

## 36 Population and individual approaches for NCD prevention and control

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Interventions to prevent and control NCDs, including WHO best buys and other recommended interventions, can be categorized into those at the population and individual levels. These two approaches are largely based on the work of Geoffrey Rose, who introduced the concept of ‘sick individuals’ and ‘sick populations’ into the public health literature and thus the need for different strategies for the prevention and control of health problems.<sup>1</sup>

**Level of action of population-wide versus high-risk individual-level interventions.** Population-wide interventions aim at controlling the determinants of NCD incidence in the whole population and they usually require action in multiple sectors beyond the health sector. In contrast, high-risk interventions aim at identifying susceptible high-risk individuals and offering them individual protection. They mainly engage in action at the health care level and require a well-functioning health system. The main characteristics of population-based and high-risk strategies for the prevention and control of diseases are shown in Table 36.1.

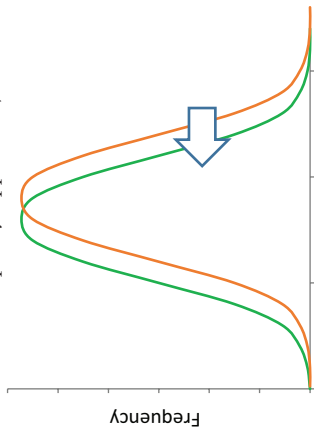
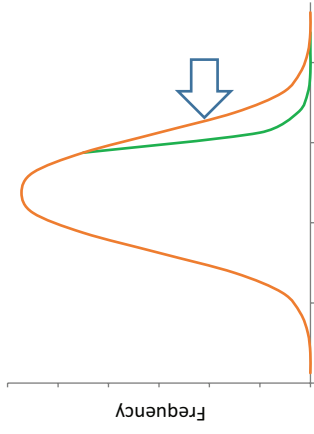
**Prevention paradox.** From an epidemiologic perspective, the largest proportion of NCD events in a population, particularly cardiovascular disease (CVD), arises from individuals with only moderately increased risk factor levels. This is because the majority of individuals in a population have slightly elevated or intermediate levels of risk factors while only a minority have highly elevated risk factor levels. For example, the majority of stroke cases are among those with only moderately elevated blood pressure (BP) rather than the smaller number of individuals with high/very high BP. This is known as the ‘prevention paradox’ and emphasizes the power of interventions aimed at reducing risk factors in the whole population, thereby addressing the underlying causes of these diseases (i.e. primary prevention of NCDs). However, high-risk interventions remain critically important for prevention, i.e. to protect susceptible individuals (i.e. those at increased risk of NCD or with an NCD).

### **Selected issues related to population strategies for NCDs**

While several of the chapters in the compendium focus on population strategies to reduce NCD risk factors in more detail, key issues for population strategies include:

1. *The importance of interventions that require minimal action from individuals*

Table 36.1 Main characteristics of population-based and high-risk strategies for the prevention and control of diseases

	Population (public health) strategies	Individual-based (high-risk) strategies
Target ('unit').	Whole population.	Individuals at risk.
Objective.	Create environments that are conducive to the adoption of healthy behaviours by all individuals. Seek to produce small changes in highly prevalent risk factors ('good for all'). Try to tackle the causes of the causes ('whole of society', 'health in all policy' approaches).	Seek to make large changes in risk factors/diseases in a few individuals at high risk ('good for some'). Aim at protecting susceptible individuals.
Mechanism.		
		
	Shift the whole risk factor curve in the population downwards (to lower values).	Identify individuals at risk (including those with NCDs) through screening and treatment.
Impact: benefit for individuals.	Small.	Large (if patients are cooperative; adherence is the main challenge).
Impact: benefit for the population.	Large.	Small (but can be large if a large proportion of the population at risk is detected and treated).

(Continued)

Table 36.1 (Continued)

	<i>Population (public health) strategies</i>	<i>Individual-based (high-risk) strategies</i>
Sectors from which the interventions arise.	Mainly sectors outside of the health sector.	Mainly the health care sector.
Uptake of interventions by different social groups.	Generally no or little social differential. Can have an amplified impact on the poor (e.g. tobacco/alcohol tax).	Often lower uptake by the poor and/or uneducated (a major issue for efficiency and social equity).
Need to identify targeted individuals.	No (unless an intervention targets special population subgroups).	Yes (screening; requires the willingness of individuals to undergo testing/treatment).
Cooperation by individuals is needed.	No or little (e.g. taxes on tobacco and alcohol; reformulation of foods; modification of environment).	Always.
Level of action in the disease process.	Tackle the underlying causes (↓ incidence).	Do not necessarily address the causes (particularly when the causes are unknown). Delays disease development (↓ case-fatality).
Acceptability.	Often opposed by economic interests.	Often well accepted by individuals ('patients').
Cost for society.	Can be low and/or generate revenue (e.g. alcohol/tobacco/sugar excise taxes).	High or very high, cost-effective use of resources (e.g. haemodialysis or cancer treatment that is often very expensive but life-saving for the affected individuals).
Payer.	Often public (as part of agendas of sectors other than health). Different sectors, often outside of health, are often subject to decisions by parliaments at national/regional levels.	A mix of government, insurance and/or out-of-pocket. Health systems, ministry of health.
Accountability.	Can be challenging to assess as evidence most often cannot rely on controlled randomized trials (and observed effects can be biased by confounding factors).	Can rely on strong methods, including randomized controlled clinical trials.
Evidence of impact.		

(Adapted from Rose G. Sick individuals and sick populations. *Int J Epidemiol* 1985;14:32-8)

Many people have difficulty engaging in long-term behavioural change to reduce their exposure to NCD risk factors (Chapter 47). Reasons include that NCD risk factors are often asymptomatic for many years and that a large time interval can occur until an NCD actually occurs (e.g. cancer, heart attack). This emphasizes the importance of population-based strategies which can reduce exposure to risk factors in the whole population without requiring behaviour change at the individual level, e.g. by changing the environment in which people live (e.g. clean air) or by altering some external conditions (e.g. reformulation of foods, chapter 23). Similarly, fiscal, legislative and regulatory policies are helpful in making it easier for people to adopt healthy behaviours.

### *2. Simultaneous impact on multiple NCD risk factors*

When exposure to risk factors decreases in the whole population, through a supportive environment that encourages and enables the adoption of healthy behaviours such as a balanced diet and regular physical activity, several NCD risk factors are simultaneously improved. The population distributions of body-mass index, blood pressure, blood sugar, blood lipids and inflammatory markers will move in a healthy leftward direction. A healthy diet alone can reduce many of these outcomes, as can physical activity alone. Even the non-consumption of tobacco products achieves many of these goals. Health promotion, through policies that catalyse and sustain the stimulus for healthy behaviours at the population level, can greatly influence multiple risk factors and NCDs simultaneously through common pathways.

### *3. Inter-generational benefits*

Measures which are implemented to create a health-promoting environment, to support the population strategy, will not only benefit the current generations but will have carry-over benefits for future generations. A tobacco-free society, a reduction in air pollution, food and agriculture systems that promote healthy diets, and a built environment that enables safe and pleasurable physical activity can be enduring legacies that will reduce the risk of NCDs in future generations, starting with those who are very young at present. Their lifetime exposure to NCD-promoting risk factors will greatly decrease as a result. Fewer persons will then need a high-risk individual strategy for NCD risk reduction.

### *4. The benefits beyond health (win-win strategies)*

A number of interventions that are of benefit to NCD prevention and control can also result in benefits beyond health (win-win). For example, bus/cycle lanes in cities, which promote active commuting (hence increasing physical activity for many individuals) are also important interventions to reduce road

traffic congestion, decrease time spent commuting and for reducing CO<sub>2</sub> emissions. Similarly, taxes on items that can be harmful to health, such as alcohol, tobacco or sugar, generate revenue for the government (which can be used in part to fund health promotion programmes, health care or broader socio-economic development). Interventions that benefit several sectors are generally supported by a broader range of sectors and stakeholders, which enables a stronger case to be made for sustainable funding and implementation. Public health policymakers and practitioners, therefore, need to identify, as often as possible, opportunities for these win-win interventions and then work with other sectors to develop and implement them. This 'health in all policies' approach requires an understanding of the language and culture of sectors beyond health; the incentives, opportunities and barriers for those working in non-health sectors; and a recognition that not all interventions need to be framed primarily around health to benefit NCDs. This underlies the importance of multisectoral committees for the prevention of NCDs at national and more local levels to stimulate, facilitate, coordinate and monitor such win-win interventions.

### Examples of population strategies

#### *Policies to increase/decrease access to healthy/unhealthy products*

- Alter the content of foods and beverages (e.g. salt, trans-fats, saturated fats, sugar in selected foods).
- Limit marketing of unhealthy foods.
- Ban smoking in enclosed and other selected premises.

#### *Policies to improve active mobility*

- Limit the role of private vehicles and favour the use of public transport to promote walking/cycling.
- Promote healthy cities, e.g. structures such as green spaces and walkways to promote physical activity for all.

#### *Economic/fiscal policies to increase/reduce the demand/supply of healthy/unhealthy items*

- Differential taxes/subsidies on healthy fruits/vegetables vs unhealthy energy-dense foods.
- Excise taxes on tobacco, alcohol, sugar drinks.

#### *Initiatives at the community level<sup>P</sup>*

- Most effective when multifaceted, involving the community and culturally acceptable.
- Dose and duration of the interventions should be large enough and sustained over time.

#### *Educational programmes*

- Increasing population awareness of NCDs and their risk factors through the media and in different settings (e.g. schools, workplaces).

The examples above correspond to several WHO best buys and recommended interventions described throughout this compendium.<sup>3</sup>

## **Selected issues related to high-risk strategies for NCDs**

While several of the chapters in the compendium focus on high-risk strategies to reduce NCD risk factors in more detail, some key issues for high-risk strategies include:

1. ***High-risk individual-level strategies are generally well supported by individuals and health professionals***

This is because they can result in large and appreciable changes at a patient level. However, when it comes to NCDs, many conditions such as hypertension are asymptomatic and therefore long-term adherence is a significant challenge. Overtreatment is also an issue. It is important that the management of NCD conditions is based on evidence-based principles and that good governance, adequate regulatory frames, and continued monitoring are set up to ensure that the management of NCDs is not driven by the commercial interests of pharmaceutical and private health care industries.<sup>4</sup>

2. ***The importance of using approaches based on total risk rather than single risk factors***

This is an approach used especially for CVD, where clinical management can be better tailored based on an individual's total (absolute) risk,<sup>5,6</sup> which takes into account the combined effect of several risk factors and clinical conditions, as well as the underlying residual risk in a population. The use of risk prediction scores allows the identification of a relatively small proportion of a population who are at greatest risk of subsequent fatal and/or non-fatal events. Hence, risk scores enable minimizing the number of individuals who need to be treated (NNT) in order to avoid one event and thus minimizing total health care costs for health providers.<sup>7</sup> For example, a person with a high level of one particular risk factor (e.g. high BP) may not need medication when the total risk of CVD is low but may need BP-lowering medication even if BP is not elevated when the total risk of subsequent CVD is high (this is discussed in Chapter 7 on CVD and in Chapter 8 on hypertension). While the total risk approach applies largely to CVD, it has also been applied to type-2 diabetes, certain cancers and other NCDs, also using, for example, genetic and other biomarkers or scores. Total risk scores require regular calibration and validation across the population in question (e.g. taking into account changing CVD risk over time).

3. ***Issues around total risk scores***

While well-calibrated total risk scores can reliably predict hard outcomes at the population level (e.g. incidence of myocardial infarction), they are less useful at an individual level (this is again a feature of the 'prevention paradox' where

a majority of events in the population occur among those with low or intermediate risk).<sup>8</sup> This is because of the relatively (and perhaps surprisingly) weak associations between conventional risk factors and NCDs (e.g. a relative risk [RR] of 2-5 for most single conventional CVD risk factors or a RR up to 50 or so for combined CVD risk factors), while a reliable prediction of an event at the individual level would require a much stronger association (e.g. a relative risk >200).<sup>9</sup> Research is important to identify new variables such as biological and genetic markers and sub-clinical changes (e.g. coronary artery calcification) to enhance the prediction at the individual level.

Older age is, by far, the strongest risk factor of NCDs, and therefore the most discriminant variable in NCD risk scores (e.g. age alone contributes to up to 80% of the performance of the currently used CVD risk scores).<sup>10</sup> This explains why the management of NCDs based on total risk scores tends to concentrate on older age groups. Many would consider that assessment of NCD risk should also be considered at earlier ages, even if the total risk is not particularly high, in view of the chronic and largely irreversible nature of NCDs (e.g. atherosclerosis and CVD). This may require using scores that predict risk over a longer period (e.g. 30 years vs 10 years).<sup>11</sup> While assessing the risk of CVD at a younger age can have important public health benefits, it also has significant resource implications if individual-level interventions are used.

### **Population strategies and high-risk individual strategies and WHO best buys and other recommended interventions in the WHO Global NCD Action Plan**

Of the approximately 80 WHO best buys and other specific recommended interventions (outlined in Chapter 34 and described in chapters throughout the compendium), 40 can be characterized as population-wide strategies and 33 as high-risk individual-level strategies. Being aware of which intervention is population-based and which is individual high-risk is important to help understand which partners to work with.

### **Indicators for surveillance**

Indicators useful to guide population interventions include population-based surveys in adults and children in order to assess mean levels and prevalence of risk factors in the whole population (e.g. STEPS or similar surveys, Chapter 5), ideally stratified by age, sex, socioeconomic level and other population characteristics. Indicators useful to guide high-risk strategies include surveys at the health care level (e.g. service availability and readiness assessment [SARA] or similar health facility-based surveys assessing the use of services, performance, equipment, etc.) but also population-based surveys (e.g. to assess the level of control of risk factors in the whole population). Data from vital statistics or registers (e.g. cancer), which provide information on rates of diseases in a population, are useful to guide both types of interventions.

## Notes

- 1 Rose G. Sick individuals and sick populations. *Int J Epidemiol* 1985;14:32–8.
- 2 Soltani S et al. Community-based cardiovascular disease prevention programmes and cardiovascular risk factors: a systematic review and meta-analysis. *Public Health* 2021;200:59–70.
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- 4 Clark J. Medicalization of global health 3: the medicalization of the non-communicable diseases agenda. *Global Health Action* 2014;7:24002.
- 5 Manuel DG et al. Revisiting rose: strategies for reducing coronary heart disease. *BMJ* 2006;18:332:659–62.
- 6 Bovet P et al. Screening for cardiovascular disease risk and subsequent management in low and middle income countries: challenges and opportunities. *Public Health Rev* 2015;36:13.
- 7 Ndindjock R et al. Potential impact of single-risk-factor versus total risk management for the prevention of cardiovascular events in Seychelles. *Bull WHO* 2011;89:286–95.
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- 11 Grundy S et al. Guideline on the management of blood cholesterol: a report of the ACA/AHA task force on clinical practice guidelines. *Circulation* 2019;139:e1082–43.