Session 3: Assessing cost-effectiveness of population level interventions

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Basic elements of modelling
(same as previous session)

• Interventions to be evaluated, their effect size and costs
• Flow and outcomes
• Model construction
• Populating the model (data)
• Validation
• Presentation of results
Population level interventions

Aim = Prevention and cessation
• reduce smoking initiation
• increase smoking cessation
• reduce exposure to secondhand smoke

Usually achieved through **Policy or Strategies** that affect everyone in a jurisdiction or defined area
Types of interventions

• Taxation and price increase
• Smokefree laws
• Bans on sales to minor and advertising bans
• Plain packaging of tobacco products
• Mass media campaign
• School-based/community-based /workplace –based interventions
Modelling issues

• Different considerations from individual-level interventions
  – Effect size → quit rates vs. relative reduction in prevalence
  – Unit costs versus per capita expenditure on the programme
  – Static vs. dynamic effect
  – Net vs. combined effects
Modelling issues

• Good model = best prediction
• Evidence base on effect size of population-based interventions is usually not robust
  – Challenges in attributing effect to a single intervention in a multiple intervention context
  – Pragmatic difficulties in conducting RCTs
  – Sources of variation- level, degree of enforcement
Example – SIMSMOKE model

- Projects smoking rates and deaths attributable to smoking (in total and for lung cancer, COPD, heart, and stroke).
- Examines the effect of tobacco control policies on those outcomes.
- Examines the effect of policies individually and in combination on different ages and other demographic groups

(Example based on publicly available docs – see bibliography)
SIMSMOKE model structure

- **Population** model begins with initial year population (by age and gender) and moves through time (by year) with births and deaths
- Includes never smokers, smokers, and ex-smokers with initiation, cessation and relapse (Markov)
- Mortality and RR define smoking-attributable outcomes
- One intervention with interdependent effects on smoking rates
Model structure

- States – never smokers, smokers, ex-smokers (by year since quit)

  Smokers = 100 cigarettes in lifetime, smoked more or all days

- Transition – initiation, cessation, relapse
  - Change in prevalence before age 24 (initiation)
  - Quit in last year (cessation)
  - Start to smoke again in last year (relapse)

- Subgroups – age and gender
Model structure transitions

Never Smoker → *Initiation* → Ever Smoker* → **Not quit** → Current Smoker**

*Not initiate* → Quit → Ex-Smoker

**Relapse**
Smoking attributable mortality

Deaths $\rightarrow$ Attribution rates $\rightarrow$ Attributable to Smoking

% smokers

Relative risk

Deaths
Interventions

• Cigarette taxes
• Smokefree laws
• Mass media
• Bans on sales to minors
• Advertising bans
• Warning labels
• Cessation treatment
Model parameters - effects

- Policy effect is percentage reduction relative to smoking rate e.g. prevalence elasticity for taxation
- Age and gender differential in effect allowed
- How policy was implemented (i.e. Level, degree of enforcement, publicity, other concurrent policies, etc.) has an impact of effect size
- Prevalence elasticises for taxation, for instance, varies from -0.1 (35+ years) to -0.6 (15-17 years)
- Dynamic effects less understood

- Populated for several countries/jurisdictions – USA (Arizona, California, KY, MASS, and NY), Albania, Argentina, China, France, Japan, Korea, Malaysia, Poland, Taiwan, Thailand, Vietnam
SIMSMOKE also includes individual-level intervention (similar to previous session)
SIMSMOKE Validation - Thailand

Impact of past tobacco control policies - Thailand

Smoking prevalence was 25% less as a result of policies!

Source: Levy – Presentation to Health Economics workshop
Impact of specific policies – Thailand

Role of individual policies in reducing smoking prevalence by 2006
Cost-consequence vs. Cost/QALY

Though population-level policies/strategies are usually evaluated for their effect in terms of reduction in prevalence (and therefore the cost-consequence implications), the same model can be tailored to estimate costs and QALYs as discussed in the previous session.
Summary

• Much of the general model considerations are the same as individual level modelling
• However, data on effect size tends to be less robust
• SIMSMOKE model has been adapted to many different population/countries
• Models can be extended and used to assess return on investment from tobacco control policies
Bibliography

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