PHIRI
Population Health Information Research Infrastructure

Foresight Capacity and Activities Survey

Task 9.1, V.1 18 January 2022

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101018317

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Executive summary

The PHIRI project (Population Health Information Research Infrastructure on COVID-19) seeks to lay the foundation of a federated research infrastructure on population health to support research across Europe to underpin public health policy decisions. PHIRI's work package 9 (WP9) aims to support Member States (MS) in gaining insight in possible future health impacts of the COVID-19 outbreak using foresight methodologies. WP9 uses a four-step approach; Task 9.1 is the first and aims to deliver an inventory of current foresight activities and initiatives in the European Union (EU) through a desk research and a survey. The present report aims to provide the results of this *"Foresight Capacity and Activities survey"* (hereafter referred to the survey') and draw lessons from it.

The survey specifically aims to gain insight in the use of foresight studies (use of foresight methodologies and use in the policy cycle), to gain insight in the needs to develop foresight capacity, and to identify persons of each country interested to be part of PHIRI's public health foresight network. The survey consisted of 8 questions divided in 4 sections covering the four aspects we aimed to collect information on: national foresight activities, experts in the field, uptake in policy cycle, and capacity building needs. It was distributed among PHIRI's participating MS.

Through the survey we gathered information from 21 EU Member States (MS). Of these, 18 MS have conducted studies using foresight methodologies; only 2 MS reported having no knowledge of studies using foresight methodologies in their countries. The survey results showed that most of the studies reported by participants are related to COVID-19. Some participants also reported other areas of study, such as noncommunicable diseases (NCDs) and health services. Most of these studies have been used and shared with policy makers. Most participants responding to this survey reported needing foresight capacity; methods and data were the most common areas of interest. Finally, interested participants were identified to join the Public Health Foresight Network.

The results of this survey show that there is some knowledge, use, and capacity in public health foresight (and related methodologies). More advocacy is needed to showcase the relevance of foresight studies into public health policy decision making. Public health foresight capacity in Europe needs to be further developed and strengthened across the region, particularly in countries with no capacity. Information gathered through this survey was used to fine tune and develop the 'Foresight Capacity Building' course in Task 9.2.

Key points

1. Most MS participating in the survey have reported on foresight (or on methods used in foresight) studies conducted in their country.

2. Most of these studies have been used to inform policy makers. More advocacy is needed to extend the use of foresight studies into the policy cycle and stress its importance towards desirable futures in public health.

3. Most MS reported having some type of capacity in foresight studies and methods. However, they also indicated that more capacity in foresight is needed. The survey gathered information to feed the development of the Foresight Capacity Building Course (Task 9.2).

4. The survey was able to identify experts and professionals interested in foresight studies. This information will aid on the development of the Public Health Foresight Network, which in turn should foster the development of the foresight field in public health across Europe.

Glossary

- ***Forecast/Prediction*** is the most likely projection and is based on the most likely set of assumptions. A forecast usually covers a short- or medium-term period
- ***Foresight*** is a systematic, participatory, future-intelligence-gathering and medium-to-long term vision-building process aimed at enabling present-day decisions and mobilizing joint actions.
- ***Modelling*** is the process of using various mathematical structures – graphs, equations, diagrams, scatterplots, tree diagrams, and so forth – to represent real world situations. The model provides an abstraction that reduces a problem to its essential characteristics.
- ***Projection*** refers to model-derived estimates of future trends, given a set of assumptions.
- ***Scenario*** is a coherent, internally consistent, systematic and plausible description of a possible future state of the world.

PHIRI Task 9.1: Foresight Capacity and Activities Survey

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I. Introduction

The Population Health Information Research Infrastructure (PHIRI) on COVID-19 seeks to lay the foundation of a federated research infrastructure on population health to support research across Europe to underpin public health policy decisions in current and future pandemics or crisis. PHIRI offers a European mechanism for structured exchanges and research to facilitate and generate the best available evidence for research on health and well-being of populations.

This project is composed by nine work packages. Particularly, Work Package 9 (WP9) aims to gain insights in possible future health impacts of the COVID-19 outbreak, by building capacity on foresight studies, supporting countries to develop scenarios, building a network, and draw lessons for the EU.

Foresight refers to a broad range of methodologies to describe possible futures**.** The working definition that we use in this survey is: Foresight is a systematic, participatory, future-intelligence-gathering, and medium- to long-term *vision-building process* aimed exploring the future to anticipate plausible trends and support present-day decisions and mobilising joint actions [1]. Foresight comprises methodologies such as scenario building (including business-as-usual scenarios and policy scenarios), forecasting, horizon scanning, trend impact analyses, driver analyses, etc. (as described in the Glossary) to explore future trends and the plausible effects of events (e.g. a health crisis, long-term effect of COVID-19) and/or interventions. Foresight studies can provide valuable information of possible future developments that can be considered by policy makers when developing strategies and implementing interventions aiming at healthier futures.

WP9 follows a four-step approach on gaining insights in possible future health impacts of the COVID-19 outbreak, by building capacity on foresight studies (step 2), supporting countries to develop scenarios (step 3) and supporting the identification of promising policy strategies (step 4). The first step in this approach is to gain insight in the current foresight

activities and initiatives in the Member States (MS) and on European level, in the form of an inventory. As part of this inventory, we developed the *"Foresight Capacity and Activities"* survey. We used this to collect information on current activities on foresight in MS, and the current capacity and potential demands for applying foresight methodology to feed and fine tune the foresight capacity building task (Task 9.2). This report describes the aim, approach, and results of the survey as part of the first step and discusses the limitations and lessons learned to be used and considered during the next step (Task 9.2).

II. Aim and Objectives

The *"Foresight capacity and Activities"* survey was developed to complement the activities carried out in Task 9.1 (desktop search and literature review). Task 9.1 has the aim to provide an overview of foresight activities and studies across Europe and beyond. More specifically, the objectives of this survey were:

1. To collect information on the current and recent use of foresight studies across Europe, including (but not limited to) scenario building, preparedness, and modelling related to COVID-19 and other (public) health related aspects.
2. To gain insights in how foresights studies are being used in the policy making process.
3. To collect information on the existing capacities regarding foresight studies and needs to expand these capacities.
4. To identify professionals of each country who wish to be part of PHIRI's public health foresight network.

III. Approach

The survey gathered specific information on foresight directly from public health researchers/professionals in MS. The survey is available in Appendix 1.

The survey covered 4 main areas: national foresight activities, experts in the field, uptake in policy cycle, and capacity building needs. It was directed to EU/EFTA based policy makers and researchers in public health organizations, ministries of health, academic, and non-academic research institutions with an interest in public health issues and foresight studies. This survey collected information on experiences on health-related foresight studies in the European countries, as of 2015, including all experiences with foresight methodologies (including - but not limited to - scenario building, preparedness, and modelling), the outcomes of research, and related publications focused on public health related topics and

COVID-19; the use of foresight in the policy cycle; current foresight capacity of MS; and gaps and needs for foresight capacity from MS.

The survey did not consider the collection of information on foresight studies on non-public health related topics, specific health technologies (pharmaceutical products and medical devices), studies before 2015, and studies conducted outside the EU/EFTA.

To facilitate distribution, participation and processing, the survey was developed in an online format using Formdesk (Formdesk 4.1). The survey was first shared among colleagues and team members of the PHIRI project, i.e., more than 100 stakeholders from 28 Member States (MS). These colleagues were asked to share the survey amongst other colleagues whom they identified as (possible) experts in foresight studies (i.e., snowball method). The survey was circulated on February 2021 and participants were given a period of 3 weeks to respond.

IV. Results

A. Participants

We received responses from 27 participants from 21 MS, as shown in Figure 1: Albania, Austria, Belgium, Bosnia and Herzegovina, Croatia, Czech Republic, Estonia, Finland, Germany, Ireland, Lithuania, the Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Spain, Sweden, and the United Kingdom (UK). Next to some countries being represented by more than one respondent, some respondents collected input from others within or outside their own organization; thus, input per country may have come from multiple sources.

The affiliations and job descriptions of participants was diverse. Participants were affiliated to public health institutions, ministries of health, universities, and public health agencies. They held positions as researchers and research managers, statisticians, data analysts, medics, foreign affairs managers, professors, policy makers, senior advisers, vice-rectors, health officers, heads of unit, and public health specialists.

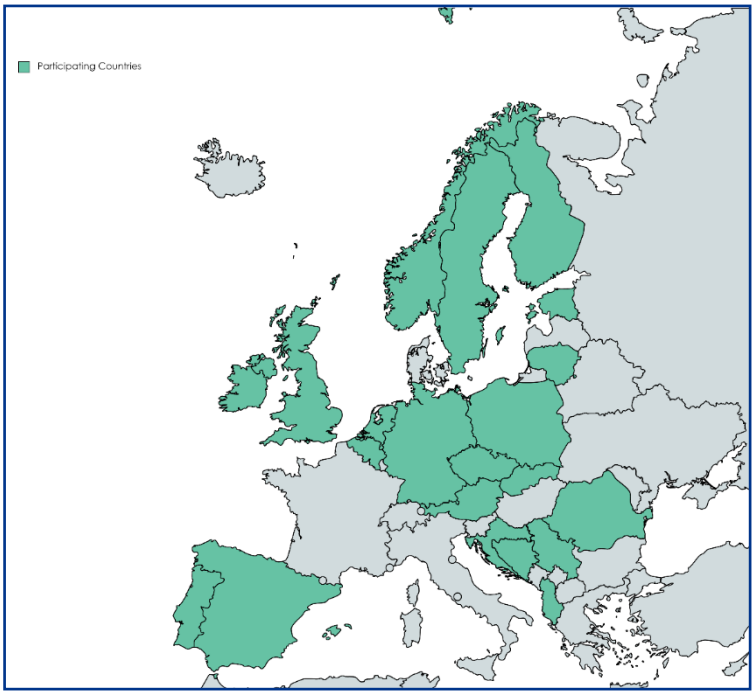

Figure 1. Participating countries

B. Studies conducted in Members States

The survey asked participants if they had information or knowledge about studies using foresight methodologies that had been conducted in their countries since 2015, as shown in Figure 2. Twenty-one participants reported being aware of studies being conducted in their countries, including: Austria, Belgium, Bosnia and Herzegovina, Croatia, Czech Republic, Estonia, Finland, Germany, Ireland, Lithuania, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Spain, and the United Kingdom. Only 5 participants reported being unaware of studies conducted in their countries (Albania and Serbia). One participant did not respond to this question.

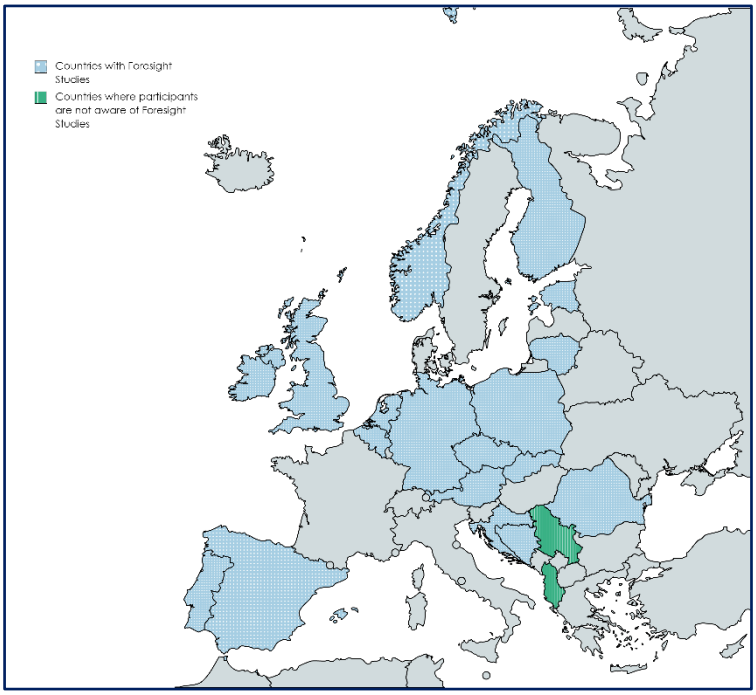

Figure 2. Countries with Foresight Studies

Of those participants that had knowledge of studies conducted in their countries, they reported that most studies have been about COVID-19 (81%). Other common topics addressed in foresight studies were on other health conditions such as NCDs, influenza, etc. (57%); other public health issues such as human resources in healthcare, health care payments and drug pricing, impact of legislation changes, health technologies, health capacity, primary care services, integrated hospital services, security challenges, and aging populations (57%); and health care expenditures (48%). Less common areas addressed in foresight studies included determinants of health (29%), environmental health (24%), and health inequalities (24%). These results are shown in Figure 3.

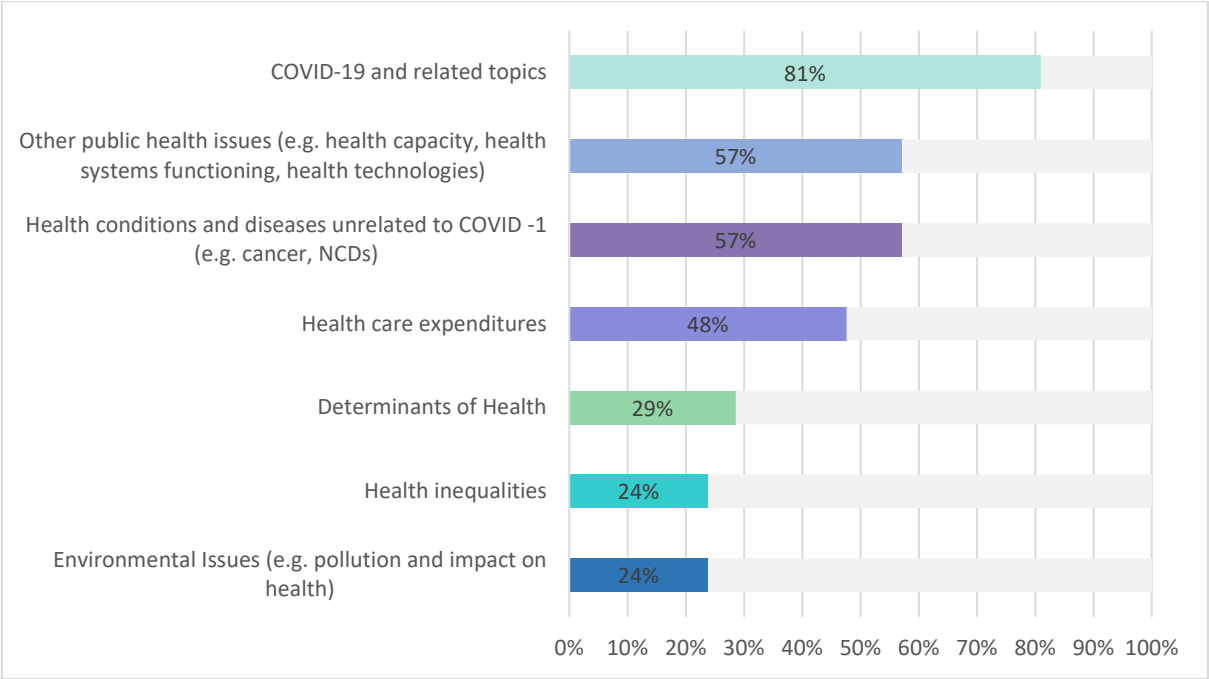

Figure 3. Health related topics addressed in foresight studies conducted in MS

The following sections present information provided by participants on studies using foresight methodologies.

C. Studies on COVID-19

Fifteen participants provided information, references, and links to studies that have been conducted in their countries on COVID-19 and related topics. Table 1 below summarizes this information and provides the links and references to these reports. Only one respondent reported that the results of foresight studies are not available in the public domain. Please note that not all reported studies are foresight studies and that we did not analyze and remove studies not fitting our original scope.

Table 1. Reported information on studies in Member States related to COVID-19

Member State	References to Foresight Studies on COVID
Austria	Supporting Austria through the COVID-19 Epidemics with a Forecast-Based Early Warning System. This study reports on four key contributions by which a forecasting and reporting system has helped shaping Austria's policy to navigate the crisis and re-open the country stepwise. More information **here** The economic development in Austria under the sign of the COVID-19 pandemic. Medium-term forecast 2020 to 2024. Forecast studies

	with a medium time range (up to 5 years) related to budget and expenditure paths related to the effects of the pandemic. More information **here**
Belgium	RESTORE Consortium. The RESTORE consortium constitutes an inter-university collaboration with the goal of producing different scenario analyses with regard to the spread of SARS-CoV-2 in Belgium. More information **here** Covid-19 Belgium: Extended SEIR-QD model with nursing homes and long-term scenarios-based forecasts. This study models the evolution of the covid-19 epidemic in Belgium with an age-structured extended SEIR-QD epidemic model using a MCMC method. More information **here**
Czech Republic	Documentation of predictive models. Studies and reports limited to short-medium term projections of COVID-19 burden. More information **here**
Estonia	COVID-19 prognosis. It is used to impose limitations or mitigations on COVID-19 related activities. Additionally, for health care planning in COVID-19 changing situation.
Germany	Modeling of example scenarios of the SARS-CoV-2 epidemic 2020 in Germany. This document reports on modeling of example scenarios to show to what extent measures, if implemented, can have an influence, making it possible to estimate or justify the range of measures needed to influence the course of the epidemic in such a way that it is manageable. More information **here**
Ireland	The Irish Epidemiological Modelling Advisory Group (IEMAG) was formed on 11 March 2020 to provide statistical and mathematical modelling support and advice to the Chief Medical Officer and the National Public Health Emergency Team (NPHET). COVID-19 modelling is used to forecast the short term spread of the virus at the population level, with age cohorts and agent-based models. More information **here** COVID-19 and emergency department attendances in Irish public hospitals. This study uses the most up to date data available on emergency department attendances in acute public hospitals to examine the impact on the numbers and types of attendances since the onset of COVID-19. More information **here**
Netherlands	2020: New Dutch Public Health Foresight study in the light of COVID-19. Scenarios were developed to provide insight into possible future (direct and indirect) impacts of the current coronavirus outbreak. More information **here**

Poland	The ICM Epidemiological Model describes the development of the COVID-19 epidemic in Poland. It is capable of forecasting potential paths of further epidemic development, as well as simulating various scenarios and effects introduced by dynamically applied administrative restrictions. More information **here**
Portugal	Strategic challenges for Portugal Post-COVID-19. This foresight report provides a diagnosis (through scenarios) that contributes to understand the situation, identify the internal potentials/vulnerabilities and external opportunities/threats, and thus support the assessment of strategic challenges for the future of Portugal in the post-COVID-19 period. More information **here**
Romania	IASO is an integrated computer system for monitoring and epidemiological modeling to limit the effects of the coronavirus pandemic in case of community transmission. More information **here**
Spain	National sero-Epidemiological study of the infection by SARS-CoV-2 in Spain (ENECOVID). ENE-COVID is a large, population-based, sero-epidemiological longitudinal study to estimate the prevalence of SARS-Cov2 infection by determining antibodies against the virus in Spain and evaluating its temporal evolution. More information **here** Monitoring the behavior and attitudes of the population related to COVID-19 in Spain (COSMO-SPAIN): WHO Study. This survey has the aim of monitoring the behavior and attitudes of the population related to COVID-19 in Spain. More information **here** COVID-19 spread factors in Spain. The objective of this project is to identify spread factors and transfer this knowledge so that they can be acted upon and thus reduce the intensity of the epidemic and prevent future ascents. More information **here**
United Kingdom	A variety of models created by UK academic groups, including at Swansea University

Full references are presented in Annex 1. All links reported here were checked and found working on December 3rd, 2021.

D. Studies on other (Public) Health Related Topics

Eighteen participants provided information, references, and links to studies that have been conducted in their countries on (public) health related topics (other than COVID-19), taking

since 2015. Table 2 below summarizes this information and provides the links and references to these reports. Please note that not all reported studies are foresight studies and that we did not analyze and remove studies not fitting our original scope.

Table 2. Reported information on studies in Member States related to (public) health related issues (other than COVID-19)

Member State	References to Foresight Studies
Austria	The Austrian Health Structure Plan – ÖSG 2017. Planning for health capacities (e.g. intensive care beds, rehabilitation, etc.) is performed together with stakeholders and scenario building. More information **here**
Belgium	EU Foresight Project FRESHER. The overall project objective is the representation of alternative futures where the detection of emerging health scenarios will be used to test future policies to effectively tackle the burden of NCDs. More information **here** The Belgian Health Care Knowledge Centre (KCE) is an independent federal research centre that focuses on the organisation, financing and reimbursement of health care and on health technology assessment. Each KCE study results in recommendations for competent authorities and health care stakeholders. More information **here** The protocol for the Belgian Cancer Foresight study is under development by Sciensano
Bosnia and Herzegovina	Strengthening the DOTS strategy and improving the Tuberculosis Control Program, including controlling the emergence of multidrug-resistant strains and controlling the spread of infection in Bosnia and Herzegovina. This UNDP project is working to combat the spread of tuberculosis in the country by 2015, with activities aimed at providing access to diagnosis, treatment and care for all people affected by TB. Strategic bases for the adoption and implementation of the Health Sector Strengthening Project. The project aims to improve the efficiency of the health system through restructuring and strengthening primary health care through the development of family medicine and strengthening the policy-making process through the development and implementation of monitoring systems and health sector performance, as well as capacity building for health sector management. More information **here**
Czech Republic	Project on cancer and highly innovative care including projection of volumes and expenditures from public health insurance

Estonia	Prognosis of sustainability of health insurance. This study used a model suitable for forecasting health insurance revenues and expenditures, allowing the assessment of both long-term financial sustainability as well as to test the impact of different policy scenarios. More information **here**
Finland	The effect of health care payment legislation on poverty – a simulation study. This project used simulation to look at the effects of out-of-pocket payments in healthcare on poverty and social assistance. More information **here** Social and health care cost projections - the CHESS model. This study assesses tractable elements of the reforms on care sectors. More information **here** The WHO goal of reducing mortality in Finland is realistic - but not self-evident. Short briefs about WHO NCD targets. More information **here**
Germany	Report on risk analysis in civil protection 2012. Includes risk analysis on the pandemic by Virus Modi-SARS. More information **here**
Ireland	Projections of expenditure for public hospitals in Ireland. This analysis extends the Hippocrates Model to provide baseline estimates of expenditure in 2018 for public acute hospitals and psychiatric in-patient services in Ireland, and to project expenditures for these services to 2035. More information **here** Paying more to wait less: Estimating the cost of reducing Ireland's public hospital waiting lists. The aim of this analysis is to estimate the activity and expenditure required to clear the accumulated backlog and account for future service demand. More information **here** Projections of Demand for Healthcare in Ireland, 2015-2030: First Report from the Hippocrates Model. This report provides baseline estimates and projections of public and private healthcare demand for Irish health and social care services for the years 2015–2030. More information **here** How many beds? Capacity implications of hospital care demand projections in the Irish hospital system, 2015-2030. Incorporating assumptions on the rebalancing of care to nonhospital settings, this paper analyses the capacity implications of projected demand for hospital care in Ireland to 2030. More information **here**

	Universal GP care in Ireland: Potential cost implications. The analysis identifies and uses three alternative scenarios to assess the potential cost implications of universal GP care in Ireland in terms of public and total healthcare expenditure. More information **here** Reforming the delivery of public dental services in Ireland: potential cost implications. This report details the results of an analysis of the potential cost implications of proposed changes to aspects of the model of delivery of publicly financed dental services in Ireland. More information **here** The Irish Longitudinal Study on Ageing (TILDA). The aim is to provide a comprehensive and accurate picture of the characteristics and needs of older people in Ireland to provide information for policy makers and public sector planners as well as insurance companies. More information **here** Decomposing socioeconomic inequality in child vaccination: Results from Ireland. This paper aims to measure and decompose socioeconomic inequalities in childhood vaccination in the Republic of Ireland. More information **here** There is a cross Ministry project in Ireland, looking at developing strategic foresight as a capacity and policy. The project is part of Our Public Service 2030 (OPS2030) and is being led by the Department of Public Expenditure and Reform. OPS2030 is currently under development and will be published during 2021. In the meantime, the OPS Networks and Action Teams will continue their existing work programs.
Netherlands	PHFS-2018: A healthy prospect. The overall aim of the PHFS-2018 was twofold: first to show how public health and healthcare in the Netherlands will develop over the next 25 years if we pursue our current course and do not take any additional measures, and second, to give options for dealing with the major future societal challenges we face. More information **here**
Poland	Influenza epidemic spread simulation for Poland - a large scale, individual based model study. In this work a construction of an agent-based model for studying the effects of influenza epidemic in large scale (38 million individuals) stochastic simulations, together with the resulting various scenarios of disease spread in Poland are reported. More information **here**
Slovakia	National plan for antimicrobial resistance

Full references are presented in Annex 1. All links reported here were checked and found working on December 3rd, 2021

E. Policy Uptake

As shown in Figure 4, 87% of participants reported that studies (using foresight methodologies) have been used to inform policy making. Some participants reported that these studies have been shared with policy makers and government agencies, but do not know if the results of these studies have been implemented or had an influence in the policy cycle; some participants have reported that, in fact, these reports have had an outcome and influenced policy. Thirteen % of participants reported that the foresight studies have not been used for informing policy making.

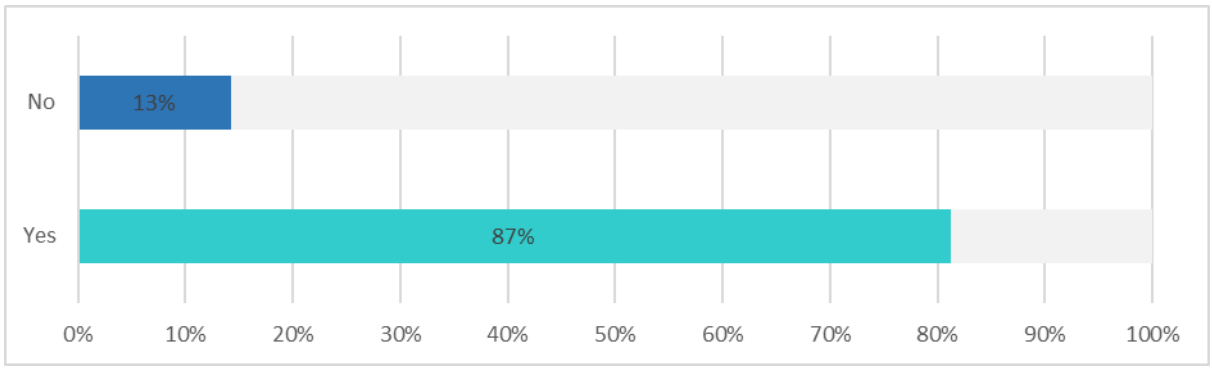

Figure 4. The use of Studies by/to inform Policy Makers

Table 3 provides the references and information provided by the participants on the use of studies to inform policy making.

Table 3. Results reported by participants on the use of Studies by Member States to Inform Policy Making

Member State	Use of Foresight Studies in Policy Making
Austria	The Austrian Health Structure Plan – ÖSG 2017. Planning for health capacities (e.g. intensive care beds, rehabilitation, etc.) is performed together with stakeholders and scenario building. More information **here** Rehabilitation plan. The results of this needs assessment for adult rehabilitation present an overview and in the form of a balancing of inpatient and outpatient rehabilitation capacities according to care zones and federal states (inpatient) or suitable locations and rehabilitation indication groups. More information **here** These are used as legally binding planning instruments.

Belgium	KCE is an independent research center that provides scientific advice on topics related to health care. The topics are generally asked for by the public authorities (Minister / Ministry of Public Health, NIHDI), universities, professional associations, etc. Examples include: Future scenarios about drug development and drug pricing. This scenario project seeks to highlight creative scenarios to explore new drug development and pricing models resulting in more sustainable pricing mechanisms and policies. More information **here** Alternative scenarios for the forecasting of the midwifery workforce: horizon scanning and quantification model. This study reports on a horizon scanning developing alternative scenarios to define a consistent vision of the future incorporating the challenges faced by midwifes during the projection period of the workforce. More information **here** RESTORE Consortium. The RESTORE consortium constitutes an inter-university collaboration with the goal of producing different scenario analyses with regard to the spread of SARS-CoV-2 in Belgium. More information **here**
Bosnia and Herzegovina	Studies and reports are shared with policy makers, having an effect of improving the way of collecting data
Croatia	Research, studies and reports are shared with the Government
Czech Republic	COVID-19 projections are being used as a part of epidemic information support by decision makers. Highly innovative care projections are used in health insurance planning.
Estonia	COVID-19 prognosis. It is used to impose limitations or mitigations on COVID-19 related activities. Additionally, for health care planning in COVID-19 changing situation.
Finland	Foresight studies are prepared by the request from the Ministry of Social Affairs and Ministry of Health to guide their decision making.
Germany	The example scenarios were used to show the potential harm that the COVID-19 epidemic might cause in Germany and that the epidemic might be controlled by anti-epidemic measures. The modelling of the modi-SARS scenario was meant as a reasonably worst-case scenario.
Ireland	The modelling outputs have been used by the Department of Health and the National Public Health Emergency Team (NPHET) to inform recommendations and decisions related to COVID-19.

Netherlands	The RIVM has an official mandate by law to carry out a foresight study periodically (e.g., every four years). The study is reported to the Ministry of Health
Poland	The ICM team cooperates on an ongoing basis with the Minister of Health and the Department of Analyzes and Strategies of the Ministry of Health and the Government Center for Security (RCB).
Romania	At the end of the project the most recent simulation (COVID spread modeling) was sent to the Ministry of Health (in Romanian language) asking to support the implementation.
United Kingdom	Informing Welsh Government COVID-19 Technical Advisory Group

Full references are presented in Annex 1. All links reported here were checked and found working on December 3rd, 2021.

F. Foresight Capacity Needs

Capacity building is important in the PHIRI project. In this survey, respondents had the opportunity to share their capacity needs in the field of public health foresight. With this information, WP9 aims to develop workshops addressing these needs and thereby level knowledge and capacity (WP9, Task 9.2).

Sixteen participants provided their input and informed what are their needs in order to develop foresight capacity and skills. Participants were asked if they thought that their country needed foresight capacity and were provided with a list predefined options to choose from (including the option to provide other options if they were not listed). They were subsequently asked to specify their choice. As shown in Figure 5, only 2 participants (13%) reported not needing any foresight capacity. As for the rest of participants, the main areas to develop are understanding foresight studies (94%) and the use of methodologies (88%). Other areas that require attention include how to carry out foresight studies (75%), data (69%), advocating foresight (50%), and resources and capacity (44%). 2 Participants (13%) reported on ‘other’, mentioning that all areas require comprehensive training with practical examples since developing foresight skills is an ongoing process.

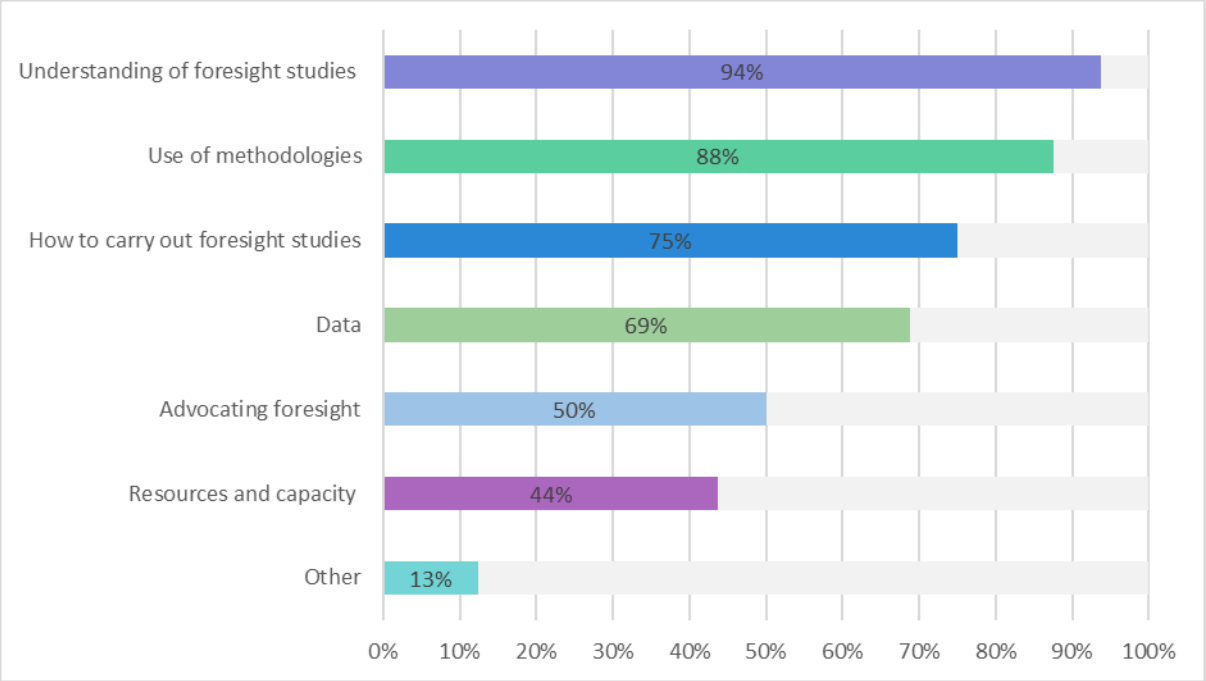

Figure 5. Foresight Capacity Needs

Regarding the option 'Understanding of Foresight Studies' (Table 4): participants specified their choice by indicating that they need a deeper understanding and knowledge on what foresight entails, the full foresight cycle and on its methodologies, how to select the methods according to certain scope and purpose, understanding the degree of automation and integration, and proper implementation of foresight studies particularly when communicating to policy makers, but also on how to train other individuals on foresight.

Table 4. Participant responses specifying their capacity needs on 'Understanding of Foresight Studies'

Understanding Foresight
There is no clear view about foresight for policymakers
Although different foresight techniques are used for public health, only rarely more advanced concepts are used. Hardly ever a full forecast methodology cycle is used.
How to choose the foresight method that is fit for purpose (quantitative, qualitative, mixed, etc.) 1. Purpose: from providing independent advice as an input to a policy process through legitimizing existing policy decisions; 2. Scope: from providing an overview of an uncharacterized field through exploring a predefined field; 3. Degree of automation—from an automated process through an expert-driven exercise; 4. Duration: from an on-demand activity through an ongoing process; and 5. Integration—from being a stand-alone activity through being part of a broader policy-making process.

Learn about how to implement the results of foresight studies
We do not have a tradition of modelling, so we need to develop this skills and methods
Basic concepts and methodologies used in foresight
More in-dept knowledge of the methodologies used in foresight
To my knowledge foresight studies are not widely used in Germany, up to now. I am aware of foresight studies to inform potentially negative events in the future. I think there is a potential to show potentially positive developments as well.
Improvements in the use of foresight studies with more emphasis on training individuals on how to carry out such studies and why they are important.
Advanced knowledge on foresight studies, the methods and applications
Training, bibliography available to guide the development of foresight studies
To understand foresight studies. I would like to gain specific knowledge of foresight and future studies, especially regarding the methods.
Advanced applications of foresight studies

Regarding the option 'Use of Methodologies' (Table 5): some participants specified the need to learn about some specific methods such as scenario building and forecasting. Participants wanted to learn about the complete methodology steps on foresight studies: from data collection, choosing methods and appropriate combination of methods, to the synthesis of results and reporting.

Table 5. Participant responses specifying their capacity needs on 'Use of Methodologies'

Use of Methodologies
Use of modern approaches
Although different foresight techniques are used for public health, only rarely more advanced concepts are used. As far as I know, hardly ever a full forecasting methodology cycle is used.
- For the synthesis/reporting: recommendations on combining qualitative and quantitative aspects and data - Which are the tried and tested methods for conducting stakeholder workshops/interviews as

part of a foresight study - Useful software's for data collection and analysis
Consistent and harmonized methodologies that can allow data comparisons. Improving the use and application of methodologies
There are many methods that are being used, and we are just finishing the first validation analysis for prediction in our data
Forecasting methods
How to extensively involve different partners
Permanent functions are being planned and considered
Scenario building and forecasting methods
Complete methodology steps from data collection and analysis to results according to scenarios. How to choose methods and appropriate combination of methods.
Any advanced methodology

Regarding the option 'How to Carry Out Foresight Studies' (Table 6): participants specified that they want to learn on the different aspects of planning and carrying out foresight studies: time needed, essential elements before setting up the study, level of integration with the policy process, implementation, evaluation, etc.

Table 6. Participant responses specifying their capacity needs on 'How to Carry out Foresight Studies'

How to Carry out Foresight Studies
Although different foresight techniques are used for public health, only rarely more advanced concepts are used. As far as I know, hardly ever a full forecasting methodology cycle is used.
- Time needed and other consideration and planning aspects - What are the essential elements to put in place before setting up the foresight study (including regulatory)? - Level of integration needed in the policy process? - What are the next steps, once the foresight study is completed? implementation? evaluation?
The use of common methodologies that can allow the comparison of results with other country
Mechanics of the modelling, especially refining the model

All aspects related and considerations necessary to carry out foresight studies
Process of the foresight studies, how to incorporate all the available information to the models.
How have in place guides/ tools/templates/case studies on a central webpage.
Protocols and methodologies to carry out studies
Step by step methodology with examples. Interested to learn about software applications used for foresight studies
Best implementation practices in the context of federal countries

Regarding the option 'Data' (Table 7): participants informed that there are data gaps, and that data can be limited; therefore, participants specified that they were interested in learning more about which specific data is necessary to conduct foresight studies, on data collection, data sources, and data analysis. They have also mentioned the importance of data harmonization, generation of evidence, and the use and automation of databases.

Table 7. Participant responses specifying their capacity needs on 'Data'

Data
More information and training on how to carry out data collection
Health care system in Austria is very federal oriented. And so it is with data. Some information (e.g., diagnosis data for outpatient health care) is not available at all. How to manage these challenges?
Publicly available data are extremely limited in Belgium - What types of data (linkages) have been helpful in the context of generating evidence for foresight studies? - How have routine population health databases and non-health administrative databases been used? - What is the level of automation needed?
Data collection and analysis
There are no harmonization efforts across institutions. How to manage this issue regarding the collection and use of data?
Specific data for scenario building

There are a number of national data gaps. How to handle this issue?
Data sources and analysis methods
How to abstract relevant data. Data analysis, especially in the area of human resources for health.

Regarding the option 'Advocating for Foresight' (Table 8): participants acknowledge that it is important for all the different stakeholders (policy makers, clinicians, patient groups, general public, etc.) to understand and appreciate the utility of scientific foresight studies into policy making. They specified that they want to learn about how to properly advocate and promote foresight studies and knowledge translation.

Table 8. Participant responses specifying their capacity needs on 'Advocating for Foresight'

Advocating for Foresight
There is a bad understanding of the utility of scientific foresight studies from policy makers and the general population. Information on developing the dissemination strategy for a foresight study and key elements for policy, clinicians, patient group, general public, etc.
There are still problems related to perception of foresight results in the general and professional audience
Knowledge translation
How to sale the product to relevant stakeholders
This is currently being considered through the OPS2030 Project
Guidelines for advocating foresight
How to advocate and how to promote studies.

Regarding the option 'Resources and Capacity' (Table 9): participants specified that they want to learn about the resources (e.g., data, time, manpower), human and infrastructure capacity necessary to carry out foresight studies.

Table 9. Participant responses specifying their capacity needs on 'Resources and Capacity'

Resources and Capacity
There is a lack of human and infrastructure capacity
A "middle" tear, moderating the foresight process with expert/research knowledge and stakeholders similar to the Netherlands is missing.
Necessary considerations: - FTE's - Duration of the whole study
We need more manpower for this activity
What type of expertise would be required to carry out foresight studies?
Training of specialists, online literature access
How to obtain relevant data, and how to carry out foresight studies on future capacities.

G. Public Health Foresight Network

The survey collected personal details of participants (stored with their consent) and additional information on other professionals involved in foresight studies they were aware of. This information can be used to develop PHIRI's Public Health Foresight Network.

Figure 6 shows the countries where professionals in foresight studies were identified from the survey.

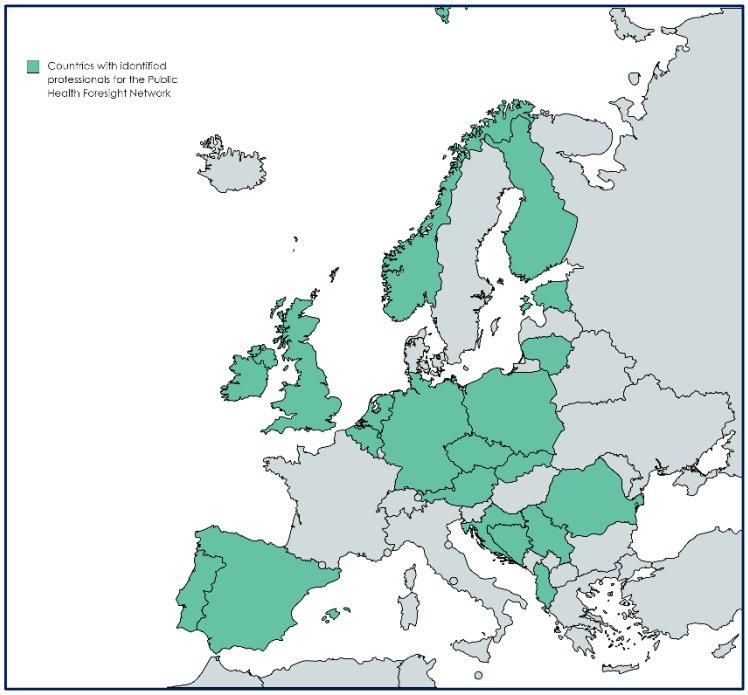

Figure 6. Countries with identified professionals on Foresight Studies

V. Discussion, implications and limitations

A. Discussion

The *"Foresight Capacity and Activities"* survey collected information from 21 MS on professionals in the field of foresight, the foresight activities that have been carried in these MS, if foresight studies have been used to inform policy making, and on foresight capacity needs.

The results of this survey indicate that in most of the participating MS, there have been studies conducted using foresight or methodologies commonly used in foresight, such as forecasting, modelling, and scenario analysis particularly in the area of COVID-19, other diseases (particularly NCDs), and other public health issues. However, some studies did not relate to foresight or its methodologies. In this report we did not analyze in detail all studies and have decided to mention all survey results (studies) as reported by respondents (see C. Limitations).

Most of the studies shared via the survey have been shared with authorities and in some countries they have been used to inform policy making. The extent of the use and impact of these studies into the policy cycle is unknown since only few participants reported that the studies had in fact been implemented and influences the policy cycle. Some countries have

institutions with the capacity to perform such studies and with a mandate to share results and findings with the Ministry of Health and/or other authorities (e.g., Belgium, the Netherlands). In this context, participants showed having more knowledge on the impact of studies using foresight methodologies into the policy cycle. However, for countries without such mandate and/or capacity in specialized institutions where studies were performed, the acknowledgement of the impact of these studies into policy is unknown.

Most participants reported needing better foresight capacity. Results show that, although most participating MS have used some methodologies used in foresight (e.g., forecasting, modeling, scenario analysis), the field is still immature across the region and the capacity limited and unbalanced. Mainly, participants want to deepen their understanding on how to develop and carry out foresight studies, they want to extensively comprehend the use and applications of the different foresight methodologies, and the collection and use of data. They also stressed the need to learn how to advocate for foresight so that relevant stakeholders understand the utility of foresight into the policy cycle.

B. Implications

This survey gathered information on the use of foresight and related methodologies in the policy cycle. While some studies have been commissioned and used by authorities, some have been shared with authorities without much acknowledgement of their use and impact in public policy. The use and importance of foresight to inform policy and the possible outcomes of interventions needs to be further developed. Therefore, more advocacy on the use and importance of foresight (and its methodologies) in public health is necessary. Foresight studies can assist in better and more informed decision making of current and new interventions towards more desirable futures.

This survey has provided relevant information to complement the inventory of foresight activities and to prepare capacity building workshops (WP9, Task 9.2) that will address the participants' needs, which may level MS in foresight capacity. The information collected through this survey will also serve as basis to guide the development of country scenarios during the following phase of the PHIRI project (WP9, Task 9.3).

Although relevant foresight activities and related methodologies have been conducted in the European MS, they are still limited and, therefore, broader efforts are necessary. PHIRI

represents an opportunity to promote public health foresight into becoming a more mature field: first, through the development of the 'Foresight Capacity Building' course in Task 9.2; second, through the development and promotion of the Public Health Foresight Network. The network can be an important forum and mechanism to strengthen and develop the field of public health foresight, by promoting discussions and exchange of experiences, advancing new studies, and engaging with experts and interested professionals.

C. Limitations

The survey collected information from only 21 MS, meaning that the information from some MS was still lacking. Some participants provided thorough and detailed information, while other answers were broad and not specific. As well, some responses were not focused on foresight studies only but included answers addressing the use of other methodologies, some related to foresight and others unrelated to foresight. The analysis of this survey did not include the thorough analysis of the studies and activities reported by respondents; here we only report the responses received in the survey. Thus, this limits the ability to draw more detailed conclusions on the use and impact of foresight across Europe and its use in policy making.

Additionally, the survey can be biased since it was only shared among colleagues participating in the PHIRI project. We do not know if stakeholders not involved in PHIRI were able to access this survey in order to respond to it.

Finally, this survey might have missed the collection of information on international projects, since it focused more on national projects. However, we received one answer on the participation of MS in international projects: Belgium reporting their participation on the FRESHER project [2].

VI. Conclusions and recommendations

The *"Foresight Capacity and Activities"* survey gathered important information on foresight activities across MS, with a particular focus on COVID-19 but also including other (public) health related areas. The information gathered through this survey allowed to get insight on the use of foresight and related methodologies into the policy cycle. This survey identified professionals of each MS as potential members of PHIRI's public health foresight network.

Additionally, this survey has collected information on the current capacity and potential demands for applying foresight methodology and for developing capacity on foresight, to fine tune the foresight capacity building task.

We recommend that professionals from MS with limited foresight capacity, particularly where no capacity or foresight-related activities were reported, join the Foresight Capacity Building course and/or watch the videos of this course[1] (Task 9.2) to develop knowledge and capacity in this field. Furthermore, we recommend participants of all MS to stay updated on PHIRI's foresight activities, which include support in foresight study development (Task 9.3) and joining the network of foresight professionals.

Furthermore, it is important that, in addition to capacity and further development of public health foresight, experts and professionals advocate the use of these studies by policy makers. Foresight studies can make a difference towards desirable and healthier futures.

[1] Public Health Foresight Studies' Training

References

1. OECD. *Strategic Foresight*. [cited 2021 11 March 2021]; Available from: https://www.oecd.org/strategic-foresight/.
2. FRESHER. *How healthy will we be in 2050? Foresight and the future of health*. [cited 2022 13 January]; Available from: https://www.foresight-fresher.eu/.

Appendices

A. Appendix 1. Foresight Capacity and Activities

Introduction to this Survey

This survey is set up within the context of the PHIRI project. **PHIRI** aims to set up and lay the foundation of **a federated research infrastructure** on population health to facilitate and generate the best available evidence for research on health and well-being of populations. PHIRI's purpose is to **support research** across Europe to underpin (public health) policy decisions in current and future epidemics or crises. PHIRI's initial focus is the impact of COVID-19.

This project is composed by nine work packages. Particularly, Work Package 9 (**WP9**) aims to **gain insights in possible future health impacts of the COVID-19** outbreak, by **building capacity on foresight studies**, supporting countries to **develop scenarios**, building a network, and draw lessons for the EU.

The team members of WP9 of the PHIRI project invite you to participate in this survey. We **aim to collect information** to get an overview of how European countries have been **using foresight studies and methodologies** regarding COVID-19 and other public health areas, to **get insight on the needs** of European countries to develop capacity on foresight, and to **identify persons** for each country who wish to be part of our **public health foresight network.**

The survey consists of 8 questions within 4 sections covering: National Foresight Activities, Experts in the Field, Uptake in Policy Cycle, and Capacity Building Needs. It takes approximately 15 to 20 minutes to fill in this survey. You can pause and return to the survey if you need to; you can also go back and change answers if necessary. You **can respond** to this survey until **February 19th, 2021**.

If you have any questions about this survey, please contact PHIRI.NL@rivm.nl.

Scope of the Survey

Clarification of terminology

Foresight refers to a **broad range of methodologies to describe possible futures**. It comprises methodologies such as scenario building (including business-as-usual scenarios and policy scenarios), horizon scanning, trend impact analyses, driver analyses, etc. The working definition that we use is: "**Foresight is a systematic, participatory, future-intelligence-gathering, and medium-to long term *vision-building process* aimed at enabling present-day decisions and mobilising joint actions**."[2]

Objectives of this survey:

1. To collect **information on current and recent foresight studies**, including (but not limited to) scenario building, preparedness, and modelling related to COVID-19 (and other health related aspects).

[2] OECD. Strategic Foresight. Available at: https://www.oecd.org/strategic-foresight/

2. To **collect information on the existing capacities regarding foresight** studies and needs to expand these capacities.
3. To gain insights **in how foresights studies are being used in the policy making process** (policy uptake).

This survey considers:

- Information and **experiences on health-related foresight studies** in the European countries, particularly the EU/EFTA, as of **2015.** These include, but are not limited to: scenario building, preparedness studies, focus groups, and modelling.
- **Information on foresight capacity** of the member states (MS) in the EU/EFTA (existent or not, needs for capacity building) and/or organizations (e.g. academic and other research organizations) conducting research to inform policy makers. This information includes all experiences with foresight methodologies, the outcomes of research, and related publications **focused on public health related topics and COVID-19.**
- **Information on gaps and needs for foresight capacity from MS**. Information should include, but is not limited to: awareness on the use of foresight studies, the extent on which these methods have or have not been used, etc.

This survey does not consider:

- Foresight studies on non-public health related topics (e.g. social and economic studies, use of technologies, etc.)
- Specific health technologies (pharmaceutical products and medical devices)
- Studies before 2015

Target group(s):
This survey is directed to EU/EFTA based **policy makers and researchers in public health** organizations/institutions, ministries of health, academic (Universities), and non-academic research institutions with an interest in public health issues and foresight studies.

This survey does not consider MS outside EU/EUFTA and researches and policy makers not involved in public health issues and foresight studies

Questions:

Background

□ I agree to my personal data being stored and used for the purpose of this survey, according to the GDPR and AVG regulations

Country: _____
Respondent:

- Name:
- Affiliation:
- Position (e.g. researcher, policy maker, etc.):
- Email:

Please provide us with your email address; you will receive a confirmation email with a PDF with your answers to this survey.

National foresight activities

1- Are you aware of any foresight studies and/or activities performed in your country since 2015?*
   - Yes
   - No

If you answered 'No', you can continue with the last question (question number 8), so we can learn about foresight capacity needs.

2- Within these foresight studies, which health related topics or issues have been addressed?
   - Health conditions and diseases unrelated to COVID 19 (e.g. cancer, NCDs)
   - COVID 19 and related topics
   - Other public health issues (e.g. health capacity, health systems functioning, health technologies)
   - Health care expenditures
   - Determinants of health
   - Environmental issues (e.g. pollution and impact on health)
   - Other, please specify:____

Please specify your choice of 'Health conditions': _____
Please specify your choice of 'Other public health issues': _____
Please specify your choice of 'Determinants of health': _____
Please specify your choice of 'Environmental issues': _____

3- If these studies are **about COVID-19**, please provide as much information as possible (links to projects, reports, references, etc.)*
   Please provide information (links to projects, reports, references, etc.) of each example in a different text field (provided below)

4- For topics **other than COVID 19**, please list reports and projects on foresight studies in your country **with related links and references**? (or please include a brief description of the project if you have no links or references)*

Experts in the field

5- Do you know who has carried/is carrying out health foresight studies/applied foresight methodologies/building scenarios in your country?*
   - Myself
   - Someone else. Could you please provide the contact details of experts in foresight in (public) health? (please provide name, affiliation, any other information): *_____

6- Did you/they have any partnership when carrying out foresight studies?
   - No.
   - Yes (Please provide information on countries, institutions, and/or researchers involved):*_____

Uptake in the policy cycle

7- Have the results of health foresight studies/activities been used by/to inform policy makers?*
   - No
   - Yes. How? (please share links, information, etc.)_____

Capacity building needs

We want to learn which are your needs on developing foresight skills in order to carry out foresight studies. Please indicate (with as much details as possible) what you would like to further develop and learn.

8- Do you think that your country needs additional public health foresight capacity?*
   - o No
   - o Understanding of foresight studies (e.g. basic concepts, methodologies, advanced applications, etc.)
   - o Use of methodologies (e.g. scenario building, forecasting, etc.)
   - o How to carry out foresight studies
   - o Data (e.g. availability, analysis, etc.)
   - o Resources and capacity (e.g. in governmental institutions)
   - o Advocating foresight (e.g. knowledge translation, link to policy process, etc.)
   - o Other, please specify_____

Please specify your choice of 'Understanding foresight studies': _____
Please specify your choice of 'Use of methodologies': _____
Please specify your choice of 'How to carry out foresight studies': _____
Please specify your choice of 'Data': _____
Please specify your choice of 'Resources and capacity': _____
Please specify your choice of 'Advocating foresight': _____

B. Appendix 2. References of studies and reports identified through the survey

Member State	References to Foresight Studies on COVID
Austria	Bicher et al. Supporting Austria through the COVID-19 Epidemics with a Forecast-Based Early Warning System. MedRxiv, 2020. DOI: https://doi.org/10.1101/2020.10.18.20214767 Josef Baumgartner & Serguei Kaniovski & Jürgen Bierbaumer-Polly & Christian Glocker & Ulrike Huemer & Simon Loretz & Helmut Mahringer & Hans Pitlik, 2020. ""Die Wirtschaftsentwicklung in Österreich im Zeichen der COVID-19-Pandemie. Mittelfristige Prognose 2020 bis 2024"[Economic development in Austria under the sign of the COVID-19 pandemic]. Medium-term forecast 2020 to 2024 ," WIFO Monthly reports , WIFO, 2020; 93 (4), pages 239-265. Bundesministerium. Der Österreichische Strukturplan Gesundheit – ÖSG 2017 [The Austrian Health Structure Plan – ÖSG 2017]. 2017. Accessed 10 March 2021. Available at: https://www.sozialministerium.at/Themen/Gesundheit/Gesundheitssystem/Gesundheitssystem-und-Qualitaetssicherung/Planung-und-spezielle-Versorgungsbereiche/Der-%C3%96sterreichische-Strukturplan-Gesundheit-%E2%80%93-%C3%96SG-2017.html Reiter, D, FülOp, G, Pochobradsky, E, Röthlin, F, Stoppacher, A. Rehabilitationsplan 2020 [Rehabilitation Plan 2020]. Gusundheit Österreich, 2020. Accessed 11 March 2021. Available at: https://www.sozialversicherung.at/cdscontent/load?contentid=10008.742311&version=1611835415
Belgium	COVID en Wetenschap. RESTORE. 2020. Accessed 10 March 2021. Available at: https://covid-en-wetenschap.github.io/restore Franco, N. Covid-19 Belgium: Extended SEIR-QD model with nursing homes and long-term scenarios-based forecasts. MedRxiv, 2020. DOI: https://www.medrxiv.org/content/10.1101/2020.09.07.20190108v2 CORDIS. FRESHER Project - FoResight and Modelling for European HEalth Policy and Regulation. 2017. Accessed 11 March 2021. Available at: FoResight and Modelling for European HEalth Policy and Regulation | FRESHER Project | H2020 | CORDIS | European Commission (europa.eu) KCE - Belgian Health Care Knowledge Centre. 2021. Accessed 11 March 2021. Available at: https://kce.fgov.be/en Van den Broeck, P, Raeumakers, P, et al. Future scenarios about drug development and drug pricing. KCE Report 271, 2016. Accessed 11 March 2021. Available at:

	https://kce.fgov.be/sites/default/files/atoms/files/KCE_271_Drug__Pricing_Report.pdf Benahmed, N, Lefèvre, M, Vinck, I, Stordeur, S. Alternative scenarios for the forecasting of the midwifery workforce: horizon scanning and quantification model. KCE Report 312c, 2019. Accessed 11 March 2021. Available at: https://kce.fgov.be/en/alternative-scenarios-for-the-forecasting-of-the-midwifery-workforce-horizon-scanning-and
Bosnia and Herzegovina	UNDP. Jačanje DOTS strategije i unapređenje Programa borbe protiv tuberkuloze, uključujući i kontrolu pojave sojeva rezistentnih na više lijekova i kontrolu širenja infekcije u Bosni i Hercegoviniv [Strengthening the DOTS strategy and improving the Tuberculosis Control Program, including controlling the emergence of multidrug-resistant strains and controlling the spread of infection in Bosnia and Herzegovina]. 2016. Accessed 10 March 2021. Available at: https://www.ba.undp.org/content/bosnia_and_herzegovina/bs/home/operations/projects/democratic_governance/strengthening-the-dots-strategy-and-improving-the-national-tuber.html Federalno Ministarstvo Zdravstva. Strateške osnove za usvajanje i implementaciju Projekta jačanja zdravstvenog sektora [Strategic bases for the adoption and implementation of the Health Sector Strengthening Project]. Accessed 10 March 2021. Available at: https://www.fmoh.gov.ba/index.php/projekt-jacanja-zdravstvenog-sektora
Czech Republic	Dokumentaceprediktivnich modelu [Documentation of predictive models]. 2021. Accessed 10 March 2021. Available at: https://share.uzis.cz/s/cmFHjc4jbqPBAER
Estonia	Fischer, K and Kadastik, M. COVID-19 Prognoosid 22.12.2020 [COVID-19 prognosis 22.12.2020]. University of Tartu, 2020. Accessed 10 March 2021. Available at: https://www.kriis.ee/sites/default/files/eriolukord/covid19_progrnoosid_krista_fischer_ja_mario_kadastik.pdf Lukka, K and Habicht, T. Ravikindlustuse pikaajalise prognoosimudeli uuendamine ning uute poliitikastsenaariumite analüüs [Updating the long - term forecast model of health insurance and introducing new ones for the analysis of policy scenarios]. 2016. Accessed 11 March 2021. Available at: https://www.sm.ee/sites/default/files/content-editors/Ministeerium_kontaktid/Uuringu_ja_analuusid/ravikindlustuse_prognoos_2060.pdf
Finland	Tervola, J, Mukkila, S, Ilmarinen, K, Kapiainen, S. The effect of health care payment legislation on poverty – a simulation study. 2018. Accessed 11 March 2021. Available at: https://www.slideshare.net/THLfi/jussi-tervola-susanna-mukkila-

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Germany	RKI. Modellierung von Beispielszenarien der SARS-CoV-2-Epidemie 2020 in Deutschland [Modeling of example scenarios of the SARS-CoV-2 epidemic 2020 in Germany]. 2020. Accessed 10 March 2021. Available at: https://www.rki.de/DE/Content/InfAZ/N/Neuartiges_Coronavirus/Modellierung_Deutschland.html Deutscher Bundestag. Unterrichtung durch die Bundesregierung. Bericht zur Risikoanalyse im Bevölkerungsschutz 2012 [Report on risk analysis in civil protection 2012]. 2013. Accessed 11 March 2021. Available at: https://dipbt.bundestag.de/dip21/btd/17/120/1712051.pdf
Ireland	Department of Health. Irish Epidemiological Modelling Advisory Group to NPHET. 2021. Accessed 10 March 2021. Available at: https://www.gov.ie/en/publication/dc5711-irish-epidemiology-modelling-advisory-group-to-nphet-technical-notes/ Brick A, Walsh B, Keegan C and Lyons S. COVID-19 and emergency department attendances in Irish public hospitals. ESRI Quarterly Economic Commentary, Special Article. 2020. Accessed 10 March 2021. Available at: https://www.esri.ie/publications/covid-19-and-emergency-department-attendances-in-irish-public-hospitals Keegan, C, Brick, A, Bergin, A, Wren, M-A, E, Henry, E. and Whyte, R. Projections of expenditure for public hospitals in Ireland, 2018–2035, based on the Hippocrates Model. ESRI Research Series Report 117. 2020. Accessed 10 March 2021. Available at: https://doi.org/10.26504/rs117 Brick, A, Keegan, C. Paying more to wait less: Estimating the cost of reducing Ireland's public hospital waiting lists. ESRI Working Paper 688. 2020. Accessed 10 March 2021. Available at: https://www.esri.ie/system/files/publications/WP688_0.pdf

	Wren MA, Keegan C, Walsh B, Bergin A, Eighan J, Brick A, Connolly S, Watson D, Banks J. 2017. Projections of Demand for Healthcare in Ireland, 2015-2030: First Report from the Hippocrates Model. Research Series Report 67. Dublin: ESRI. Accessed 11 March 2021. Available at: https://www.esri.ie/system/files/publications/RS67.pdf Keegan, C, Brick, A, Walsh, B, Bergin, A, Eighan, J, Wren MA, 2018, How many beds? Capacity implications of hospital care demand projections in the Irish hospital system, 2015-2030. The International Journal of Health Planning and Management, 2018, pp. 1-14. DOI: https://doi.org/10.1002/hpm.2673 Connolly S, Nolan A, Walsh B and Wren MA. 2018. Universal GP care in Ireland: Potential cost implications. Economic and Social Review 2018; 49(1): 93-109. Accessed 11 March 2021. Available at: https://www.esri.ie/system/files/media/file-uploads/2018-05/RB201813.pdf Nolan, A. 2019. Reforming the delivery of public dental services in Ireland: potential cost implications. ESRI Research Series Report No. 80. DOI: https://doi.org/10.26504/rs80 Trinity College Dublin. The Irish Longitudinal Study on Ageing (TILDA). 2020. Accessed 11 March 2021. Available at: https://tilda.tcd.ie/about/ Doherty, E, Walsh, B, O'Neil, C. Decomposing socioeconomic inequality in child vaccination: Results from Ireland. Vaccine, 2014. 32 (17); pg 3438-3444. DOI: https://doi.org/10.1016/j.vaccine.2014.03.084
Netherlands	RIVM. 2020: New Dutch Public Health Foresight study in the light of COVID-19. 2020. Accessed 10 March 2021. Available at: https://www.rivm.nl/en/foresight-studies RIVM. PHFS-2018: A healthy prospect. 2018. Accessed 11 March 2021. Available at: https://www.rivm.nl/en/foresight-studies
Poland	ICM. ICM Epidemiological Model. 2020. Accessed 10 March 2021. Available at: https://covid-19.icm.edu.pl/en/ F. Rakowski, M. Gruziel, L. Bieniasz-Krzywiec, J. Radomski. Influenza epidemic spread simulation for Poland - a large scale, individual based model study. Physica A 389(16); pg 3149-3165. DOI: https://doi.org/10.1016/j.physa.2010.04.029

Portugal	Auditores Nacionais do Curso de Promoção a Oficial General. Desafios estratégicos para portugal no pós-COVID-19. Centro de Investigação e Desenvolvimento (CIDIUM). 2020. Available at: https://www.ium.pt/s/wp-content/uploads/CIDIUM/Cadernos%20do%20IESM-IUM/Cadernos%20do%20IUM%20N.%C2%BA43%20-%20Desafios%20Estrat%C3%A9gicos%20para%20Portugal%20no%20P%C3%B3s-Covid-19.pdf
Romania	Sistemul informatic integrat IASO [Integrated computer system – IASO]. 2020. Accessed 10 March 2021. Available at: https://www.spacescience.ro/projects/iaso/
Spain	Instituto de Salud Carlos III. Estudio Nacional de sero-Epidemiología de la infección por SARS-CoV-2 en España (ENECOVID) [National sero-Epidemiological study of the infection by SARS-CoV-2 in Spain (ENECOVID)] Accessed 10 March 2021. Available at: https://portalcne.isciii.es/enecovid19/ Instituto de Salud Carlos III. Monitorización del comportamiento y las actitudes de la población relacionadas con la COVID-19 en España (COSMO-SPAIN): Estudio OMS [Monitoring the behavior and attitudes of the population related to COVID-19 in Spain (COSMO-SPAIN): WHO Study]. Accessed 10 March 2021. Available at: chttps://portalcne.isciii.es/cosmo-spain/ Instituto de Salud Carlos III. Factores de difusión COVID-19 en España [COVID-19 spread factors in Spain]. Accessed 10 March 2021. Available at: https://coviddifusion.isciii.es/fdd/ Other sources on COVID-19: https://www.isciii.es/QueHacemos/Servicios/VigilanciaSaludPublicaRENAVE/EnfermedadesTransmisibles/MoMo/Paginas/MoMo.aspx https://www.isciii.es/QueHacemos/Servicios/VigilanciaSaludPublicaRENAVE/EnfermedadesTransmisibles/MoMo/Paginas/MoMo.aspx

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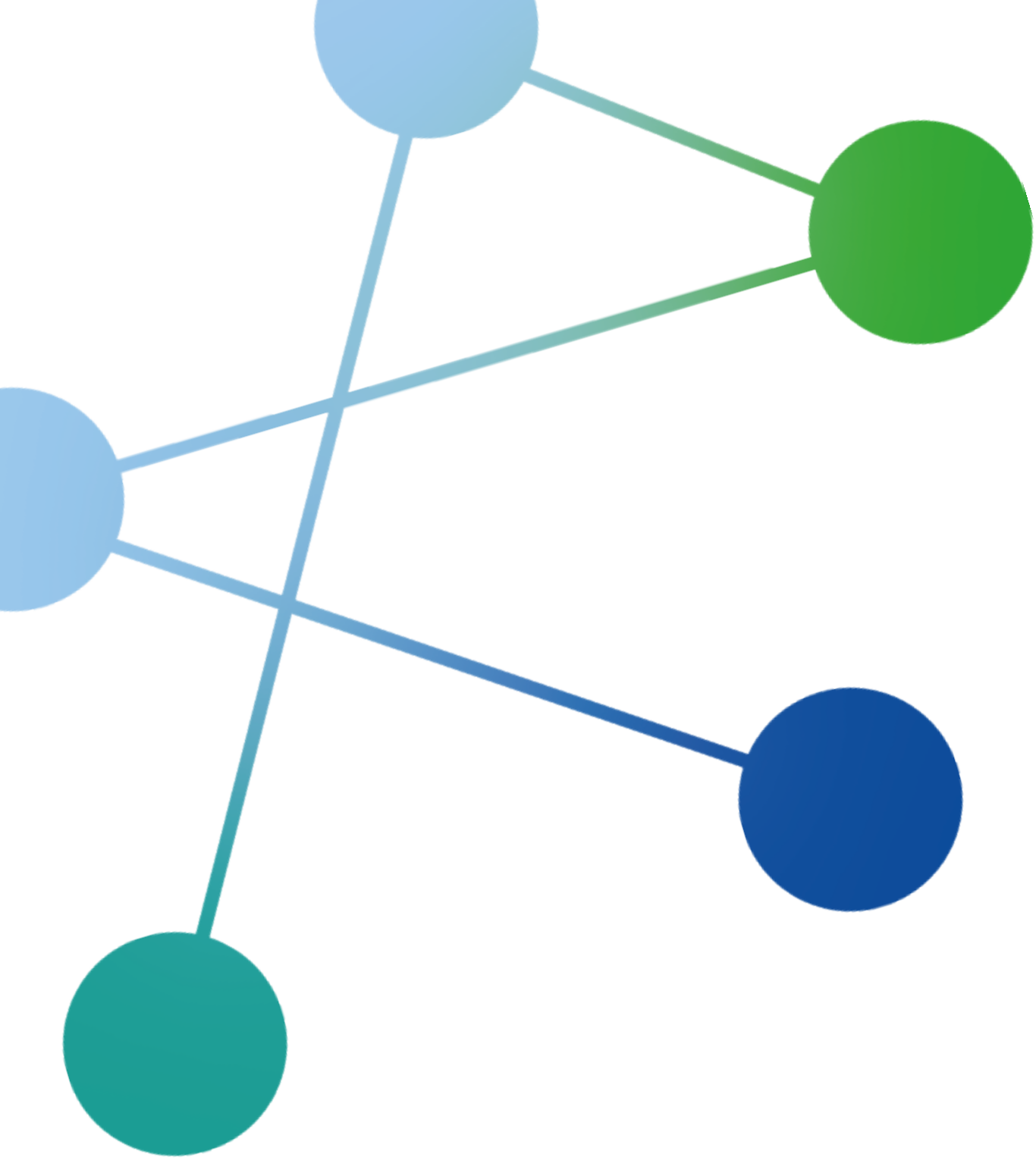

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