8.K. Workshop: Health impact quantification for a culture of ''foresight''? Dyadic Workshop, part 1

Chairperson(s): Johan Mackenbach - The Netherlands, Rainer Fehr - Germany

An orientation of foresight and precaution is among the core virtues of Public Health. In times of rapid changes referring to personal health behavior, health systems, and other sectors beyond health (''Health in all Policies''), with increasing awareness of a multitude of systems interacting, it is particularly challenging to assess future impacts on health and disease. Quantitative modeling is meant to help in estimating impacts of developments, policies and interventions, in identifying group differentials, comparing scenarios, ranking interventions, and thus to support governance and decision-making. A range of impact quantification tools are available, providing approaches to strengthen ''foresight'' awareness, and to contribute to the development of health impact modeling as a component of good Public Health practice.

Toolmakers and users of tools convened in the past to discuss experiences and challenges. There were, e.g., two documented workshops [1, 2] and two publications [3, 4] from this initiative. It has become clear that issues deserving special attention include the following: systemic interactions; differential impacts (equity); temporal dynamics; uncertainty of estimates; and visualization of results.

The current workshop focuses on practical experiences with existing models and tools, compares and critically discusses them, and identifies appropriate steps forward. A range of real-life examples of tool application will be discussed, in the light of the following questions: What was the (governance) question or problem that triggered the analysis? What model was applied, what data used? How were the following issues dealt with: (systemic) interactions, differential impacts/(in)equity, changes over time, uncertainty of estimates, visualization of results? How did decision-makers and/or the public react?

Workshop format: 4 presentations, plenary discussion (10 min).

This is part 1 of a dyadic workshop. Part 2 contains presentations on three additional approaches, plus a summary presentation with conclusions.

Key messages:

- The essential Public Health virtues of foresight and precaution call for assessing future impacts on health and disease
- Using impact quantification tools, health impact modeling can develop into a component of good Public Health practice

Modelling the economics of chronic disease with the EConDA tool and the UKHF microsimulation model

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Context
Policy makers and planners need to understand the distributions of avoidable non-communicable diseases (NCDs), and how they are likely to develop in the future. The UK Health Forum (UKHF) uses advanced microsimulation modelling methods to forecast trends in risk factors and test the health and related cost-impacts of policy interventions.

Methods
Two approaches were applied: (i) the Economics of Chronic Diseases (EConDA) tool, a deterministic model developed for policy makers, across 8 EU countries, to assess the cost-effectiveness of specific BMI-related interventions for different population age groups, and (ii) the stochastic UKHF microsimulation model which was originally developed for Foresight Tackling Obesities (England), has modelled obesity and related diseases in 70 countries, and was used to test the impact of BMI trends and interventions over time. Data for each country were collected from a variety of sources including both cross-sectional and longitudinal studies.

Results
The EConDA tool and the microsimulation model are both data intensive; data needs include cross-sectional age-sex risk factor data (e.g. for body mass index (BMI), or smoker status), and disease incidence, prevalence, and mortality. When interventions such as a sugar sweetened beverage (SSB) tax and multi-component lifestyle intervention (MCLI) were compared to a baseline (no change) scenario where individuals follow BMI trends predicted by cross-sectional data, then small reductions in BMI were shown to have a significant effect on reducing both the levels of NCDs and their related costs. The model predicted that a 20% SSB tax would have a significant impact on prevalent NCDs such as Heart Disease and Type 2 Diabetes.

Conclusions
Both models can be used to predict the impact of interventions at a population level in terms of BMI-related NCDs and their associated (non-)healthcare costs. Deterministic tool and

stochastic microsimulation provide a good validation of each other.

Risk factor modelling with the Proportional Multi-State Life Table model
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Approach
Originally designed by Barendregt in the 1990s, the models mimic morbidity and survival of populations in 5-year age-sex groups over their remaining lifetime, comparing an intervention scenario with 'business as usual'. Risk factors such as body mass, physical activity and dietary factors are modelled as distributions. Potential impact fraction calculations link these with the incidence of explicitly modelled diseases. Health-related quality of life is calculated using disability weights, and changes in mortality are integrated in the life table. The main health outcome is health-adjusted life years. Trends can be incorporated.

Results
Recent applications of the model include the estimation of the health impact of sugared drinks taxes in South Africa (Manyema, Veerman et al., PLoS One. 2015;10(11):e0143050) and Australia (Veerman, Sacks et al., PLoS One. 2016;11(4):e0151460). In the latter example we used consumption and body mass data from the Australian Health Survey 2011–2013, Australian price elasticity estimates, energy balance calculations, health care costs from the Australian Institute for Health & Welfare, and relative risks, disability weights and epidemiological data from the 2010 Global Burden of Disease. Results indicated that a 20% valoric tax on sugared drinks could lead to a gain of 112,000 health-adjusted life years for men (95% uncertainty interval [UI]: 73,000–155,000) and 56,000 (95% UI: 36,000–76,000) for women, and a reduction in overall health care expenditure of AUD 609 million (95% UI: 368 million– 870 million).

The South African Minister of Finance recently announced plans for a tax on sugared drinks. This seems related to our publications on the potential impact of such a tax on obesity and diabetes rates, which received much media attention. The impact on the Australian debate is as yet unclear, but sensitised by the UK announcement of a sugar tax, our publication sparked debate across online, print and visual media.

Integrated environmental impact assessment with ECOSENSE – the impact pathway approach
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Background, methodology
In the 1990s, the European Commission, DG RTD, financed the ExternE (external costs of energy) series of projects, for quantitatively assessing the health risks and other impacts caused by energy technologies. In subsequent projects, with my team and me playing a leading role, the methodology was refined; the sectors extended, and the range of pollutants widened.

Results
The methodology is now widely used for policy support, especially for assessing air pollution control policies and transport and industry project appraisal. Impacts are transformed into monetary values using willingness-to-pay-approaches, allowing for cost-benefit analyses and estimating external costs (ECOSENSE tools family, www.ExternE.info: online tools, www.integrated-assessment.info: guidebook).

One exemplary application shows that it is important to take account of impacts caused by air pollution when assessing policies to reduce climate change: the promotion of wood firings in cities leads to negative health impacts that more than compensate the positive effect on climate change, unless the firing is equipped with a dust filter. Similarly, insulation of houses may lead to higher indoor pollution, thus installing new windows should be coupled with mechanical ventilation systems. - Different policies reducing air pollution caused by urban transport were ranked by impacts on air pollution and climate, with bicycle use, traffic management, and replacing short haul air traffic by rail being most efficient.

Reactions: Decision makers in Europe, e.g. DG TREN, national authorities or the EIB, now support or even demand cost-benefit analyses to support decision processes. Press and public are especially interested if high risks occur, or if recommendations disagree with current policies.

Conclusions
The use of methods and tools for integrated environmental, health and climate impact assessment increases rapidly, especially for pollution control and transport project appraisal.

Assessing Cancer Control Initiatives in Canada – the Role of CRMM
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The Canadian Partnership Against Cancer (CPAC) was funded by the Government of Canada in 2009, to work with all stakeholders across the country to reduce cancer incidence, improve treatment, and improve the health of cancer survivors. As part of its initial mandate, CPAC has developed a detailed simulation model, the Cancer Risk Management Model (CRMM), designed to integrate and synthesize a wide range of empirical data, clinical trials and expertise to provide rigorous evidence for analysis and decision-making on cancer control policies.

Three major cancer site models have been completed. However, the analysis and decision-making across these cites offer notable contrasts. Each cancer site model was based on cross-country consultation with a key focus centred around what were the main policy questions over the coming two to five years. Responses guided prioritization of various design elements in the models.

For cervical, a high priority was how to organize HPV vaccination and Pap testing vs DNA tests. For colorectal a focus was comparative cost-effectiveness of FIT (at various thresholds) and FOBT screening. With a recent clinical trial showing a 20% reduction in mortality by using low dose CT (LDCT) screening for heavy smokers, the recent focus with the lung model includes annual versus biennial screening.

Policy responses have been quite different. For cervical, the Ontario government has moved to vaccinate boys as well as girls. For colorectal screening, a pan-Canadian group of administrators of provincial screening programs is the key audience. For LDCT, audiences include both the federal preventive services task force and provincial cancer control agencies who are moving ahead with pilot projects.

This paper contrasts the analyses for cervical, colorectal and lung cancer and their take-up in policy.