Project Number: 643576

FRESHER

Foresight for health policy development and regulation

Final Technical Report

Overview of results

FRESHER - Foresight and modelling for European health policy and regulation - aimed at representing alternative health Scenarios to test future policies for tackling Non-Communicable Diseases (NCDs). The key added-value consists in the combination of qualitative foresight and quantitative forecast approaches: a micro-simulation model, specifically tailored within the project, computed the health outcomes of the four FRESHER Scenarios. More precisely, FRESHER has reached four, strongly interrelated, goals:

I. To produce **quantitative estimates of the future global burden of NCDs** in the EU and its impact on health care expenditures and delivery, as well as on population well-being. Within the FRESHER Project a micro-simulation model was developed, based on an advanced OECD model, to produce quantitative forecast of NCDs burden and impact.

II. To base such estimates not only on extrapolation of observed past health trends but also on foresight techniques allows the interdependencies of structural long-term trends to be taken into account. This goal implied the elaboration of a Scenarios Building exercise leading to the creation of four alternative futures: **the FRESHER Scenarios.**

III. To illustrate **options for decision-makers** in order to contain the burden of NCDs and its adverse impact on citizens well-being. The micro-simulation model is also designed to assess the impact of future policies. Sets of public health policies aimed at tackling smoking, harmful alcohol use and obesity were assessed as part of the project to determine their effects on chronic diseases, life expectancy, and health care expenditure.

IV. To promote an **interactive process with key actors in health and European policies** in order to produce recommendations for policymakers and to design an agenda for future European Health Research. The FRESHER Research Agenda intends to identify key research priorities which can be used as starting points for the development of research strategies and funding programmes. This document is the result of consultation processes with research communities and stakeholders from business, government and civil society, as well as open online surveys that received contributions from people in all European countries.

All efforts converged to elaborate and produce inputs for an empirically-based, yet unique, **micro-simulation model** capable of quantifying the current and future health and economic impact of risk factors. The model provides opportunities for testing "what if" policy options regarding the potential future impact of the qualitative scenarios, as well as new policies and policy combinations. FRESHER is among the first European research project to combine qualitative foresight and quantitative forecast approaches, including the assessment of major societal trends and simulations of their long-term outcomes.

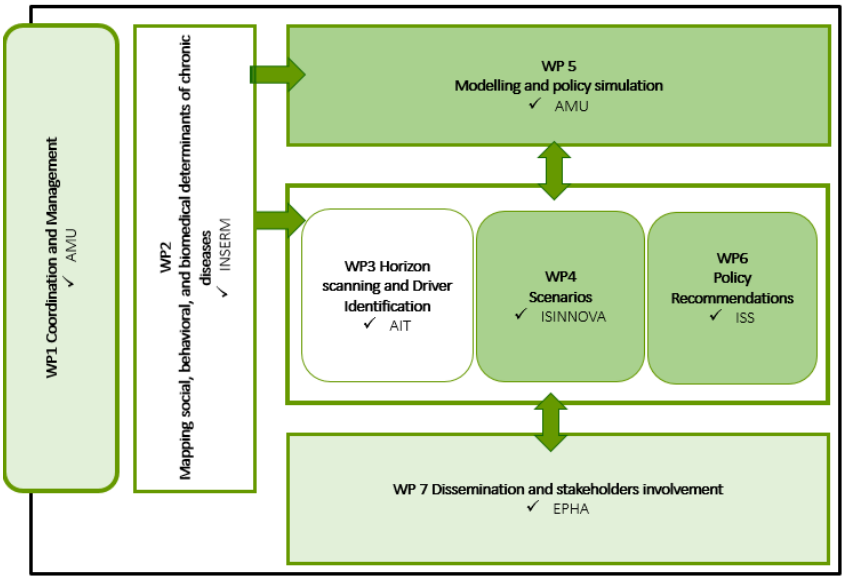


Figure 1 FRESHER Diagram

Research and dissemination activities

The FRESHER Consortium has fully achieved the objectives set for the project. Specifically, the following activities were carried out and the related results achieved:

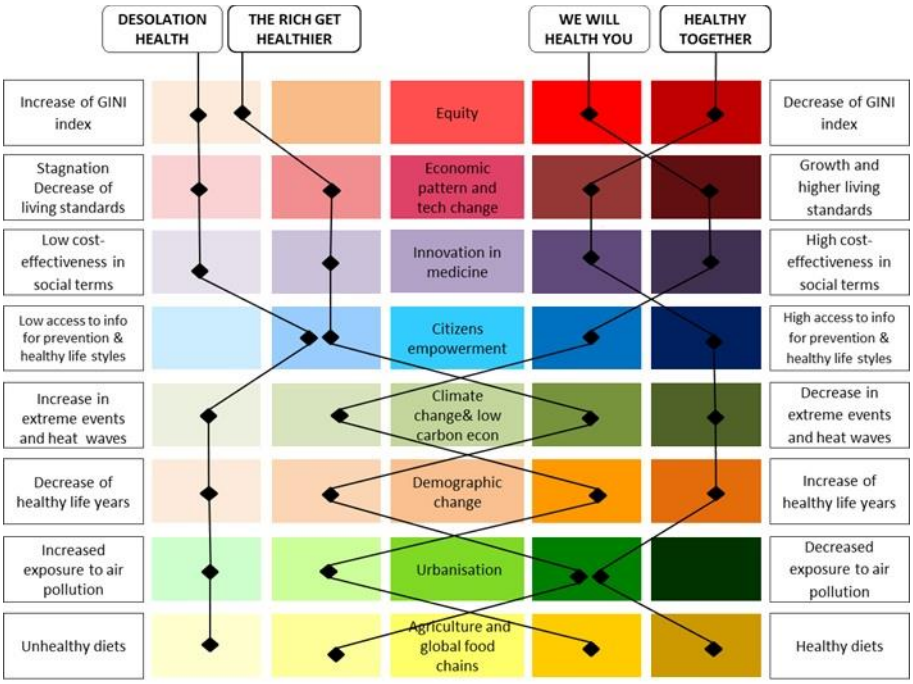
- ✓ **WP1 Project Coordination & Management** has ensured appropriate guidance, assistance and support to the entire consortium by guaranteeing that outputs were delivered on time and with high quality standards. The Management team has continuously created opportunities for knowledge exchange among partners. The main progress and results are: the effective management of the project, the efficient communication with the EC and the Euro-Healthy Project, the successful organisation of eight project meetings and the production of the Report on Data Management (D.1.1),
- ✓ **WP2 Mapping social, behavioural, and biomedical determinants of chronic diseases** has identified the key social, behavioural, and biomedical determinants of seven chronic conditions, both as individual outcomes and when they are co-morbid. The WP has produced the following four reports: an umbrella review on major NCDs (D2.1); a detailed protocol of the meta-analysis to be undertaken on comorbid conditions (D2.2.); a Report assessing the role of risk factors on comorbid conditions (D.2.3) and a report on heterogeneity (D2.4).
- ✓ **WP3 - Horizon Scanning and Driver Identification** has identified the health related short, medium and long-term trends, drivers, wild cards and weak signals in the future of health and NCDs. The WP team has conducted an extensive literature review on trends and drivers of NCDs, complemented by the organisation of three stakeholders' workshops (Vienna, Brussels, and Lisbon). The main results are: the Horizon Scanning Report (D 3.1) and the Synthesis report: "Health and well-being mapping" (D.3.2).
- ✓ **WP4 Scenarios** has ranked by importance and uncertainty the trends emerged in WP3 through the launch of the survey "What will impact your health the most?". The survey results and the first draft of the FRESHER Scenarios space are available in the "Health scenario stories" (D4.1). Fully fledged "FRESHER Health Scenarios" were subsequently developed thanks to the input received from consortium members as well as from stakeholders. The II FRESHER survey "How healthy will your future be?" was then disseminated to elicit stakeholders' contributions in order to liaise the scenarios work with the micro-simulation model and to imagine innovative set of policies. In addition, three regional workshops were held to downscale the Scenarios (Warsaw, Coruna, and Helsinki). Drawing on all the activities above, ISINNOVA wrote the D4.2 "Report on consolidated scenario storylines and quantitative simulation results" (D4.2).
- ✓ **WP5 Modelling and policy simulation** has conceptualised and implemented aEuropean Health Policy Model software (D5.1) that served as basis for an empirically-based dynamic micro-simulation model. The Model contains: i) a demographic model with exogenous births, accounting for net migration flows and trends in all-cause and cause-specific mortality over time; ii) a (chronic) disease models based on disease incidence, remission (when appropriate) and fatality as functions of individual characteristics and risk factors; iii) a risk factor models based on longitudinal trajectories of exposure and behaviour over the life-course; iv) the assessment and implementation of joint distributions and interactions between chronic diseases and between risk factors, and their effects on health, longevity and health care expenditures. In addition, WP5 has also collected data to capture and project geo-spatially the population's exposure to environmental factors with significant risks to health within the same population modelling framework for three large European cities (Lisbon, Vienna, and Tallinn). The II FRESHER survey inputs allowed to run the simulation of the four FRESHER Scenarios. The models run results are contained in the report on projecting the future social, health and economic burden of risk factors, disease and injury in the EU (D5.2) whereas the micro-simulations setting are described in the scientific paper on the micro-simulation methodology, results and recommendation for future research (D5.3). The micro-simulation results can be also explored through the web-interface: http://www.fresher-explorer.eu/
- ✓ **WP6 Policy Recommendations** WP6 team conducted a review of the best practices and policies targeting risk factors and at early detecting, treatment and rehabilitation of NCDs (D6.1). In addition, ISS analysed the evidence, impact and cost effectiveness of existing policies (D6.2). ISS, in conjunction with EPHA (European Public Health Alliance), organized the following three Policy Events to elicit ideas on policies and research needs from stakeholders: Policy workshop "Good Practices"; "Linking Health Policies to Scenarios", and the "FRESHER Policy Roundtable". The meetings findings, complemented by the results of II FRESHER Survey, were used as basis for the compilation of a list of alternative policy options for policy

makers according to different scenarios (D 6.3) and for the elaboration of Future Public Health Research Agenda (D6.4).

- ✓ **WP7 Dissemination and Stakeholder Involvement** has continuously followed up and liaise the FRESHER activities with external stakeholders and policy makers. On the ground of the Dissemination Strategy (D7.3), EPHA has produced targeted communication and documentation tools (flyers, posters, brochures, and videos). The Stakeholders involvement strategy and mapping (D7.2) has ensured that the FRESHER participatory activities such as the regional workshops, the survey and the policy workshops reached a wide and competent audience. The project's results were continuously updated in the project FRESHER website, http://www.foresight-fresher.eu//en/ and disseminated though the FRESHER Newsletter to over 700 subscribers.

Conclusions on the project

The Scenarios building activities involved overall more than four-hundred experts and stakeholders, with different backgrounds, within and beyond health fields, throughout all the steps of the process, in two surveys and nine workshops. The horizon scanning phase led to identify a wide range of societal trends that impact health and NCDs. Considering a long-term horizon at 2050, eight trends were then selected and ranked according to their importance and uncertainty: Equity, Economic pattern and technological change, Innovation in medicine, Citizen empowerment, Climate change and low-carbon economy, Demographic change, Urbanisation, Agriculture and global food chains. In the Scenario Building phase, the combination of different possible evolutions of the selected trends resulted in the four alternative futures: a Business as Usual Scenario, 'The rich get healthier', two response Scenarios, 'We will Health you' and 'Healthy together', and a worst case Scenario 'Desolation Health'. The logic to develop the scenarios was to imagine different futures and look at how health and NCDs would subsequently change in such worlds. The key point was thus to describe how trends that are mainly beyond the reach of health policies, and their dynamics, translate in health outcomes, specifically in terms of NCDs' burden.

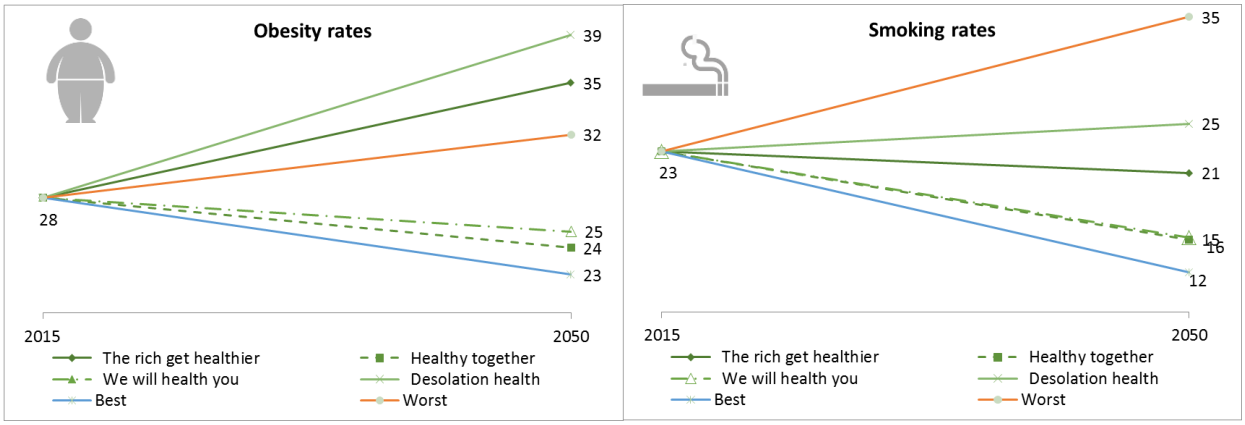


The FRESHER Scenarios

The FRESHER micro-simulation model was then used to predict the future health outcomes of populations in three European zones (Southern, Northern, and Central-Eastern) at the 2050 horizon. The model simulates key behavioural and physiological risk factors (smoking, alcohol consumption, obesity, physical activity, and blood pressure) and the relative risks of developing NCDs. The baseline projection explores the impact of current demographic projections on the spread of NCDs, assuming that there will be no change in the risk factors and the probability of developing NCDs that women and men of different ages have today in Europe. The FRESHER four alternative scenarios were integrated into the model assuming the expected changes in risk

factors resulting from an expert's consultation. Two additional boundary projections simulated worst and best case scenarios if all countries converged to the highest and lowest rates of risk factors observed in Europe in 2015.

The four FRESHER scenarios are associated with evolving trends in the main risk factors for chronic diseases. Overall, two scenarios ('Healthy Together' and 'We will health you') are associated with reduced exposure to risk factors compared to the current situation, while the other two ('The Rich Get Healthier' and 'Desolation Health') are generally associated with a worse risk factor outlook. Tobacco smoking rates, for instance, are expected to continue the decline observed in most of Europe in recent years in three of the four scenarios, with the greatest reduction in the 'Healthy Together' scenario (from 23% in 2015 to 15% in 2050) and an increase to 25% in 2050 in the 'Desolation Health' scenario. These experts' predictions are shown in the right-hand panel below, with the left-hand panel showing the corresponding predictions for obesity. The figure also includes the rates which would be seen in Europe in 2050 if all countries converged to the lowest rates observed in Europe in 2015 ('Best' case prediction), or the highest rates observed in 2015 ('Worst' case prediction).



Expert-based predictions of risk factor levels, Europe, 2050

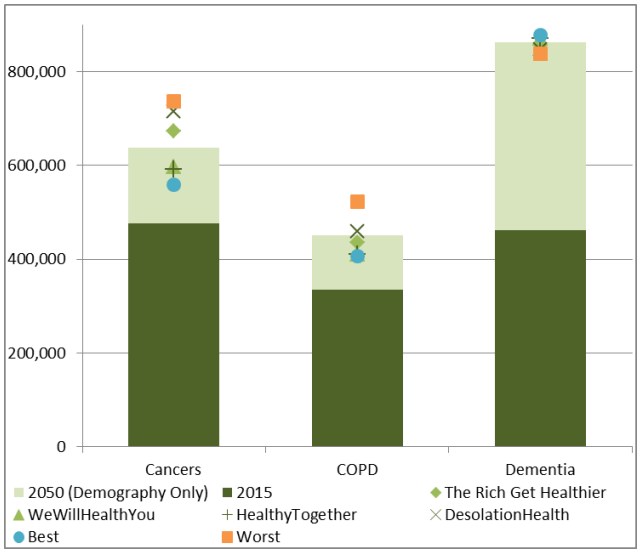
Source: FRESHER Experts' survey, 2017

The changes in risk factors that were predicted for the different scenarios may have a significant impact on chronic diseases, and ultimately on life expectancy in the European population. Life expectancy is projected to grow compared to current levels, but to different degrees in the four FRESHER scenarios. Based on demographic projections, in 2050, women in Southern Europe will be expected to live 89.5 years. The changes involved in the different scenarios may add up to 6 months to this life expectancy, or reduce it by up to 10 months. Men in Southern Europe will be expected to live 84.4 years, with different scenarios potentially adding up to 9 months or reducing it by up to 11 months. In Northern Europe, scenarios potentially add up to 8 months or subtract up to 11 months from projected life expectancies of 84.3 years for men and 87.2 for women. In Eastern-Central Europe, scenarios potentially add up to 8 months or subtract up to 12 months from projected life expectancies of 77.7 years for men and 83.5 for women.

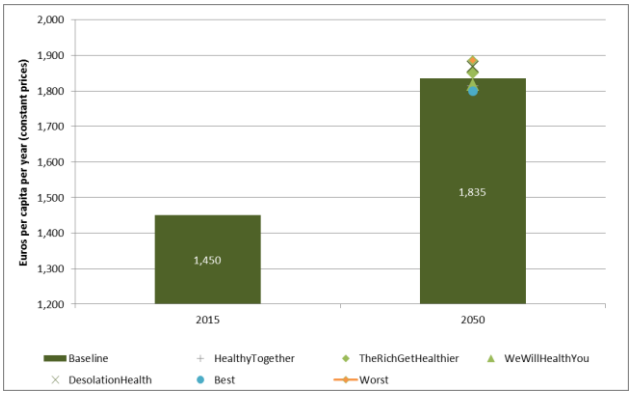
The scenarios 'The Rich Get Healthier' and 'Desolation Health' would lead to increased numbers of new cases of chronic diseases (like diabetes, cancers, COPD, IHD, and stroke), while the scenarios 'Healthy Together' and 'We will health you' would lead to reduced numbers of cases. The best and worst case scenarios, based on countries converging to the best and worst risk factor levels observed in 2015, have the most extreme outcomes. Dementia is a partial exception to the pattern described above: as people live older with fewer chronic diseases in the more favourable scenarios, the incidence of dementia tends to increase slightly.

The projected health impacts of the four FRESHER scenarios are important, but relatively small compared with those of underlying demographic trends. None of the scenarios is projected to offset the life expectancy gains envisaged by current population projections. This means that an increase in chronic diseases is to be expected as an effect of population ageing, which could be fuelled or mitigated to some degree by societal trends, but would not be changed fundamentally in the absence of dramatic changes in policy or human behaviour.

The impact of scenarios on health care expenditure are relatively minor compared to the projection of a 25% increase in health expenditure driven by the sole effect of population ageing. In Southern Europe, health care cost per capita will vary by –2% to +3% across different scenarios.



New cases of chronic diseases according to the different foresight scenarios, Southern Europe



Impacts of scenarios on health expenditures, Southern Europe

Analysis based on a new model developed by OECD for the FRESHER project, 2017

As result, a first step to improve the health outlook for the European population would involve a consistent implementation of public health policies which have been proven effective in reducing the prevalence of poor diets, sedentary behaviours, obesity, tobacco smoking, and harmful use of alcohol across the whole of Europe. The FRESHER project has assessed the impacts of a combination of the most efficient policies aimed at tackling the above risk factors, finding that life expectancy would be prolonged by one month on average between 2018 and 2050, and the incidence of diseases would be reduced. In Southern Europe, a similar combination of policies would bend downwards the increasing trend in new cases of cancer compared to the scenario 'The Rich Get Healthier'. The policies would shift downwards the trend of the new cases of cancers –the increase of cancer new cases between 2010 and 2050 is estimated at 60% in 'The Rich Get Healthier' while 57% when policies are accounted for. For comparison, the 'Healthy Together' scenario would lead to an increase in the incidence of cancer of 40%.

Based on its simulation analyses, the FRESHER project provides evidence that a consistent implementation and scaling up of established public health policy approaches in tackling major risk factors for chronic diseases would lead to some improvements in the health of the European population. However, those policies alone can, at best, bend the increasing trend of chronic diseases. Radical and innovative solutions are required, only some of which may be in sight today. The Sustainable Development Goals agenda for 2030 adopted in September 2015 by the United Nations offers an opportunity to elaborate and promote new inter-sectorial and global policies which would contribute to the control of NCDs.

Treating chronic diseases more and more efficiently, preventing their complications, optimizing medical drug prescriptions, especially in the oldest segment of the population, and coordinating effectively the care required by patients with multiple morbidities are all key steps in containing further growth in health and social care expenditure. However, the most radical, and most difficult, changes required are those that may reduce the number of people with chronic conditions. These changes include focusing public policies on reducing socioeconomic and health inequalities; new ways of designing urban environments; new attitudes to the production and consumption of food and nutrition, to physical activity and to the use of technology in everyday

life; and new and cleaner means of transportation, production and energy generation. New policies and grassroots initiatives must develop around these objectives, aiming at a much larger impact than those public health measures that have been attempted so far to prevent chronic diseases.

As regard the micro-simulation model, future works may envisage to improve the qualitative and quantitative works integration. Results of projections are to be viewed not as a predictive estimation but rather as a comparative estimate of one scenario to another.

In the future, the following limitations of the current model maybe subject of further research. First, the scenarios were incorporated into the micro-simulation model through only one entry point: the change in risk factors. In the absence of robust evidence, a consultation was launched to elicit experts' educated guesses about the evolution of key risk factors under each of the four scenarios. Second, the future levels of risk factors are assumed to capture all the structural changes described in the scenarios, which may not be the case. For instance, particular catastrophic situation described in some scenarios (e.g. 'Desolation Health') cannot be fully reflected in the experts' assessment of risk factors, mainly because the survey included no questions related to access to healthcare. In addition, some structural factor changes are not part of the model such as strong modifications in the life expectancy due to medical progress or larger access to healthcare. A third limitation is that the cumulative impact of risk factors cannot be modelled because of lack of evidence. Finally, the model does not currently take into account Indirect costs of diseases such as loss of productivity.

The socio-economic impact of the project

FRESHER primarily aims at the development of innovative approaches to devise and assess NCDs policies. The main expected impact was therefore the enhancement and improvement of the scientific body of knowledge required for the above developments. Accordingly, the project has strived to ensure that its results are:

- Innovative, in that they substantially add to the current state of the art;
- Policy relevant, in that they can provide usable inputs of current and future EU policies;
- Potentially relevant for society as a whole, in that the implementation of the policies devised in the project can be concretely expected to improve the quality of life of European citizens;
- Widely diffused and discussed among the scientific community, policy makers and stakeholders involved in the formulation and implementation of health and health related policies.

The ambition of FRESHER to provide a conceptual renewal and empirical improvement of health forecasting models, foresight activities and policies was achieved mainly through:

- *An explicit relationship of quantitative modelling with qualitative approaches for building long-term scenarios*. The FRESHER project has identified eight key societal trends that are especially likely to influence the health of people in Europe between today and 2050, and alternative policies to manage these trends. Four different future Scenarios were derived from alternative hypothesis about their impact on the main risk factors for NCDs and interfaced with a micro-simulation model.
- *A better understanding of the impact of non-health determinants on population health and health expenditures*. Micro-simulation results show that NCDs rates may increase by up to a third in 2050 relative to current levels, and health expenditures may increase by one fourth. Life expectancy as well as incidence and prevalence of NCDs are projected to grow to different degrees in the four FRESHER scenarios compared to current levels. However, demographic trends, i.e. population ageing, will remain the main driving force for increase in NCDs and their impact irrespective of the other structural trends affecting health.
- *An integration of the complex causal chains of chronic diseases and multiple risk factors and co-morbidities.* The FRESHER project has attempted to better take into account multimorbidity than in previous prospective exercises. Multimorbidity will have significant amplifying consequences on the impact of NCDs. Socioeconomic and behavioural factors appear to be more important than clinical parameters in progression from a single disease to multimorbidity or risk of mortality in those with multimorbidity. In addition, FRESHER economic analysis reveals a super-additive effect of comorbidity on costs.
- *The FRESHER project has assessed the impact of a combination of the most efficient public health policies aimed at tackling NCDs risk factors* (poor diets, sedentary behaviours, obesity, smoking, and harmful use

of alcohol). Results suggest that scaling up these policies across whole of Europe will have some, but limited effect for control of NCDs. Indeed, Scenarios such as 'Healthy Together' which already include innovative policies promoting environmental, nutrition, social protection and lifestyle improvements would produce better results than just generalising conventional public health policies in all the other scenarios. Therefore, there is an urgent need for additional and innovative policies targeting the above factors.

- *A dedicated web-tool www.fresher-explorer.eu* allows for an in-depth comparison between the health scenarios, their impact on NCDs evolution and the effectiveness of standard public health policy interventions. The tool will be further refined and can be used by policy makers from all sectors, researchers and the public health community at large.

In a longer time, horizon, the FRESHER Project aims to support the inclusion of new and better scientific and technological knowledge to address future health needs achieved thanks to the identification of priorities and the subsequent orientation of research, as well as more evidence-based policies to maximize public health and social welfare of the European population. Results that have emerged from the FRESHER project have direct impacts on:

- *The RTD community* by ensuring major advancements in the modelling tool related to NCDs and by explicitly incorporating and representing Scenarios in the modelling exercises. In general, the project made the most of the high level of multidisciplinary featured by the Consortium, particularly with a view to "think out of the box" when developing new visions of the future and the associated methodological approaches.
- *The EU policy-makers* by highlighting the need to consider structural trends and their interactions in tackling the burden of NCDs. FRESHER project succeeded in shedding new light on the qualitative and quantitative effects of policies that explicitly target tacking the future burden of NCDs. The project results have emphasised the need to break away from silos thinking and put NCDs control at the core of synergistic interactions between the 17 Sustainable Development Goals (SDGs).
- *Society at large* even if FRESHER does not explicitly feature dissemination activities that are exclusively and directly targeting the public at large, it has generated abundant evidence to this effect that could be exploited in other projects focusing on the science and society link.