatal cardiovascular events ≥ 20%	70 m DALYs averted (40% CVD burden)	Quite cost-effective	Higher cost	
Cancer (78m DALYs; 5.1% global burden)	Cervical cancer – screening (visual inspection with acetic acid), and treatment of pre- cancerous lesions to prevent cervical cancer*	5 m DALYs averted (6% cancer burden)	Very cost- effective	Very low cost	Feasible (primary care)
	Breast cancer - treatment of stage I Breast cancer - early case finding through mammographic screening (50 - 70 years) and treatment of all stages Colorectal cancer - screening at age 50 and treatment	3 m DALYs averted (4% cancer burden) 15m DALYs averted (19% cancer burden) 7 m DALYs averted (9% cancer burden) Not assessed globally	Quite cost-effective	Higher cost Quite low cost	Not feasible in primary care (diagnosis and treatment requires secondary or tertiary care)
	Oral cancer - early detection and treatment		Not assessed globally	Not assessed	

Respiratory disease (60m DALYs; 3.9% global burden)	Treatment of persistent asthma with inhaled corticosteroids and beta-2 agonists	Not assessed globally (expected to be small)	Quite cost-effective	Very low cost	Feasible (primary care)
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^a DALYs (or disability-adjusted life years) are widely used as a measure of premature mortality and ill health - one DALY can be thought of as one lost year of healthy life .

^b See Appendix for sources of evidence .

^c Includes prevention of recurrent vascular events in people with established coronary heart disease and cerebrovascular disease .

Appendix 1c. Cost-effectiveness checklist for NCD prevention and control best buy interventions

(Source: Prevention and control of NCDs: priorities for investment; WHO, 2011b)

Interventions	Data source(s)	Is intervention highly cost-effective? *					
		High-income <i>Europe (West)</i> (EurA) (e.g. Spain, Sweden) [< US\$ 30 439 per healthy life year]	Middle-income <i>Europe (East)</i> (EurC) (e.g. Ukraine, Russia) [US\$ 9972 per healthy life year]	Middle-income <i>Latin America</i> (AmrB) (e.g. Brazil, Mexico) [< US\$ 9790 per healthy life year]	Middle-income <i>Western Pacific</i> (WprB) (e.g. China, Vietnam) [< US\$ 6948 per healthy life year]	Low-income <i>South-East Asia</i> (SearD) (e.g. India, Nepal) [< US\$ 1985 per healthy life year]	Low-income <i>Africa</i> (AfrE) (e.g. Kenya, Zambia) [< US\$ 2154 per healthy life year]
RISK FACTORS	Tobacco use: Excise tax increase, information and labelling, smoking restrictions and advertisement bans	Yes	Yes	Yes	Yes	Yes	Yes
	Harmful alcohol use: Excise tax increase, ad bans, restricted access	Yes	Yes	Yes	Yes	Yes (except tax)	Yes
	Unhealthy diet: Reduced salt and trans fat content in food (regulated food industry, mass media)	Yes	Yes	Yes	Yes	Yes	Yes
	Unhealthy diet: Mass media, food taxes and subsidies, information / labelling, and marketing restrictions	Yes (UK)	Yes (Russia)	Yes (Brazil, Mexico)	Yes (China)	Yes (India)	Not established

DISEASES						
CVD (prevention): Antihypertensive drugs (BP > 160/100); poly-drug therapy (for those > 30% risk)	Murray et al. 2003 Gaziano et al. 2006	Yes	Yes	Yes	Yes	Yes
CVD (treatment): Drug therapy for IHD/stroke (aspirin, B-blocker, ACEI)	Gaziano et al. 2006	Yes	Yes	Yes	Yes	Yes
Diabetes: Glycaemic control (HbA1c > 9%); blood pressure control (> 165/95 mmHg); foot care; retinopathy screening and treatment	Narayan et al. 2006	Yes	Yes	Yes	Yes	Yes
Cancer: Vaccination, screening and treatment of cervical cancer	Ginsberg et al. 2009	Yes	Yes	Yes	Yes	Yes

* A highly cost-effective intervention is defined as one that generates an extra year of healthy life (equivalent to averting one disability-adjusted life year) for a cost that falls below the average annual income or gross domestic product [GDP] per person.

Appendix 2a. Country-level performance in tobacco control implementation

(Source: Report on the Global Tobacco Epidemic, 2008; WHO, 2008)

Country	Monitoring (tobacco)	Smoke-free policies	Cessation programmes	Health warnings	Advertising bans (tobacco)	Taxation (tobacco)
Afghanistan	1	0	1	1	0	1
Algeria	1	1	1	1	2	2
Argentina	3	0	2	1	0	2
Bangladesh	2	3	1	2	2	2
Brazil	2	2	3	3	2	2
China	2	1	1	2	1	2
Colombia	2	0	1	2	2	1
Democratic People's Republic of Korea	1	0	2	1	0	2
Democratic Republic of the Congo	1	3	1	2	3	1
Egypt	2	1	2	3	2	3
Ethiopia	1	0	2	1	0	2
Ghana	3	0	1	1	0	1
India	3	2	1	1	2	1
Indonesia	3	1	1	1	0	2
Iran, Islamic Republic of	3	3	3	3	3	1
Iraq	2	1	1	1	2	1
Kenya	2	0	1	2	2	3
Malaysia	2	0	2	3	3	2
Mexico	2	2	2	3	2	3
Morocco	2	0	1	1	0	2
Myanmar	2	1	1	1	2	1
Nepal	2	2	1	1	2	1
Nigeria	2	2	2	1	0	1
Pakistan	1	1	1	2	2	2
Peru	2	0	1	3	1	1
Philippines	3	2	2	2	2	2
Romania	3	2	3	2	2	2
Russian Federation	2	0	1	2	2	1
South Africa	2	0	1	2	2	2
Sri Lanka	2	2	1	1	2	2
Sudan	2	0	1	1	1	2
Thailand	2	3	2	3	2	2
Turkey	3	3	3	2	3	2
Uganda	2	1	2	1	0	2
Ukraine	3	2	1	2	2	2
United Republic of Tanzania	1	0	2	1	0	1
Uzbekistan	2	2	1	2	3	1
Venezuela, Bolivarian Republic of	2	3	2	3	3	2
Viet Nam	3	2	1	2	2	2
Yemen	2	0	1	2	2	2

Scoring grid	1	2	3
Monitoring	No recent data or not both recent and representative	Recent and representative data for adults and / or youth	Recent, representative and periodic data for either adults or youth
Smoke-free policies	Up to two public places completely smoke-free	Three to seven public places completely smoke-free	All public places completely smoke-free (or at least 90% of the population covered by complete smoke-free legislation)
Tobacco taxes	≤25% of retail price is tax	26–50% of retail price is tax	> 50% of retail price is tax
Package warnings	No or small warnings or medium size warnings missing some appropriate characteristics	Medium size warnings with all appropriate characteristics OR large warnings missing some characteristics	Large warnings with all appropriate characteristics
Advertising bans	Complete absence of ban, or ban that does not cover national TV, radio and print	Incomplete ban on national TV, radio, print media and other forms of direct and/or indirect advertising	Ban on all forms of direct and indirect advertising
Cessation programme	None	NRT and/or some cessation services	National quit line, and both NRT and some cessation services cost-covered

Appendix 2b. Country-level performance in alcohol control implementation

(Source: Global Survey on alcohol and health, 2010)

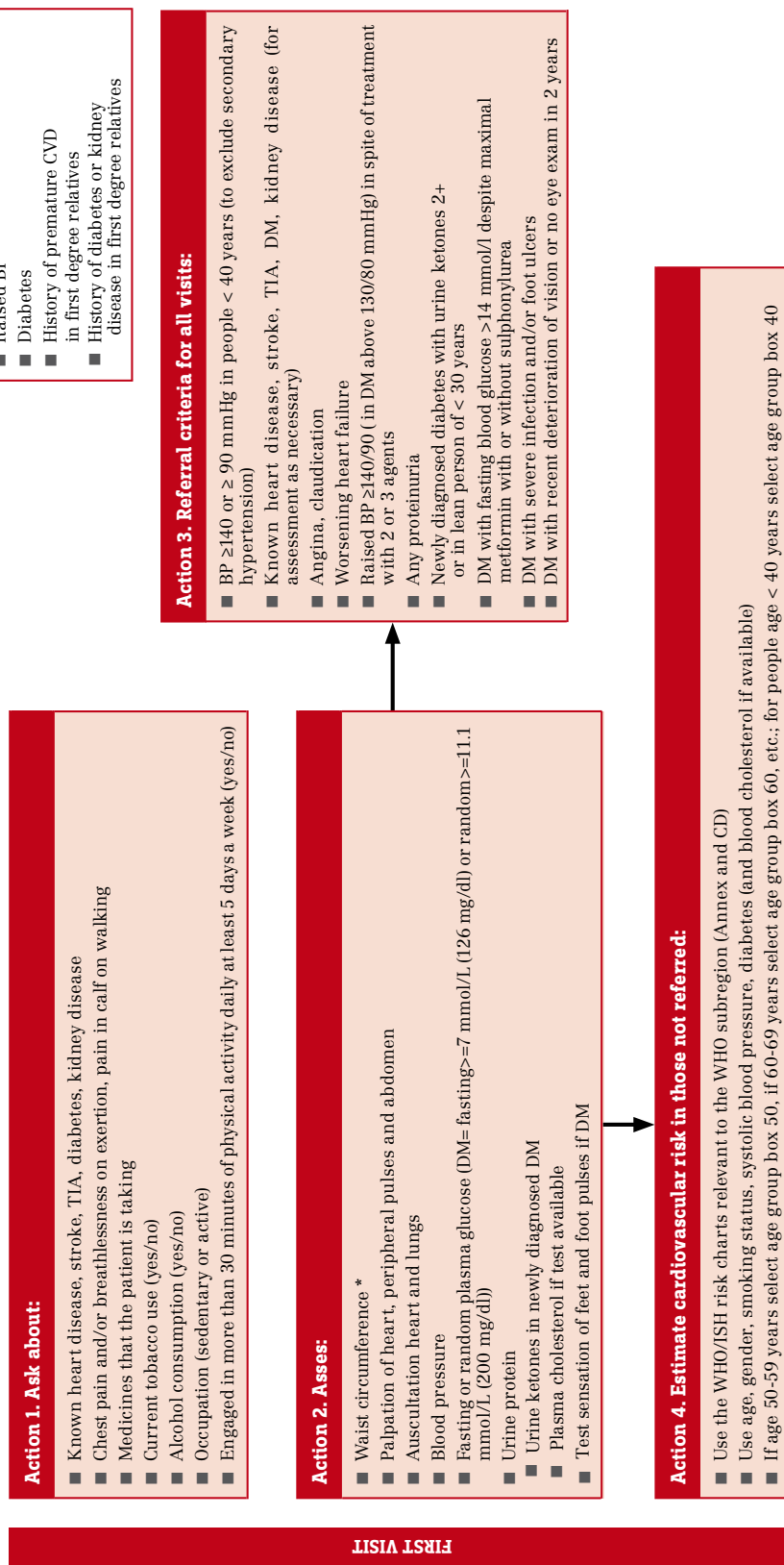
Country	Restrict access to retailed alcohol	Enforce bans on alcohol advertising	Raise taxes on alcohol	Enforce drink driving laws (breath-testing)
Afghanistan	0	0	0	0
Algeria	0	0	0	0
Argentina	2	2	2	2
Bangladesh	0	0	0	0
Brazil	1	2	2	2
China	1	1	2	3
Colombia	1	2	2	3
Democratic People's Republic of Korea	2	2	2	1
Democratic Republic of the Congo	1	1	1	2
Egypt	0	0	0	0
Ethiopia	1	2	1	1
Ghana	1	2	1	3
India	1	3	1	1
Indonesia	0	0	0	0
Iran, Islamic Republic of	0	0	0	0
Iraq	0	0	0	0
Kenya	1	2	1	2
Malaysia	2	3	2	3
Mexico	1	2	2	2
Morocco	0	0	0	0
Myanmar	2	3	1	1
Nepal	1	3	1	1
Nigeria	2	1	1	2
Pakistan	0	0	0	0
Peru	1	1	1	2
Philippines	1	1	1	1
Romania	2	3	2	2
Russian Federation	1	1	2	2
South Africa	1	1	2	1
Sri Lanka	0	0	0	0
Sudan	1	3	1	1
Thailand	2	2	2	2
Turkey	3	3	2	3
Uganda	1	1	1	1
Ukraine	1	3	2	3
United Republic of Tanzania	2	2	1	2
Uzbekistan	1	1	2	1
Venezuela, Bolivarian Republic of	2	3	2	2
Viet Nam	1	1	1	1
Yemen	0	0	0	0

Scoring system: On an implementation / enforcement scale of 1-10: 1 = <4; 2 = 4-7; 3 = 7

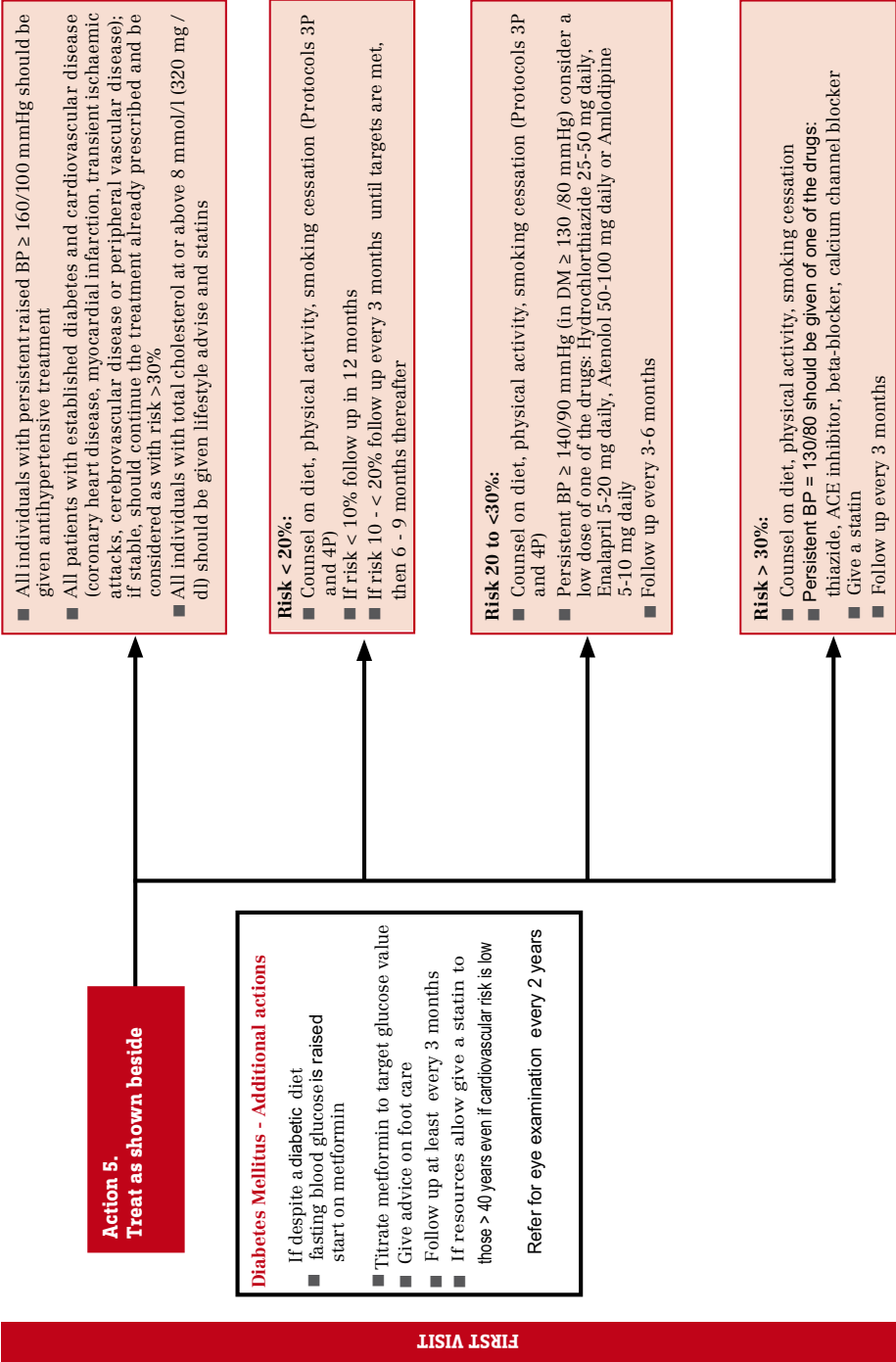


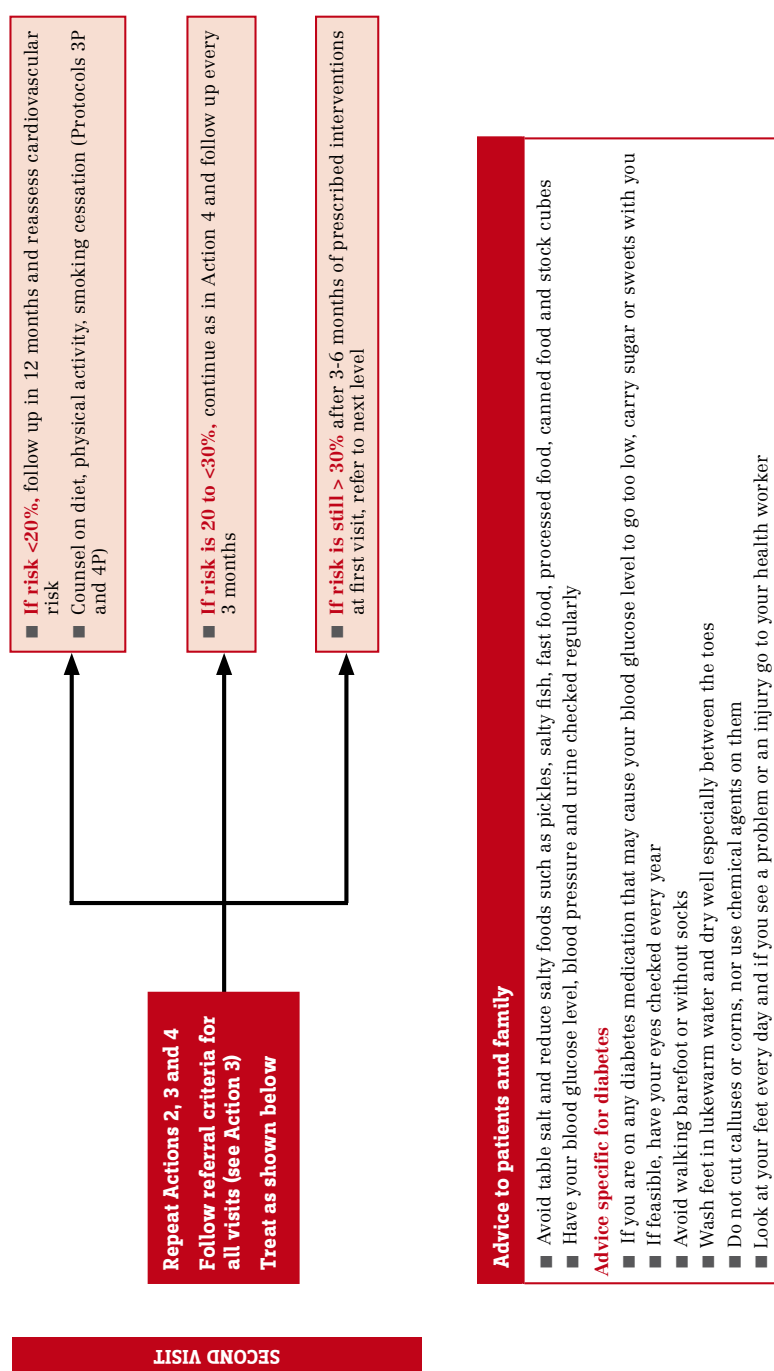
WHO Package of Essential NCD (PEN) interventions

PEN Protocol for the integrated management of hypertension and diabetes (For prevention of heart attacks, strokes, renal failure, amputations and blindness) (Total risk approach using hypertension, diabetes and tobacco use as entry points)



* e.g. waist circumference ≥ 90 cm in women and 100 cm in men





Appendix 4a. Estimating human resource requirements for smoke-free policies in a standardized population (of 50 million persons)

Top of worksheet		Annual resource needs at different stages of policy formulation / implementation (standardized population)											
Smoke-free policies		Planning (year 1)			Development (year 2)			Partial implementation (years 3-5)			Full implementation (years 6-10)		
Include (1 = Yes, 0 = No)		Administrative level (Standardized population, in millions)											
Enforcement score (1-3)		National (50m)	Province (5m)	District (0.5m)	National (50m)	Province (5m)	District (0.5m)	National (50m)	Province (5m)	District (0.5m)	National (50m)	Province (5m)	District (0.5m)
HUMAN RESOURCES													
(incl. consultants)													
Programme management (incl. M&E)		Roles / responsibilities											
		Director											
		Manager											
		Administrative officer											
		Clerical officer											
		Secretary											
		Accountant											
		I.T. computing manager											
		I.T. computing officer											
		Cleaner											
		General office maintenance											
Subtotal		1.7	0.8	0.3	1.7	0.8	0.3	1.7	0.8	0.3	1.7	0.8	0.3
Promotion / media / advocacy													
		Public health specialist											
		Public health officer											
		Health educator/trainer											
		Public Relations Manager											
		Public Relations Officer											
Subtotal		4.0	1.0	0.5	4.0	1.0	0.5	4.0	1.0	0.5	4.0	1.0	0.5
Law enforcement / inspection													
		Superintendent											
		Police Officer											
		Lawyer											
		Legal Officer											
		Transport manager											
		Transport driver											
Subtotal		1.5	0.8	0.5	1.5	0.8	0.5	1.5	0.8	0.5	1.5	0.8	0.5
National-level technical assistant (local planning / implementation)													
		International consultant (No. of 5-day trips p.a.)											
Subtotal		2			2			2			2		
TOTAL HUMAN RESOURCES		7.2	2.6	1.3	7.6	3.0	1.3	8.3	2.7	1.3	8.3	2.4	1.0

Appendix 4b. Estimating human resource requirements for smoke-free policies in an actual population (of 160 million persons)

Top of worksheet	Annual resource needs at different stages of policy formulation / implementation (actual population)											
Smoke-free policies	Planning (year 1)			Development (year 2)			Partial implementation (years 3-5)			Full implementation (years 6-15)		
	National	Province	District	National	Province	District	National	Province	District	National	Province	District
Include (1 = Yes; 0 = No) Enforcement score (1-3)												
HUMAN RESOURCES (incl. consultants)												
Programme management (incl. M&E)												
Director	0	1	0	0	1	0	0	1	0	0	1	0
Manager	0	2	8	0	2	8	0	2	8	0	2	8
Administrative officer	0	4	16	0	4	16	0	4	16	0	4	16
Clerical officer	1	8	32	1	8	32	1	8	32	1	8	32
Secretary	0	7	24	0	7	24	0	7	24	0	7	24
Accountant	0	2	8	0	2	8	0	2	8	0	2	8
I.T. computing manager	0	1	0	0	1	0	0	1	0	0	1	0
I.T. computing officer	0	2	8	0	2	8	0	2	8	0	2	8
Cleaner	0	0	0	0	0	0	0	0	0	0	0	0
Subtotal	1.6375	27.0	96.0	1.7	27.0	96.0	1.7	27.0	96.0	1.7	27.0	96.0
Promotion / media / advocacy												
Public health specialist	1	4	20	1	4	20	1	4	0	1	4	0
Public health officer	1	8	40	1	8	40	1	8	40	1	8	40
Health educator/trainer	1	8	40	1	8	40	1	8	40	1	8	40
Public Relations Manager	1	4	20	1	4	20	1	4	20	1	4	20
Public Relations Officer	1	8	40	1	8	40	1	8	40	1	8	40
Subtotal	4.0	32.0	160.0	4.0	32.0	160.0	4.0	32.0	140.0	4.0	32.0	140.0
Law enforcement / inspection												
Superintendent	0	2	40	0	4	20	0	2	0	0	1	0
Police Officer	0	8	0	1	16	80	1	10	160	1	3	40
Lawyer	0	2	40	0	2	8	0	2	0	0	2	0
Legal Officer	0	4	0	0	4	16	0	4	16	0	4	16
Transport manager	0	2	16	0	2	10	0	2	4	0	2	4
Transport driver	1	8	64	1	9	38	1	8	14	1	7	14
Subtotal	1.5	25.4	160.0	1.9	36.6	171.5	2.6	27.6	193.5	2.6	18.6	73.5

ISBN 978 92 4 150231 3

