Session 2: Assessing cost-effectiveness of individual level interventions

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Basic elements of modelling

- Interventions to be evaluated, effect size and costs
- Flow and outcomes
- Model construction
- Populating the model
- Validation
- Presentation of results
Individual level interventions

Aim = **cessation**

- Behavioural support
  - GP advice
  - Counselling (less/more intensive)
- Nicotine replacement therapy
- Pharmacological interventions

Interventions aimed at individuals to facilitate cessation of smoking
Intervention effects/costs

Intervention effect size:
- Quit rate/ success rate
- Relapse rate important (Coleman 2010)
- 1-year post
- Translation or RCT data to “real world” - Variation in practice
- Self-report vs objective (Judge 2005)

Costs:
- Health service costs, costs to local government (Local Stop Smoking Services in UK), cost to individual (societal)
- Cost of delivery = cost of health care professional time and aids/drugs
Success and relapse

Source: Coleman et al (2010)
Modelling

- Defining health states (current smoker, ex-smoker, never-smoker, light/medium/heavy smoker)
- Transition probabilities and effect size (cessation ↓ smoking prevalence)
- Smoking comorbidities to be included – major burden
- Relative mortality risk
- Utility weights
- Cost (interventions and long term sequelae)

Particular important considerations:
- Relevance of background quit rate – longitudinal data - c.2% for UK
- Generation of short-term, medium-term, long-term outputs
- Prevention vs cure and long latency
Background quit rate

Figure 1 Smoking behaviour in England, 1982 to 2010. Source: General Lifestyle Survey 2010. The Office for National Statistics. Copyright © 2012, re-used with the permission of The Office for National Statistics.
Why do we need to know the background quit rate?

- Provides an indication of the effectiveness of tobacco control policy
- Provides insights into how social norms might be changing over time
- Provides a comparator against which new policies and programmes can be compared
  - Particularly important for economics where incremental analysis is preferred
  - “i.e. What additional benefits do we attain from any additional expenditure”
Establishing the background quit rate

1. Identify a representative cohort of smokers
2. Undertake a longitudinal study of smoking habits
3. Establish quit rates over time and annualise over a relevant time period
4. Explore differences over time and within populations

- In practice, background quit rates are typically derived from regular (annual), cross sectional surveys.
- Derive age/sex standardised smoking rates at different time intervals to provide an indirect measure of annual quit rates
Populating model

- Smoking prevalence
- Use of life tables and adjustment
- RCT data for effectiveness
- Health related quality of life studies
- Cost of treating comorbidities
- Costs of absenteeism
Presenting results

Metrics: Incremental cost (utility) effectiveness ratio
Cost/benefit ratio
Depends on evaluation and decision maker needs

• Report the results and procedure transparently
• Recommended to follow best practice (e.g. Drummond’s checklist)
• Make sure results presented allows one to answer your research questions
• Aggregated and disaggregated reporting (e.g. according to cost components, perspectives, sub-groups, etc).
• Uncertainty should be accounted for
Validation

Internal validity
- Does the model appear to reflect the necessary natural history/clinical practice? (face validity)
- Does it utilise the best available evidence?
- Does the model behave in the way expected? – verification/computational error checking

External validity
- Can the model produce results (intermediate) observed elsewhere?

- “Best practice guidance” (e.g. Phillips 2006).
- HERG checklist for economic models - Construction, population, uncertainty and verification.
Example – Flack Model (2007)

- Simple 3 state Markov model - schematic below
- Estimates reduction in smoking attributable comorbidities and mortality from individual level cessation interventions (and associated costs and effects).
- **Population** - cohort of smokers
Model structure

Health states have differing probability of comorbidities:

- Lung cancer
- Coronary Heart Disease
- COPD
- Myocardial infarction
- Stroke

Each co-morbidity has associated cost and utility

Higher mortality rate associated with “smokers”
Flack (2007) model Interventions

*Individual focussed*

In UK context delivered either at NHS level or in workplace and comprise counselling or nicotine replacement or pharmacotherapy and combinations.

- Brief advice
- Self help material
- NRT
- Pharmacological interventions
- Counselling - group and individual
Model parameters


Mortality: Office National Statistics and Doll (1994)

Costs:
- Comorbidities annual costs- established estimates (Lung cancer £6,000, COPD £926)
- British national formulary, nationally published unit costs of health care staff time (Curtis, 2005)

Utility weights:
- (Tengs and Wallace, 2000) systematic review
- Lung cancer 0.58, MI 0.8
Results

- All intervention very cost-effective, most dominate (↓costs, ↑ QALY)
- Maximum cost per QALY = £984

Limitations:
- Recent vs long term quitters
- Multiple interventions if unsuccessful
Summary

- Model must appropriately reflect important aspects of risks associated with smoking and the sequelae
- Need to gather good data on interventions effect size
- Model are a reflection of quality of inputs and are data heavy
- Individual focussed interventions appear highly cost-effective
  - Flack (2010); Paech (2010)
Bibliography


• Coleman et al. Relapse prevention in UK Stop Smoking Services: current practice, systematic reviews of effectiveness and cost-effectiveness analysis. Health Technol Assess (2010);14(49)

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