Policies, modeling and health impact quantification

Gabriel Gulis (ggulis@health.sdu.dk)
University of Southern Denmark

based on RAPID project experience – work in progress

RAPID full chain approach - model

- Policies and strategies influence
- the wider determinants of health. These determinants have their impact on
- a range of different risk factors which then
- directly affect human health.
- The main aim of the project is to develop methodologies for conduct of "full chain" risk assessment and implement them on a case study application on selected EC policy and via a series of national workshops.

Top-down and bottom -up

Top down

- **A policy is done or under preparation and possible health impacts needs to be assessed**

Bottom-up

- **There is a health problem and links to policies (sectors) leading to problem needs to be outlined**

Quantification

- **Policy to health effect?**
  - No, not possible on direct way
  - Policies rarely (if at all) influence health direct; they do influence state of wider determinants of health and prevalence of risk factors (protective factors)

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Danish energy policy – simplified example

- **We start with an assumption that there is a need for a certain well defined amount of energy E for Denmark in 2008. The assessed policy aims to reduce this amount by 4% until 2020. This leads to total energy available in 2020 will be 0.96 x E. This total energy available is produced by different methods which we can mark as E_1, E_2... E_n. Besides decreased consumption the other aim is to change the balance between different types of energy production so that less pollutant is produced through diverse energy production methods, so that production will increase and pollution will decrease. This can be put into an equation**

  $0.96 \times E = \mu_1 \times E_1 + \mu_2 \times E_2 + \mu_3 \times E_3 + \ldots + \mu_n \times E_n$

  where μ_n are changes in production of that single type of energy.
- **For sake of simplicity let us substitute the single energy source production $\mu_1 \times E_1$ in 2020 by a marker EP_1 (and up to EP_n). Each single change by type of the energy production will lead to change in environmental pollutants related to that single type of production. Mathematically we can again expect that energy production EP_1 will produce a certain amount of specific pollutants, for example air pollution products P_1, P_2, P_3, ..., P_x. The change in that single type of energy production will of course changes in production of each single pollutant; it is important to note that at this point one should not sum up the change in total pollutants across pollutants but across energy production type. For risk assessment it is more important to know how will production of single pollutants change in total across different types of production rather than the total of pollutants linked to a single type of production. So, to get this number we need to sum up amount of pollutants produced via different types of production**

  $\sum P_1 = P_{1EP1} + P_{1EP2} + P_{1EP3} + \ldots + P_{1EPn}$
- **After one gets $\sum P_1$ a coefficient to calculate ambient air parameters needs to be applied and a following application of a risk ratio from epidemiological research to a specific sub-populations (or even total population) allows to calculate the changes in potential health effects.**
- **Once such an algorithm is developed and data is available the health effects of any energy policy could be quantified. Of course this simplified description does not contain formulas and considerations related to statistical uncertainties of individual steps. It is obvious that their inclusion is very important and necessary and they should come from basic epidemiological or technology research providing baseline information for individual steps of the calculation.**

Challenges - conclusions

- **Definition of exposure**
- **Horizontal interactions (environmental – social-behavioral)**
- **Uncertainties**
- **Priority making vs. balance of positive/negative**
- **Final presentation format**