OECD'S SPHeP MODELS

A TOOL TO INFORM STRATEGIC PLANNING IN PUBLIC HEALTH

OECD
BETTER POLICIES FOR BETTER LIVES

1 Introducing the SPHeP Models

The family of OECD models to support Strategic Public Health Planning (SPHeP) are designed to inform and support the decision making process in countries at all levels of income. Our models produce evidence that can guide policy decisions on how to ensure that resources spent on public health policy actions will produce the greatest health outcomes and economic benefits. They are designed to generate data on how to prevent, manage and control key public health threats. This includes the vast majority of non-communicable diseases, injuries and mental health problems, as well as emerging threats in the field of communicable diseases.

The OECD has developed two advanced system-modelling tools to cover all the areas of public health:

- A microsimulation model, which covers all the key threats related to non-communicable diseases. These include diabetes, cancers and cardiovascular diseases, in addition to injuries and mental health issues, as well as key risk factors such as harmful alcohol consumption, unhealthy diet, physical inactivity and tobacco use. In total, the model accounts for more than 26 diseases and 6 risk factors, which represent the vast majority of the burden of disease.
- An agent-based model, to simulate dynamics specific to communicable diseases. So far, the OECD is applying this methodology to antimicrobial resistance (AMR) and COVID-19, but the framework can be broadly applicable to all communicable diseases.

OECD work covers more than 50 countries - all the 37 OECD member countries, the other non-OECD EU and G20 countries, as well as other key partners of the OECD - accounting for more than 4.7 billion people (over 60% of the world's population) and nearly 80% of the world economy (Figure 1).

The models can easily be adapted to cover any country in the world.

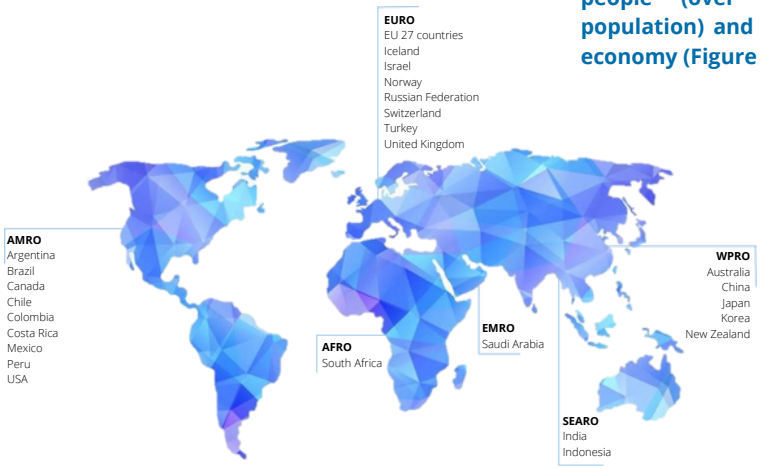


Figure 1: Countries covered by the OECD SPHeP models by WHO Region

THE OECD's SPHeP MODELS

The models help policy-makers respond to the following questions:

- What would be the investment needed to implement or scale up a specific public health programme?
- What would be the impact of this intervention in terms of population health and healthcare expenditure? (e.g. Figure 2)
- What would be the effects of the new programme on labour force productivity and the economy (i.e. GDP)?
- What is the return on investment of the policy action and its distributional impact?
- How long will it take to produce the desired effects?

An example from previous modelling work on obesity and the economy

As part of work on obesity, the OECD SPHeP-NCD model was used to evaluate the impact of a reformulation programme to reduce calories by 20% in foods high in sugar, salt, calories and saturated fat. This target could be achieved by implementing a mix of policies such as raising awareness in the population, using economic incentives to promote reformulation and procurement policies. While a global deal to reduce calorie content in relevant food by 20% would not address all the causes underpinning the obesity epidemic, it would have a significant health and economic impact.

Figure 2: The impact of a 20% reduction in calorie content in energy dense food across 42 countries, according to the SPHeP-NCD model

1.1 million cases of non-communicable diseases avoided per year

0.5% increase in GDP

13.2 billion (USD PPP) saved every year due to reduced healthcare expenditure

1.4 million additional full-time workers per year

Source: OECD analyses based on the OECD SPHeP-NCD model.

STRENGTHS OF OECD MODELS

The OECD family of models focuses on the economic aspects of key public health issues, helping **Ministries of Health and Public Health Institutions speak the same language as the Treasuries.**

We use the **most advanced methodological approaches** to carry out highly specific and policy relevant analyses. Our model on non-communicable diseases is based on a microsimulation approach, while our model on communicable diseases is based on agent-based modelling technique, both considered the **gold standard for modelling** in their respective fields.

Our modelling work looks at the **impact of real policies** implemented by other countries or in other settings. We calculate the **cost of transferring** this policy to the new setting and **evaluate its impact** according to the specific characteristics of the country.

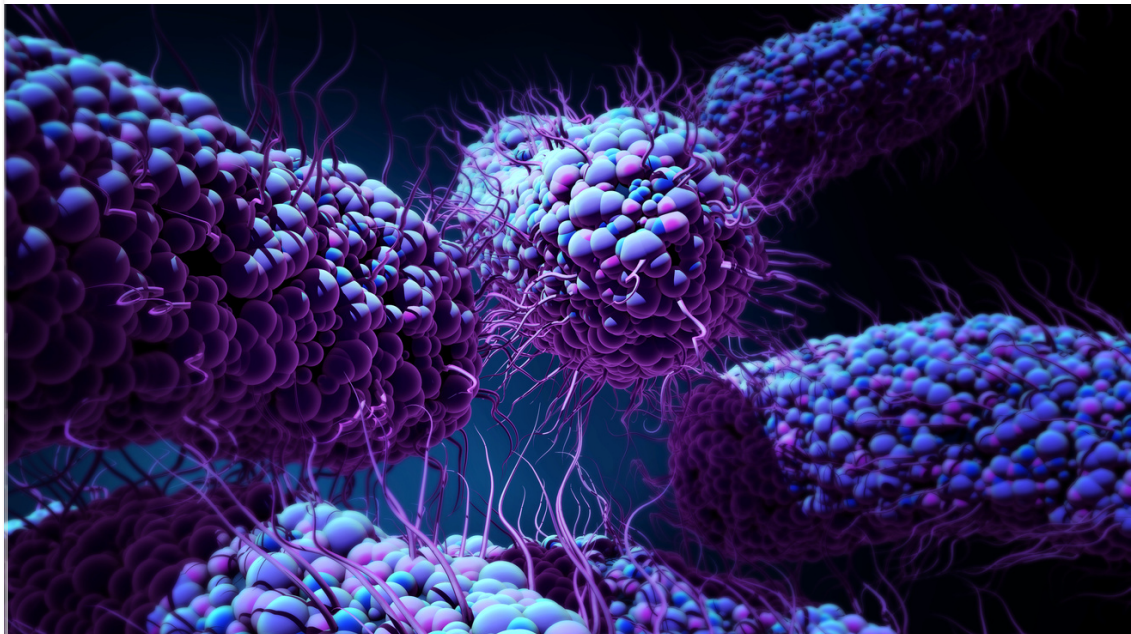
Our models are designed to support countries in allocating resources and in evaluating the impact of public health policies. All countries can benefit from this modelling work, including:

- Countries that are designing a new public health policy and that would like to assess its likely impact, implementation cost and return on investment;
- Countries that have implemented a policy, or a comprehensive policy package in the past, and would like to evaluate the health and economic impact of their reform once sufficient data have been collected;
- Countries that would like to strengthen their strategy to deal with a specific public health issue and are interested in comparing alternative options to identify the most effective and efficient investment.

2 Inputs and Outputs of the Models

While the two models are different in their structure, they share the same philosophy and require similar types of data as input. The models generate synthetic life stories (from birth to death), in which each simulated individual is ascribed a set of characteristics and risk factors, in order to predict the consequent disease outcomes. Simulated individuals fully replicate the population of a given country in terms of:

- Risk factor profile including lifestyles (e.g. diet, physical activity and alcohol/tobacco use) and physiological risk factors (e.g. overweight);
- Epidemiology including incidence of chronic diseases and infection, probability of dying in the case of adverse outcomes, as well as consequences or disability following a disease;
- Use of healthcare services including, for example, probability of hospitalisation and length of stay as well as the disease-specific healthcare expenditure;
- Participation to the labour force including, for example, probability of being employed and average wage;
- Demography including gender and age structure as well as life expectancy.



Model functioning and outputs

Data to model all these dimensions are retrieved from international datasets providing cross-country comparable data. In addition to the OECD dataset, other common sources of data include datasets hosted by the World Bank, the World Health Organization, the International Agency for Research on Cancer, the European Centre for Disease Prevention and Control, and the Institute for Health Metrics Evaluation. However, it is also possible to use different inputs (e.g. from national health surveys), should a country prefer to do so.

The models use this input data, and through the use of standard algorithms, project a 'business as usual' scenario over a period of, usually, 30 years (e.g. between 2020 and 2050) – (Figure 3). In a second step, the models are run again after the implementation of the policy intervention - for example, to evaluate the impact of a mass media campaign aiming to increase physical activity to tackle chronic diseases at the population level, or an intervention to enhance hygiene in hospitals to prevent hospital-acquired infections. The comparison between the two scenarios generates the impact of the intervention.

The models produce a rich set of outputs providing useful information on all key health and economic perspectives. In addition, the OECD SPHeP models can be linked to the OECD long-term macroeconomic model to assess how policies impact GDP and fiscal pressure (i.e. the government primary revenue needed to stabilise the public debt). The OECD SPHeP models can produce analyses on:

- Health outcomes: life years, disability-adjusted life years (DALYs), life expectancy, premature mortality, disease cases;
- Healthcare expenditure: total healthcare expenditure and disease-specific expenditure;
- Labour force participation and productivity: absenteeism, presenteeism, early retirement or sick leaves due to ill-health;
- Gross domestic product (GDP) and fiscal pressure (i.e. the government primary revenue needed to stabilise the public debt).

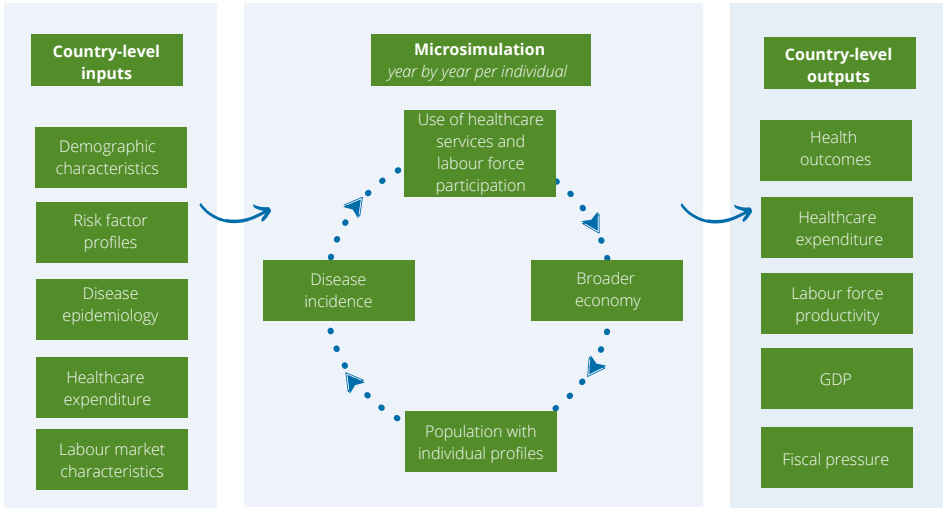


Figure 3: Inputs and outputs of the SPHeP models

Diseases covered by the models

The SPHeP-NCD model accounts for over 26 diseases, including ischaemic heart disease, diabetes mellitus, cardiovascular disease, chronic kidney disease, low back and neck pain, hypertensive heart disease, colon and rectum cancer, esophageal cancer, liver cancer, kidney and pancreatic cancer, cirrhosis, alcohol use disorder, road injuries, unintentional injuries, self-harm, interpersonal violence, breast cancer, nasopharynx cancer, stroke, chronic obstructive pulmonary disease, lower respiratory infections, atrial fibrillation, rheumatoid arthritis, depression and dementia.

The SPHeP-AMR model includes 8 bacteria and 17 antibiotic-bacterium: Acinetobacter spp., Streptococcus pneumoniae, Staphylococcus aureus, Escherichia coli, Klebsiella pneumoniae, Pseudomonas aeruginosa, Enterococcus faecalis and Enterococcus faecium. Moreover, the OECD is currently extending the model to also include Shigella, Salmonella, Campylobacter, and Mycobacterium tuberculosis.

A new SPHeP-COVID model is also being developed.

An example from previous modelling work on AMR and the economy

- Between 2015 and 2050, and after adjusting for differences in prices across countries through the PPP approach, AMR would cost approximately USD PPP 3.5 billion per year to the healthcare services of the 33 countries included in the analysis;
- Many interventions to promote prudent use of antibiotics and to enhance hygiene in hospitals cost 0.3 to 2.7 USD PPP per capita per year in many OECD countries (Figure 4), and are affordable in countries at lower levels of income;
- Investing 2 USD PPP per capita per year in a comprehensive package encompassing public health measures would avoid approximately 47 000 deaths per year in OECD countries;
- The public health package could pay for itself within just one year and end up saving USD 4.8 billion of dollars per year in OECD countries.

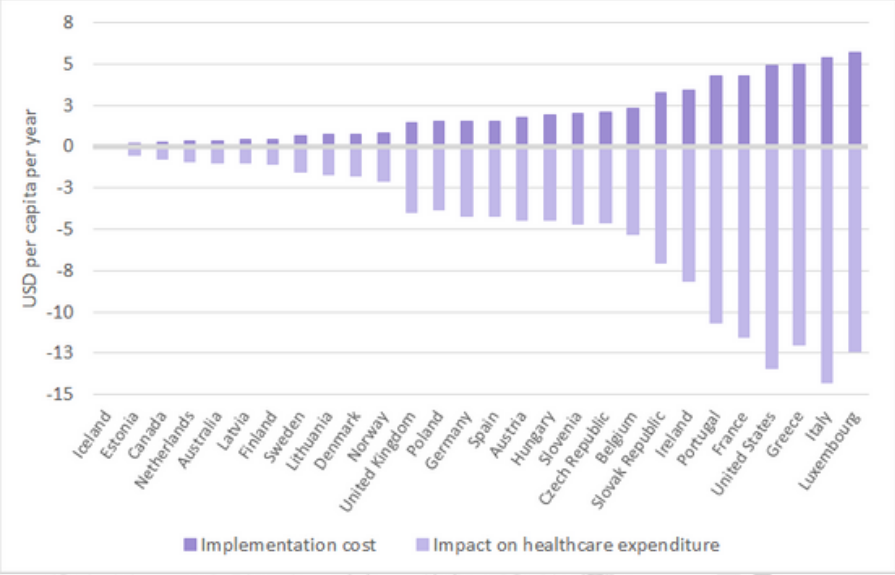


Figure 4: Economic assessment of a comprehensive public health package to tackle antimicrobial resistance: just a few dollars more produce substantial savings in healthcare expenditure.

Source: OECD analyses based on the OECD SPHeP-AMR model.

3 Examples of Collaborations

European Commission

OECD models are often used to inform recommendations by other Intergovernmental Organisations on effective and cost-effective policies to tackle top public health threats. For example, the European Court of Auditors (ECA) used outputs from the OECD SPHeP-AMR model to inform its recommendations to EU Member States and the European Commission on antimicrobial resistance (AMR).

Drawing on the findings from the OECD work, the ECA issued a number of recommendations supporting the wider implementation of the policy options assessed with the OECD SPHeP-AMR model to tackle inappropriate use of antibiotics in hospitals and other healthcare settings. In particular, ECA used the economic assessment carried out by the OECD to stress the economic case to upscale action on AMR.

The project was co-funded by the European Commission.

France

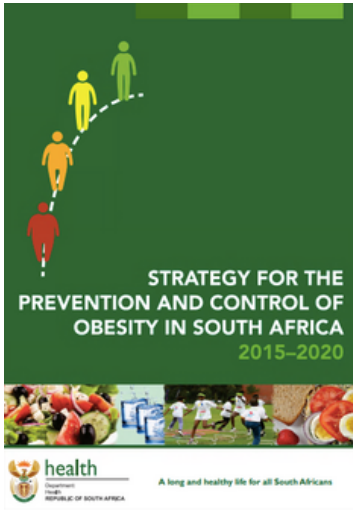
The OECD SPHeP-NCD model is used to calculate the impact of the French strategy to decrease tobacco use. In 2016, France started implementing a far-reaching strategy to tackle tobacco consumption. Increase in the price of tobacco products, support to stop smoking and actions to 'de-normalise' tobacco use are among the key pillars of this strategy.

Following the implementation of the strategy, the number of tobacco users in France decreased by 12%. Working together with Santé Publique France, the OECD is evaluating the health and economic impact of this policy package.

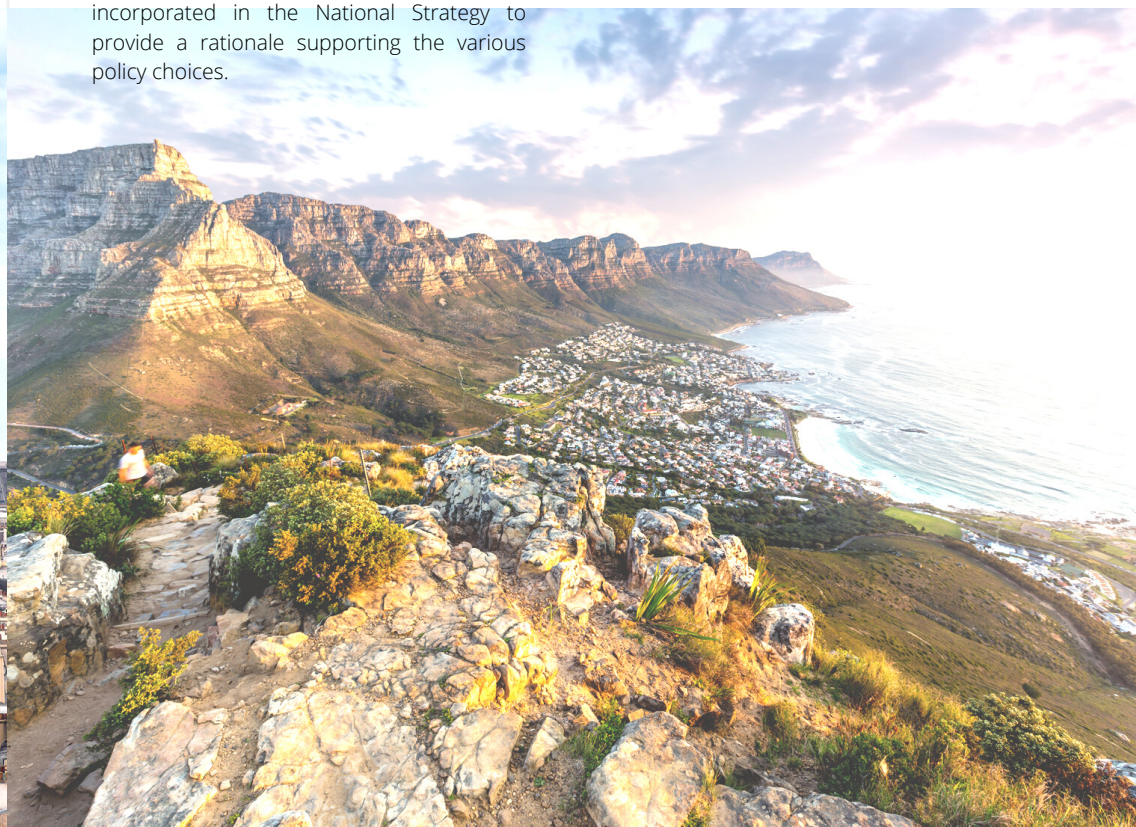
The OECD model is being used to understand how the reduction in tobacco use will decrease the future incidence of chronic diseases caused by tobacco – e.g. cancers and cardiovascular diseases – and how this decrease in morbidity will translate into a reduction in healthcare expenditure and increase in labour market outcomes.

South Africa

A precursor of the OECD SPHeP-NCD model was used to inform the preparation of the National Strategy for the Prevention and Control of Obesity in South Africa (2015-2020). High prevalence of overweight and its related risk factors, such as unhealthy diet and lack of physical activity, are among the key factors affecting population health in South Africa, and are responsible for almost 15% of the total burden of disease in the country.



Analyses based on the model supported South Africa in the preparation of the National Strategy by producing evidence on the effectiveness and cost-effectiveness of various policy options to promote healthier lifestyles. Findings from the model were incorporated in the National Strategy to provide a rationale supporting the various policy choices.



4 Publications related to OECD modelling work

OECD Flagship Publications

OECD (2021), Alcohol publication (title TBC), forthcoming.

OECD (2019), The Heavy Burden of Obesity: The Economics of Prevention, OECD Health Policy Studies, OECD Publishing, Paris. https://doi.org/10.1787/67450d67-en.

OECD (2018), Stemming the Superbug Tide: Just A Few Dollars More, OECD Publishing, Paris. https://doi.org/10.1787/9789264307599-en.

PAHO/OECD (2015), Applying Modeling to Improve Health and Economic Policy Decisions in the Americas: The Case of Noncommunicable Diseases, PAHO, Washington, D.C. https://doi.org/10.1787/9789264243606-en.

Other Publications

Cheatley J., Aldea A., Lerouge A., Devaux M., Vuik S., and Cecchini M. (forthcoming), *Tackling the cancer burden: the economic impact of primary prevention policies*, Molecular Oncology.

Cecchini M. (2018), *Use of healthcare services and expenditure in the US in 2025: The effect of obesity and morbid obesity*, PLoS One. https://doi.org/10.1371/journal.pone.0206703.

Cecchini M., Devaux M., and Sassi F. (2015), *Assessing the impacts of alcohol policies: A microsimulation approach*, OECD Health Working Papers, No. 80, OECD Publishing, Paris. https://doi.org/10.1787/5js1qwkvx36d-en.

Cecchini M., Sassi F., Lauer J. A., Lee Y. Y., Guajardo-Barron V., and Chisholm D. (2010). *Tackling of unhealthy diets, physical inactivity, and obesity: health effects and cost-effectiveness*, Lancet. https://doi.org/10.1016/S0140-6736(10)61514-0.

Devaux M., Lerouge A., Giuffre G., Giesecke S., Baiocco S., Ricci A., Reyes F., Cantarero D., Ventelou B., and Cecchini M. (2020), *How will the main risk factors contribute to the burden of non-communicable diseases under different scenarios by 2050? A modelling study*, PLoS One. https://doi.org/10.1371/journal.pone.0231725.

Devaux M., Lerouge A., Ventelou B., Goryakin Y., Feigl A., Vuik S., and Cecchini M. (2019), *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?*, Public Health. https://doi.org/10.1016/j.puhe.2019.02.009.

Goryakin Y., Aldea A., Lerouge A., Romano Spica V., Nante N., Vuik S., Devaux M., and Cecchini M. (2019), *Promoting sport and physical activity in Italy: a cost-effectiveness analysis of seven innovative public health policies*, Annali di igiene : medicina preventiva e di comunita. https://doi.org/10.7416/ai.2019.2321.

For more information on the SPHeP models and to explore their results, please go to: http://oecdpublichealthexplorer.org/, or https://oe.cd/publichealth

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