Regional contributions of six preventable risk factors to achieving the 25×25 non-communicable disease mortality reduction target: a modelling study

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Summary

Background Countries have agreed to reduce premature mortality from the four main non-communicable diseases (NCDs) by 25% from 2010 levels by 2025 (referred to as the 25×25 target). Countries also agreed on a set of global voluntary targets for selected NCD risk factors. Previous analyses have shown that achieving the risk factor targets can contribute substantially towards meeting the 25×25 mortality target at the global level. We estimated the contribution of achieving six of the globally agreed risk factor targets towards meeting the 25×25 mortality target by region.

Methods We estimated the effect of achieving the targets for six risk factors (tobacco and alcohol use, salt intake, obesity, and raised blood pressure and glucose) on NCD mortality between 2010 and 2025. Our methods accounted for multicausality of NCDs and for the fact that, when risk factor exposure increases or decreases, the harmful or beneficial effects on NCDs accumulate gradually. We used data for risk factor and mortality trends from systematic analyses of available country data. Relative risks for the effects of individual and multiple risks, and for change in risk after decreases or increases in exposure, were from reanalyses and meta-analyses of epidemiological studies.

Findings The probability of dying between the ages 30 years and 70 years from the four main NCDs in 2010 ranged from 19% in the region of the Americas to 29% in southeast Asia for men, and from 13% in Europe to 21% in southeast Asia for women. If current trends continue, the probability of dying prematurely from the four main NCDs is projected to increase in the African region but decrease in the other five regions. If the risk factor targets are achieved, the 25×25 target will be surpassed in Europe in both men and women, and will be achieved in women (and almost achieved in men) in the western Pacific; the regions of the Americas, the eastern Mediterranean, and southeast Asia will approach the target; and the rising trend in Africa will be reversed. In most regions, a more ambitious approach to tobacco control (50% reduction relative to 2010 instead of the agreed 30%) will contribute the most to reducing premature NCD mortality among men, followed by addressing raised blood pressure and the agreed tobacco target. For women, the highest contributing risk factor towards the premature NCD mortality target will be raised blood pressure in every region except Europe and the Americas, where the ambitious (but not agreed) tobacco reduction would have the largest benefit.

Interpretation No WHO region will meet the 25×25 premature mortality target if current mortality trends continue. Achieving the agreed targets for the six risk factors will allow some regions to meet the 25×25 target and others to approach it. Meeting the 25×25 target in Africa needs other interventions, including those addressing infection-related cancers and cardiovascular disease.

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Introduction

In response to the commitments made at the 2011 UN high-level meeting on non-communicable diseases (NCDs), countries have agreed to reduce premature mortality (defined as the probability of dying between the ages of 30 years and 70 years) from the four main NCDs—cardiovascular diseases, cancers, chronic respiratory diseases, and diabetes—by 25% relative to 2010 levels by 2025 (referred to as the 25×25 target). Voluntary global targets for seven NCD risk factors and for two health system interventions were also agreed in 2013.[1]

We have previously estimated the effect of achieving the targets for six of the seven risk factors with global targets (tobacco and alcohol use, salt intake, obesity, and raised blood pressure and glucose) on global NCD mortality between 2010 and 2025.[2] We found that, if the agreed risk factor targets are met, global premature mortality from the four main NCDs would decrease to levels that are close to the 25×25 target for men and there will also be substantial benefits for women. There are striking regional variations in NCD mortality and in risk factor levels,[3–10] which means that information at the regional level is needed for advocacy, planning, and

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Research in context

Evidence before this study

We used a PubMed search done for a recent global analysis of NCD mortality and risk factor targets. The only modelling analysis of the role of risk factor targets in achieving the 25 × 25 mortality target was done at the global level, with no regional information.

Added value of this study

This study analyses and presents the potential contributions of achieving the risk factor targets towards meeting the 25 × 25 mortality target by region. The regions were those used by WHO, and a set of regions based on geography and economic development.

Implications of all the available evidence

No region is on-track to achieve the 25 × 25 mortality target under current trends. However, there are substantial differences across regions, with marked reductions happening in the European region and Americas region contrasted with rising premature NCD mortality in Africa, where infection-related NCDs remain leading causes of premature death. Achieving the six risk factor targets will help all regions, but with noticeable differences by region and sex in terms of which risks are most important, and how large the additional benefits are.

accountability. This study presents a regional-level analysis of the effect of achieving the targets for six risk factors on premature mortality from NCDs between 2010 and 2025.

Methods

Data sources

The methods and data sources have been described in detail in the earlier global publication.[2] In brief, we used data for risk factor and mortality trends from systematic analyses of available country data, as detailed in the appendix. Relative risks for the effects of individual and multiple risks, and for change in risk after decreases or increases in exposure, were from reanalyses and meta-analyses of epidemiological studies, as detailed in the appendix.

See Online for appendix

Analytical approach

Our analytical approach was based on two epidemiological characteristics of NCDs. First, NCDs have many causes, the combined effects of which lead to a particular disease rate in the population. Some of these causes are non-modifiable (eg, genetic determinants), unmeasured or poorly measured (eg, health-care quality or stress), or even unknown. Therefore, trends for a specific NCD can be different from that of any single risk factor or small number of risk factors, depending on how the other determinants and medical treatment are changing. For example, cardiovascular disease mortality in high-income countries has decreased for decades, during which time some of its risk factors (eg, blood pressure, cholesterol, and, in some countries, smoking) have decreased and others (eg, obesity and smoking in other countries) have increased.[11–13] To account for this characteristic, and consistent with the vast empirical evidence on proportional effects, we analysed the effects of risk factors on future NCD mortality as a proportion of projected death rates.

The second characteristic of NCDs is that, when exposure to one of its risk factors increases or decreases, the harmful or beneficial effects on disease risk accumulate gradually.[14–17] We accounted for this characteristic using relative risks (RRs) that were a function of time since exposure change. These two components of our approach can be incorporated in a time-based, population impact fraction (PIF) formula,[18] which estimates the proportion of disease-specific deaths for years between 2010 and 2025 that would be avoided if risk factor exposures were reduced according to their targets. For each disease outcome causally associated with a risk factor, we calculated the time-based PIF for a given year (20XX) between 2010 and 2025 using the following formula:

$$PIF^{20XX} = \frac{\sum_i P_j^{20XX} RR_j^{20XX} - \sum_i \hat{P}_j^{20XX} RR_j^{20XX}}{\sum_i P_j^{20XX} RR_j^{20XX}}$$

where P^{20XX} and $\hat{P}^{20XX}$ are population distributions (which could be categorical or continuous) of risk factor exposure in year 20XX in the so-called business-as-usual scenario (BAU; ie, projections based on current trends with no additional action) and target scenario, respectively, and RR^{20XX} is the RR in 20XX (see appendix of Kontis and colleagues[2]). The first term in the numerator is the weighted (by prevalence) disease risk if risk factors continue their current trend and the second term is the weighted disease risk if risk factor trends are changed according to their target. The risk factor exposure categories, denoted by j, account for both the level of exposure and for time since change in exposure. The RR for each exposure category in this equation depends on time since exposure change. This relation is an extension of the commonly used population attributable or impact fraction in which RRs are a function of exposure level but not of time.

We estimated the proportional reduction in mortality from each NCD if all six risk factor targets are achieved using the formula for the joint effects of multiple risk factors, which accounts for multicausality and overlap of risk factors.[19] When estimating the combined effects of all six risk factors, we also accounted for the fact that raised blood pressure and glucose are mediators of the effects of