

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

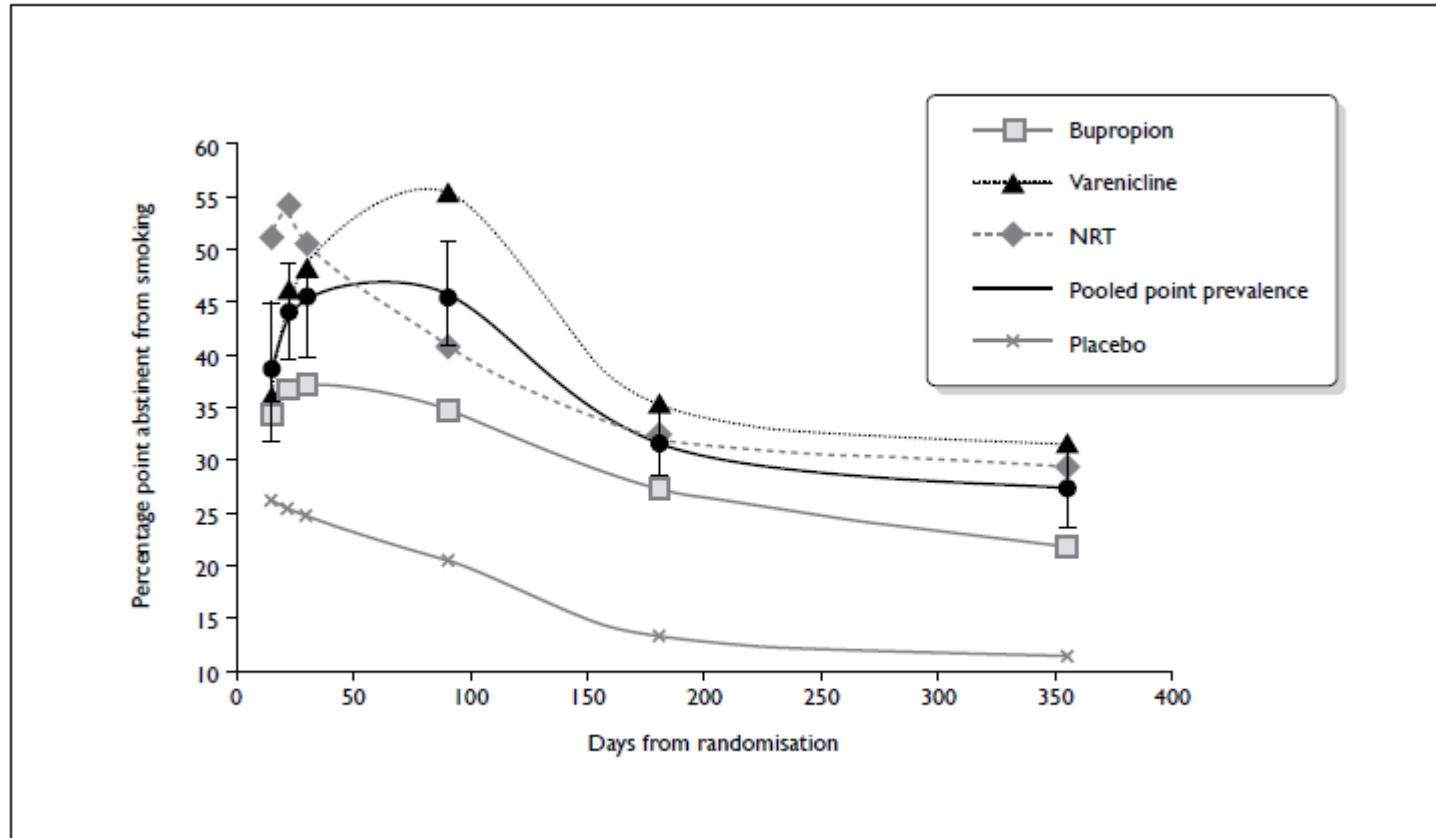
Intervention effect size:

- 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

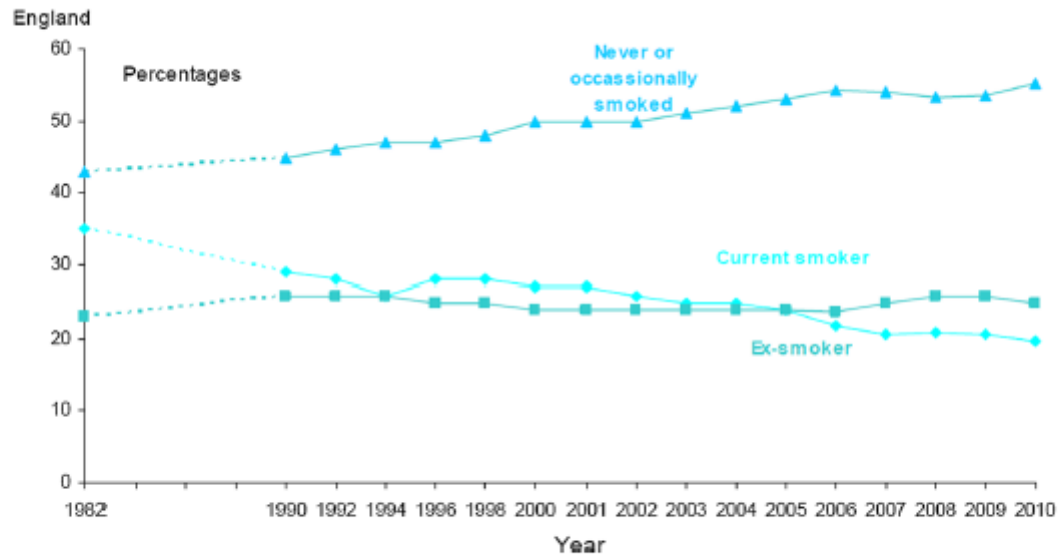


Figure 1 Smoking behaviour in England, 1982 to 2010. Source: General Lifestyle Survey 2010. The Office for National Statistics. Copyright © 2012, re-used with the permission of The Office for National Statistics.

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
 - Doll (1994/2004) – mortality of smoker/non smoker (RR)
- 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

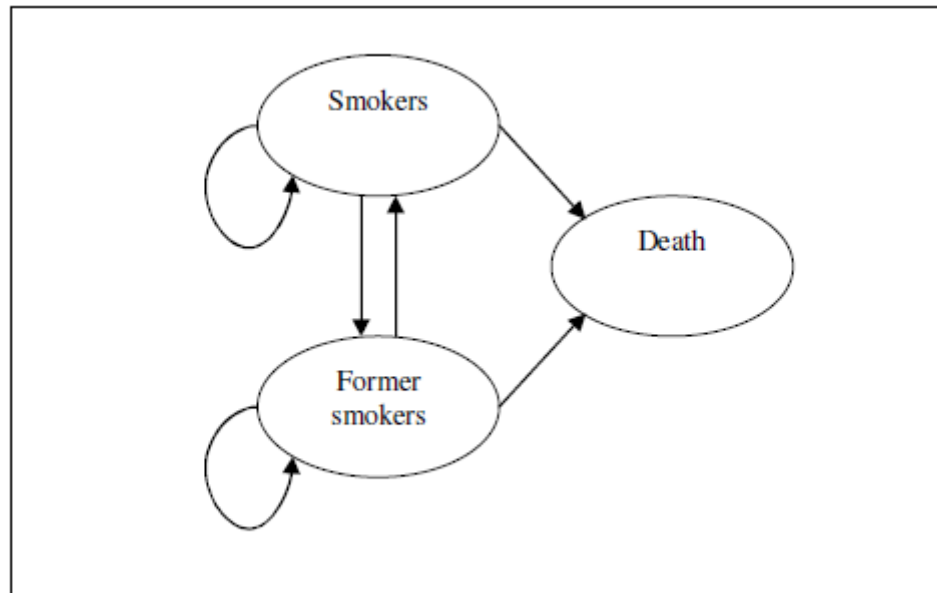
- Does the model appear to reflect the necessary natural history/ clinical practice? (face validity)
- Does it utilise the best available evidence?
- Does the model behave in the way expected? – verification/computational error checking

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

Effectiveness: McGhan and Smith (1996), Javitz (2004), Parrott (1998)

Mortality: Office National Statistics and Doll(1994)

Costs:

- Comorbidities annual costs- established estimates (Lung cancer c£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 (\downarrow costs, \uparrow 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

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