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Assessing the potential outcomes of achieving the World Health Organization global non-communicable diseases targets for risk factors by 2025: is there also an economic dividend?

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ABSTRACT

Objectives: This study assesses the change in premature mortality and in morbidity under the scenario of meeting the World Health Organization (WHO) global targets for non-communicable disease (NCD) risk factors (RFs) by 2025 in France. It also estimates medical expenditure savings because of the reduction of NCD burden.

Study design: A microsimulation model is used to predict the future health and economic outcomes in France.

Methods: A 'RF targets' scenario, assuming the achievement of the six targets on RFs by 2025, is compared to a counterfactual scenario with respect to disability-adjusted life years and healthcare costs differences.

Results: The achievement of the RFs targets by 2025 would save about 25,300 (and 75,500) life years in good health in the population aged 25–64 (respectively 65+) years on average every year and would help to reduce healthcare costs by about €660 million on average per year, which represents 0.35% of the current annual healthcare spending in France. Such a reduction in RFs (net of the natural decreasing trend in mortality) would contribute to achieving about half of the 2030 NCD premature mortality target in France.

Conclusions: The achievement of the RF targets would lead France to save life years and life years in good health in both working-age and retired people and would modestly reduce healthcare expenditures. To achieve RFs targets and to curb the growing burden of NCDs, France has to strengthen existing and implement new policy interventions.

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Introduction

In 2011, the UN General Assembly adopted a political declaration that mobilized member countries for the reduction and control of non-communicable diseases (NCDs).[1] In particular, the resolution includes an ultimate sustainable development goal (SDG) target to reduce by one-third premature mortality from NCDs by 2030. To achieve this, countries agreed on nine voluntary global targets for 2025 (with a baseline of 2010), including a target to reduce overall mortality from the four main NCDs (cardiovascular diseases, cancer, diabetes, or chronic respiratory disease) by 25% (called the 25 × 25 target), six key risk factors (RFs) targets, and two national systems response targets (Table 1).[2]

The case of France is particularly interesting as there is conflicting evidence on whether France is on track to meet the 2030 SDG and the 25 × 25 mortality targets. Some recent modeling studies suggest that if the six RF targets are met, France—as well as other high-income countries—may achieve to reduce NCDs premature mortality by 2025.[3,4] However, historical data suggest that premature mortality caused by the four main NCDs in France has declined by 20% between 2000 and 2012 and that at this pace, France would not be able to achieve the SDG target by 2030.[5] This is echoed in the Global Burden of Disease (GBD) 2018 study, which estimated that France would not meet the target of one-third premature mortality reduction by 2030.[6]

From a public health perspective, it is important to know how much achieving the RF targets by 2025 would contribute to the reduction in premature mortality and the achievement of the 2030 target. From a policy-decision perspective, it is important to understand whether meeting these targets would translate into health cost savings, buttressing the economic case for sustaining a large and ambitious public health action aiming to protect people against these risks.

Previous literature on the achievement of the 2030 SDG and the 25 × 25 targets has mainly focused on changes in premature mortality, with only one study focusing on morbidity and none on economic outcomes. While few studies conclude that the 2030 premature mortality target was achievable in high-income countries that have invested in prevention and treatment,[7–9] the GBD 2018 study estimates that the 2030 target is to be achieved for men in only 16% of countries worldwide and for women in 19% of countries.[6] Generally, these findings suggest that more efforts are necessary to achieve the RFs reduction. In the United Kingdom, achieving all RFs targets was forecast to avert 300,000 deaths and 1.3 million years lived with disabilities from NCDs for the period 2010–2025, with health gains resulting mainly from reduced mortality and morbidity from heart disease and stroke and reduced morbidity from diabetes, depression and dementia.[9]

This article assesses the health and economic outcomes under a scenario in which France meets the six NCDs global targets on RFs (i.e. targets 2 to 7) by 2025. More specifically, this analysis presents the impacts on morbidity, mortality, and healthcare expenditure. This study does not cover targets 8 and 9 on access to care, as the French health system offers universal health coverage with adequate healthcare provision and availability of treatment and counseling to prevent and control NCDs.[10,11] Target 1, on mortality reduction, is assessed through the effect mediated by a reduction in the prevalence of the RFs.

Methods

General framework

The Organisation for Economic Co-operation and Development (OECD) Strategic Public Health Planning for NCDs (SPHeP-NCD) model is used to predict the health and economic outcomes of the French population between 2016 and 2030, relying on previous microsimulation and econometric approaches.[12,13] The details of the SPHeP-NCD model are described in the Web Appendix and in a related working paper.[13]

Structure of the model and data sources

The SPHeP-NCD model is a microsimulation platform simulating individual lives of a group of people, representative of a country, from birth to death, including events such as behavioral and physiological RFs and incidence of chronic diseases, remission, and fatality from these diseases. The relevant outputs of the model contain disease prevalence and incidence, death cases, life years and life years lived in good health, and medical costs of treatment of the diseases.

The model is built on four major modules: demography, diseases, RFs, and medical costs. The three first modules

Table 1 – Nine global targets for the prevention and control of NCDs by 2025.

1. A 25% relative reduction in the overall mortality from cardiovascular diseases, cancer, diabetes, or chronic respiratory disease
2. At least 10% relative reduction in the harmful use of alcohol, as appropriate, within the national context
3. A 10% relative reduction in prevalence of insufficient physical activity
4. A 30% relative reduction in mean population intake of salt/sodium
5. A 30% relative reduction in prevalence of current tobacco use
6. A 25% relative reduction in the prevalence of raised blood pressure or contain the prevalence of raised blood pressure, according to national circumstances
7. Halt the rise in diabetes and obesity
8. At least 50% of eligible people receive drug therapy and counseling (including glycemic control) to prevent heart attacks and strokes
9. An 80% availability of the affordable basic technologies and essential medicines, including generics, required to treat major NCDs in both public and private facilities.

NCD, non-communicable disease

reproduce the demographic, epidemiological, and RF characteristics by age- and gender-specific population groups of a given country at different points in time. The demography module simulates births, deaths, and inward/outward migration following the United Nation population projections[14] and the Human Mortality database.[15] Epidemiological characteristics of the model include disease incidence, prevalence, remission, and fatality using data from the Institute for Health Metrics and Evaluation (IHME) GBD 2016[16] for eight major NCDs (listed in the Web Appendix). In addition, the model accounts for all the other causes of deaths through a residual mortality rate. The RFs module simulates key behavioral and physiological RFs. Definitions and model assumptions for these RFs are described in the Web Appendix. The input data for population exposure to RFs come from IHME GBD 2016[16] for smoking and physical inactivity, WHO 2017 and IHME GBD 2015 for alcohol consumption,[17,18] and NCD-RisC 2017 for obesity and blood pressure.[19] Relative risks (RRs) that link RFs to diseases are determined by gender and age group. Information on RRs was collected from IHME GBD 2016,[20] the dynamic modeling for health impact assessment (DYNAMO-HIA) model,[21] and the OECD alcohol model.[12] Further detailed features of the model (e.g. on disability weights used for estimating life years lived in good health) can be found in Cecchini et al.[13]

Medical costs of disease treatment are derived from national health expenditure data in France (including ambulatory care, hospital, and pharmaceutical costs) and are replicated in the future. The estimation was carried out by Cortaredona and Ventelou.[22] Disease-related costs are expressed in constant 2014 prices (Euros) and were calculated for the following diseases: chronic obstructive pulmonary disease, dementia, depression, ischemic and hemorrhagic strokes, myocardial infarction, cancers, chronic kidney disease, alcohol-related injuries, diabetes, and cirrhosis. Individual healthcare access and consumption are considered constant over time (for a given age, gender, and diseases profile). The methodology allows differentiation between average residual costs, marginal disease-related costs (with and without comorbidities), death-related costs, and cost of comorbidities. The average residual cost is an average annual per capita cost for people who not do have one of the diseases listed above.

The 'RF targets' and counterfactual scenarios

A 'RF targets' scenario is designed to reflect changes attributable to the achievement of the six RF targets by 2025 (Table 1). The salt target is combined with the high blood pressure (HBP) target assuming that the effect of salt intake on NCDs prevalence and mortality is entirely mediated by the HBP exposure. Similarly, the achievement of halting the rise in diabetes is assumed to be fully driven by the achievement of the obesity target.

The 'RF targets' scenario is compared to a counterfactual scenario to estimate the pure effect of achieving the RF targets by 2025 on health and economic outcomes (e.g. life years in good health and healthcare costs), independently of the natural evolution of mortality. The counterfactual scenario assumes that age- and gender-specific mortality rates, prevalence of RFs, and RRs are constant as of 2016.

The 'RF targets' scenario uses historical data between 2010 and 2015 (or the most recent available year) and assumes a linear reduction in the age- and gender-specific prevalence of the RFs until reaching targets by 2025. Age- and gender-specific prevalence rates for the RFs are then kept constant between 2025 and 2030. To discard the natural decreasing trend in mortality (which contains current societal trends and trends in RFs) and to isolate the net effect of the reduction of RFs, age- and gender-specific mortality rates are kept constant as of 2016 and until 2030 in both scenarios.

The comparison of the model predictions under the two scenarios allows quantifying the effect of the reduction of RFs on health and economic outcomes—net of the decreasing mortality trend—and it sheds light on how much the reduction in RFs can contribute to reducing premature mortality in France.

Results

Mortality

The probability of dying prematurely (between ages 30 and 70 years) from one of the four main NCDs diminishes with the reduction of RFs by 2025 in a scenario where age- and gender-specific mortality rates are set constant as of 2016 (Fig. 1). Specifically, the 'RF targets' scenario reduces premature mortality by 18% in men and by 15% in women from 2010 to 2025 (net of the natural diminishing trend in mortality); this would represent by 2030 about half of the one-third reduction target. At the same time, the UN projections of life expectancy—which reflect the natural decreasing trend in mortality in the model-result in an yearly reduction in premature mortality of 1.48% in the period 2010–2025, which is likely to reach a 26% reduction by 2030. In other words, the mortality reduction produced by the achievement of the 'RF targets', combined with the natural decreasing trend in mortality for other reasons, would put France be on track to meet the 2030 SDG targets on premature mortality.

Morbidity

The achievement of the RF targets by 2025 would also lead to an improvement in health outcomes. By meeting the six RF targets, about 10,100 life years and 25,300 life years in good health could be saved annually in the French adult population aged 25–64 years between 2016 and 2030 (Fig. 2). In the population aged 65+ years, about 60,500 life years and 75,500 life years in good health can be saved annually.

Expenditures

A reduction in NCD burden is associated with lowered healthcare costs. If the RF targets were met by 2025, annual healthcare costs would be reduced by about €220 million (population 25–64 years) and €440 million in people aged 65 years and above—that is a total of €660 million on average per year (Fig. 3), representing 0.35% of total health expenditure in France. Additional results of health expenditure savings over time are available in the Web Appendix.

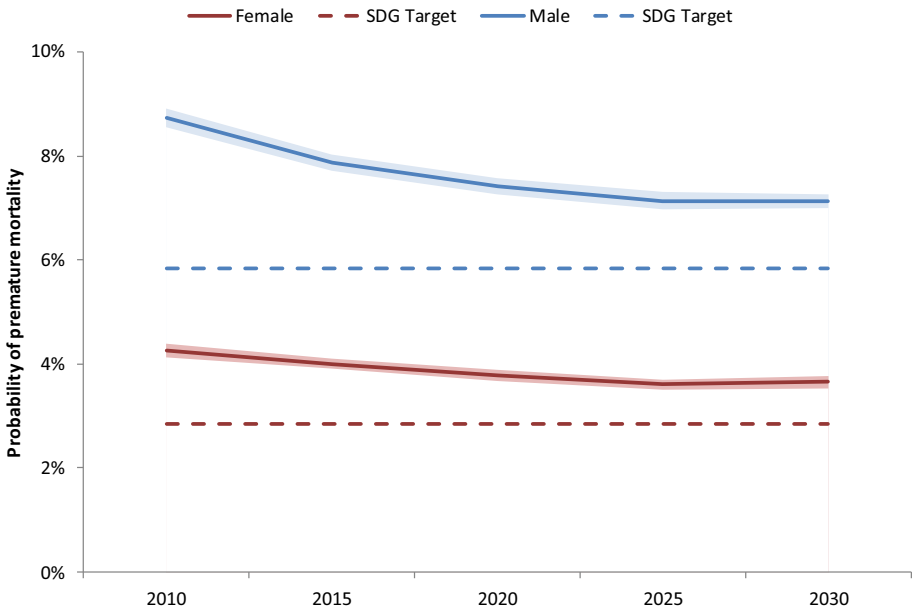

Fig. 1 – Probability of premature mortality from the four main NCDs in France, net of the natural diminishing trend in mortality. Note: Includes 95% confidence intervals of the repeated simulations. Source: OECD SPHeP-NCD model, 2018. SPHeP-NCD, Strategic Public Health Planning for NCD; NCD, non-communicable disease; Organisation for Economic Co-operation and Development (OECD).

A sensitivity analysis was carried out to test alternative assumptions on harmful alcohol use. For instance, the alcohol target was amended to include an additional 10% reduction in the age- and gender-specific prevalence of binge drinking. This sensitivity analysis showed that a further restriction on binge drinking did not strongly affect the overall results.

Discussion

This article shows notable health and economic impacts of achieving the WHO global targets for RFs by 2025 in France. The sole reduction of RFs (net of the decreasing trend in mortality) would lead to sizeable health benefits improving life years and life years in good health in both working-age and retired people and would reduce healthcare costs by about €660 million annually which represent about 0.35% of the total health spending in France. Findings also suggest that if the natural decreasing trend in mortality was combined with the mortality reduction stemming from the reduction of the RFs, France would be on track to meet the 2030 SDG premature mortality target.

Expected healthcare savings are limited, but this is the consequence of prevention policies: people who survive as a result of avoiding NCDs will continue utilizing healthcare services and therefore will incur health expenditure.

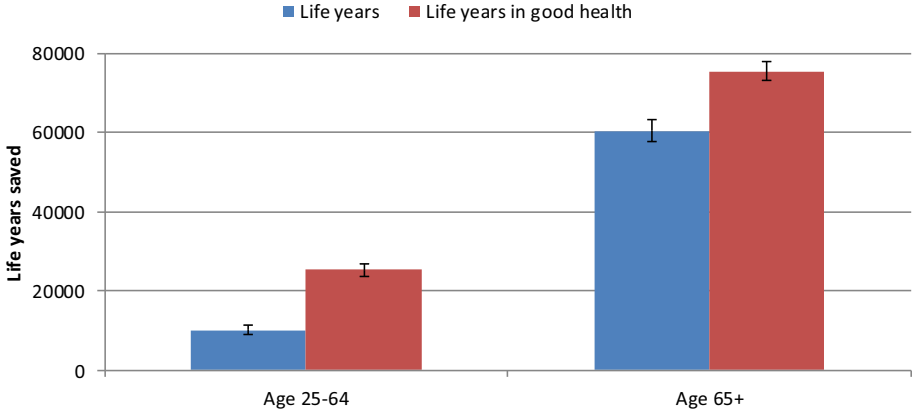

Fig. 2 – Life years and life years in good health saved in France, average per year 2016–2030, by age group. Note: Includes 95% confidence intervals of the repeated simulations. Source: OECD SPHeP-NCD model, 2018. SPHeP-NCD, Strategic Public Health Planning for NCD; NCD, non-communicable disease; Organisation for Economic Co-operation and Development (OECD).

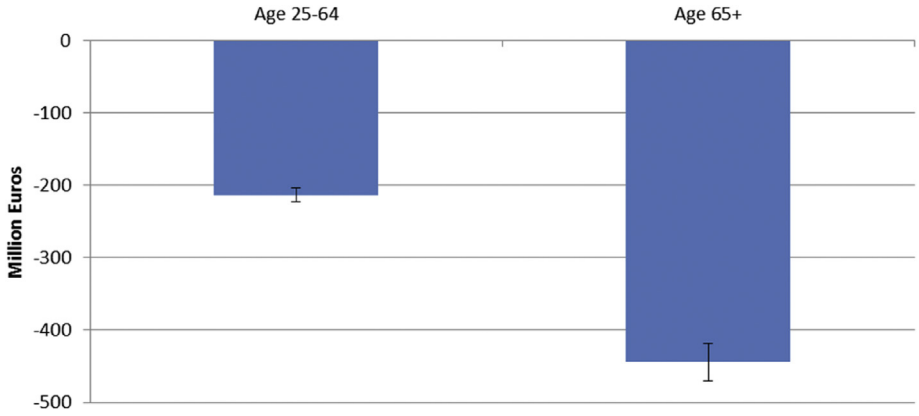

Fig. 3 – Reduction in healthcare costs, average per year 2016–2030 in France, by age group in years. Source: OECD SPHeP-NCD model, 2018. Note: Includes 95% confidence intervals of the repeated simulations. SPHeP-NCD, Strategic Public Health Planning for NCD; NCD, non-communicable disease; Organisation for Economic Co-operation and Development (OECD).

However, the success of prevention should not just be measured in terms of healthcare savings. Health gains are valuable in themselves; furthermore, social costs and indirect costs associated with NCDs and their RFs (e.g. employment prospect, absenteeism from work) are not taken into account while these costs represent about 1% of gross domestic product (GDP) in France.[23]

Results of this study not only present new estimates on the concrete health and economic impact of the SDG agenda in France but also represent a significant step forward to develop systems modeling tools for public health policy and planning.[24] SHPeP-NCD stands out against existing, similar models in the following novel ways.

First, SHPeP-NCD models real-life counterfactuals, for example, in the absence of exposure to smoking, the same individual might still be afflicted with heart disease due to other RFs. This lowers the impact of RF-specific policy scenarios compared with traditional approaches that, instead, usually assume that, in the absence of the RF, individuals would live the rest of their life in good health. However, by relaxing this assumption, the SHPeP-NCD model represents a much closer-to-reality scenario which, then, translates into more realistic economic estimates. This mechanism largely explains why the cost impact of the 25 × 25 strategy is relatively modest: people whose morbidity and mortality is reduced continue to consume health care because of other diseases.

Second, SHPeP-NCD, in novel fashion, distinguishes between costs at different stages of disease. For example, the extra cost of disease in the last year of life in a cancer patient (which is higher than when in remission) is taken into account. This approach allows to address one of the most pertinent questions in this literature: does prolonging life lead to overall costs savings or increased costs?[25,26] The model can then better inform on what happens to national healthcare costs when prolonging life does not result in compression of morbidity, but rather, the extension of years lived with disease in the population.

Lastly, SHPeP-NCD further contributes to the field of modeling the chronic disease cost burden by incorporating the cost of comorbidities. Only a limited amount of high quality results exist in this area and for only a subset of conditions.[22] Therefore, by modeling the cost of comorbidities and accounting for the extra cost of comorbidities,[22] SHPeP-NCD provides results that not only improve on existing models available to date but provides results with immediate policy relevance. More specifically, our results highlight the importance of targeting no single diseases, but also overall comorbidities.

Policy context and implications

Obesity, physical inactivity, HBP, smoking, and alcohol misuse are public health concerns that are being addressed with comprehensive national prevention policy programs in France. For instance, the French national nutrition and health programs initially implemented in 2001 and revised since (Programme National Nutrition Santé 2017-21) offers dietary guidelines and physical activity recommendations for both general and specific population groups. The French strategy against obesity also includes restrictions on food advertising to children on TV and radio, and more recently, the *Nutri-Score*, a voluntary front-of-pack food labeling scheme that aims to help consumers to make healthier choices. Regarding smoking control, a national program against tobacco addiction for 2014–2019 has introduced plain tobacco packaging, smoking bans in public places and children's areas, and taxation to increase the price to 10 euros per pack by 2020. Regarding alcohol policy, France limits the age of consumption, restricts locations and hours for selling alcohol, and forbids drink-driving. While regulations of alcohol advertising were initially introduced in 1991 by the Loi Evin, they have been modified over recent years.[27] Taxation on alcohol is uneven across types of beverages, in particular with low taxes on wine compared with other European countries.[28] While the 2025 RF targets are not yet achieved in France, continuous efforts for more actions and comprehensive strategies are required to curb the growing burden of NCDs.

Limitations

At least two limitations can be discussed. First, the model accounts for about 56% of the deaths attributable to the four

major NCDs (model result not displayed here), mainly because the disease module does not cover all types of cancers and CVDs. This means that premature mortality due to the four major NCDs is estimated by the model to be around 8.7% in men and 4.2% in women, while WHO data report 14.6% and 7.3%, respectively.[29] Second, model-based results rely on input data. In some cases, different sources may suggest slightly different trends. For instance, IHME data suggest a slow increase in obesity rates between 2010 and 2016, whereas other sources conclude that obesity has stagnated in France since 2006.[30] However, such assumptions on the historical data period do not greatly affect the results, since the 'RFs target' scenario predicts a halt in obesity. Further investigations using alternative assumptions on the trends of RFs could be tested in future model simulations.

Author statements

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The views expressed in this article are those of the authors and do not necessarily reflect those of the OECD or its member countries.

The SPHeP-NCD microsimulation model was developed at the OECD, building on previous OECD modeling work as well as on collaborative work carried out as part of the H2020 FRESHER project. Authors would like to acknowledge Thierry Pellegrini's contribution to the development of the software.

Ethical approval

Not required. The analyses carried in this article used secondary data collected at national and international levels.

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Competing interests

None declared.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.puhe.2019.02.009.