

QUANTITATIVE HEALTH IMPACT ASSESSMENT (HIA) MODELLING

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*Health Analysts' Special Interest Group
(HASIG) 'Health Modelling for Better Policy'*

2nd July 2009

Objectives of Presentation

- ⦿ Outline area of work (HIA Modelling);
- ⦿ Benefits and drawbacks of different modelling approaches;
- ⦿ How can modelling outputs (population health models) contribute to the development of better public health policy & practice?

Introduction

- ⦿ Improving population health through effective intervention, fundamental challenge for public health practitioners & policy makers;
- ⦿ Need to choose '*best intervention*'
- ⦿ Limitations on resources, time & information: decision process very complex.
- ⦿ Assessing value of health intervention? *Elements such as size of target population, prevalence of disease & intervention's effectiveness and cost.*

(Unal, 2004)

What is a Model?

- Models are tools that allow users to take into account all elements together & evaluate the intervention options.
- A model is an:

‘analytical methodology that accounts for events over time and across populations, based on data drawn from primary or secondary sources, whose purpose is to estimate the effects of an intervention on valued health consequences and costs.’

(Weinstein et al., 2003)

What is HIA Modelling?

- ⦿ Methods to quantify effects of policy on determinants of health;
- ⦿ Assesses and compares the impact of alternative public health interventions;
- ⦿ Enables scenario building;
- ⦿ Aims to demonstrate the health consequences of decisions;
- ⦿ Intended to inform real decisions.

What is HIA Modelling?

A model must:

- ⦿ Be a realistic formal model;
- ⦿ User friendly;
- ⦿ Able to accommodate available data.

Main steps in process:

1. Describe the baseline situation;
2. Model change in exposure to determinants of health;
3. Quantification of change in health outcomes.

(Lhachimi et al., 2008)

Recommended Framework for Robust, Quantitative HIA

1. Profile affected populations;
2. Identify potential impacts;
3. Obtain evidence for impacts;
4. Determine how impacts are affected by differences in subgroups' exposures and susceptibilities;
5. Draw up causal pathway;
6. Select impact measures;
7. Select (or develop) statistical model;
8. Test statistical model against empirical data & sensitivity analyses;
9. Consider economic analysis (cost-effectiveness).

(Mindell et al. 2001)

Types of Models

- ◉ CDM (Markov Simulation type model)
- ◉ DYNAMO-HIA (Range of risk factors e.g. obesity, and diseases e.g. diabetes)
- ◉ IMPACT;
- ◉ ARMADA (Age Related Morbidity And Death Analysis);
- ◉ PREVENT (developed in 1980's; range of risk factors & diseases; identifies impact of policy changes in countries);
- ◉ CISNET (Cancer Intervention & Surveillance Modelling Network; breast, colorectal, lung & prostate);
- ◉ Archimedes.

Data Requirements

- Clinical trials
- Meta-analyses
- Surveys
- Databases
- Medical records
- Official statistics (e.g. population, deaths)
- Audits
- Delphi panels (expert opinion)
- Official tariff lists for health care resource use

Approach for Current Work

- Preliminary work: population prevalence modelling (hypertension);
- Review existing public health & chronic disease modelling resources (e.g. CDM, DYNAMO-HIA, IMPACT, ARMADA, PREVENT, CISNET).
- Suitability to address key policy issues (north & south)?
- Application of models to Ireland?
- Assessment of information requirements (data & research);
- Adequacy of available information (north and south);



Recommendation of a modelling approach

Rationale for Current Work

Systematic approach to public health modelling encompassing:

- ⦿ Estimation & forecasting of population prevalence of chronic health conditions (e.g. obesity, diabetes);
- ⦿ Assessment of potential impact (variety of public health interventions);
- ⦿ Assist IPH: all-island obesity knowledge hub;
- ⦿ Aims to develop mathematical models to assess and compare the potential impact of alternative policy, public health & clinical interventions.

Scenarios

A wide range of scenarios involving:

- ⦿ Other population characteristics;
- ⦿ Cost effectiveness: prevention or treatment?
- ⦿ Social & prevention interventions (uptakes, effects & costs);
- ⦿ Diagnosis & treatment interventions (uptakes, effects & costs).
- ⦿ A wider range of outcomes including incidence, PYLL etc....
- ⦿ Valid comparison of potential impact of quite complex scenarios.

Links to other work

- ⦿ Models share some information requirements with:
 - *Population prevalence models;*
 - *The BoD study;*
- ⦿ Obesity knowledge hub.

Output for 2009

- Population prevalence (hypertension)
- By end of year, proposed modelling approach including:
 - An Initial Model:
 - Key questions*
 - which model is most useful? (policy/practice issues)
 - Availability of Irish information? (data & research)
- A strategy to further develop the model;
- A strategy to strengthen information systems to support further development of the model.

Testing the Model (2010): A Case Study

- Application of Initial model to Ireland (North & South);
- Focus on particular issues (e.g. diabetes);
- Assess potential impact of change in risk factors (e.g. obesity) on different outcomes (such as prevalence);
- Compare potential impact of prevention interventions & management/treatment interventions.

Benefits & Drawbacks of Modelling Approaches?

Benefits:

- Synthesis of evidence/data from variety of sources;
- Integration of facts & values linking data to outcomes;
- Valuable advice for policy makers (resource allocation);
- Sensible & systematic approach;
- Stimulate effects of different scenarios within a population.

Drawbacks:

- Models require considerable data input (recent & credible data);
- Availability of comprehensive, high quality data is problematic;
- Data subject to reporting and coding inaccuracy; missing data;
- Ease of access to data?
- Complex models: deter users.

'All models are wrong, but some are useful'

(Box et al., 1978)

Contribution to public health policy & practice?

- Public health practice;
- Policy implications for decision makers;
- Clinical implications?
- HIA with quantitative estimates: more influential? (*robust findings, best available evidence, explicit assumptions*);
- Allows a more informed judgement to be made i.e. targets which need to be met;
- Contribute to monitoring population-level impact of public health interventions;
- Support economic evaluations;
- Inform future data collection/surveillance.