

Health gains of smoking cessation: accounting for age and time since smoking cessation

Rudolf Hoogenveen, Pieter van Baal | 2006 may 22

Rudolf.Hoogenveen@rivm.nl

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Background

• Background

- Quantifying the potential effects of tobacco control on burden of disease is useful to support policy makers in setting priorities
- However, a problem emerges when trying to estimate possible health gains of smoking cessation:
 - relapse rates, disease risks and thus health gains not only depend on age, but also on time since smoking cessation
- Solution: introducing time since cessation next to age in simulation model

Methodology

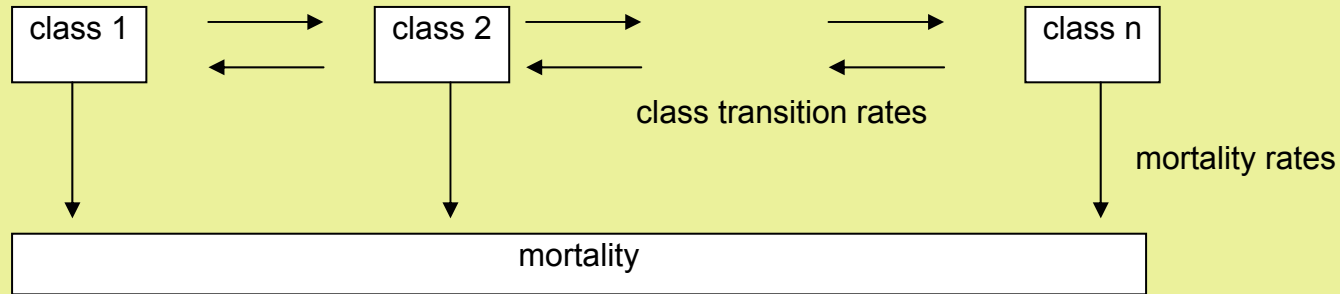
- Introduction of RIVM Chronic Disease Model (CDM) as starting simulation model for quantifying the effects
- Application of CDM on smoking

RIVM Chronic Disease Model (CDM)

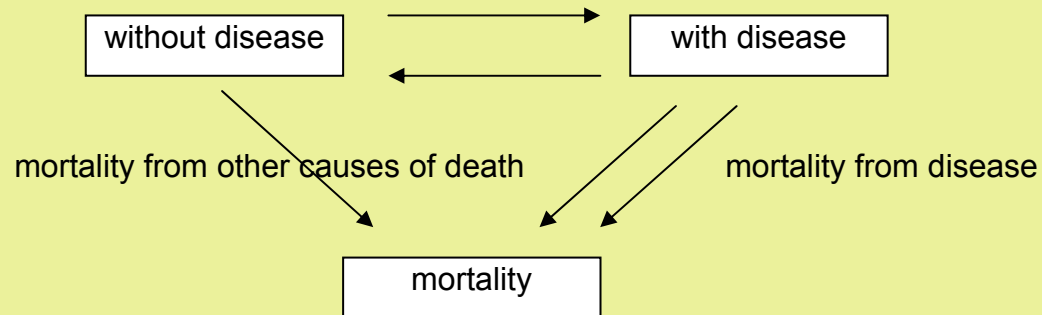
- CDM is a multi-state Markov-type simulation model to describe the changes of morbidity and mortality from several chronic diseases resulting from changes of several risk factor in the Dutch population
- Methodology:
 - Life course of cohorts are modeled
 - Model states are defined by risk factor class and by disease state
 - Change of state prevalence rates are modeled through transitions between states (state-transition, Markov-type)
 - Disease incidence rates depend on risk factor levels
 - Mortality rates depend on disease status
 - All transition rates are specified by gender and age

• State-transition structure of CDM

Transitions between risk factor classes



Transitions between disease states



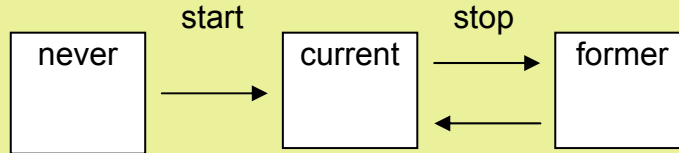
Application of CDM on smoking

- That means:

- selection of risk factor smoking and all smoking-related diseases
- standard CDM version: smoking cessation and disease incidence rates dependent on age
- new CDM version: rates dependent on time since smoking cessation

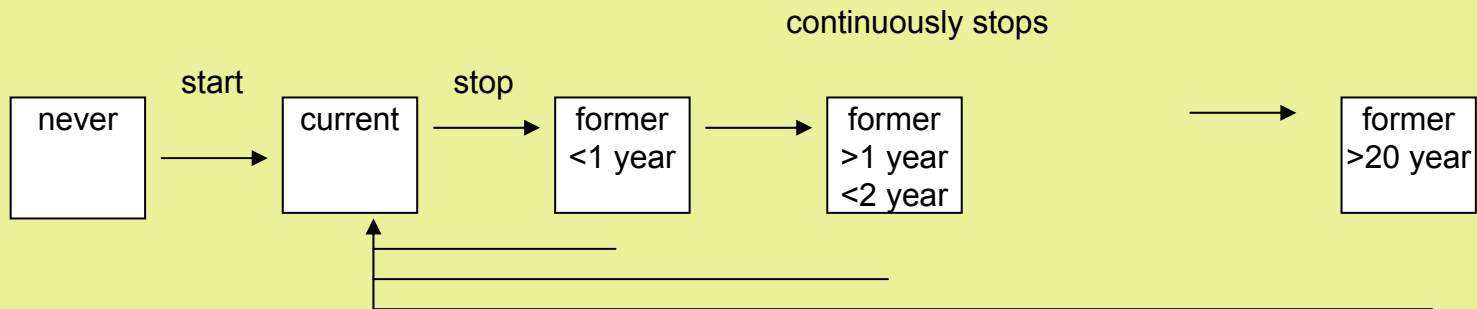
- Model structure:

- In case of age-dependent rates:



relapse rates depend on age

- In case of time-dependent rates:



relapse rates depend on time since smoking cessation

Data used

- Data on smoking behaviour from retrospective survey
 - initial distribution over never/current/former smoking classes
 - age-dependent start, stop and relapse rates
 - relapse rates dependent on time since smoking cessation
- Disease data from registries in general practice and cancer registries
 - disease-related excess mortality rates (DisMod)
- Relative risks from literature
 - relative risks for disease incidence
 - dependent on age
 - dependent on time since smoking cessation
- Disability weights from Dutch Burden of Disease Study
 - disability weights specified by disease to quality-adjust life years

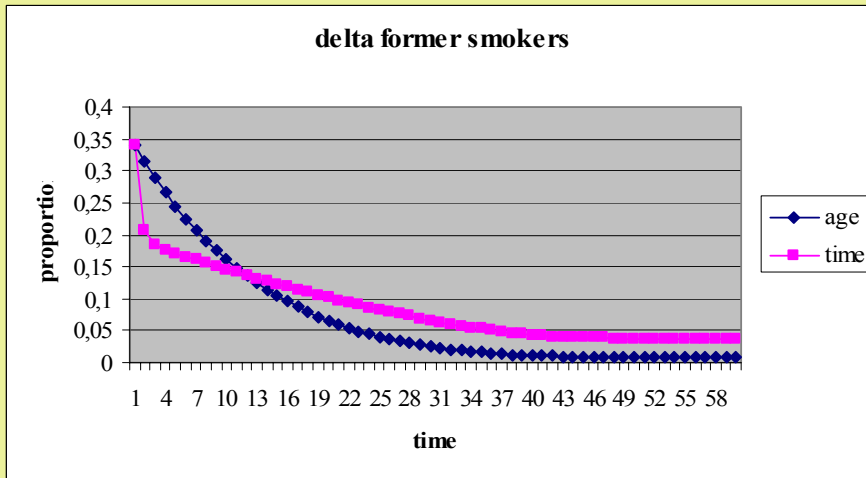
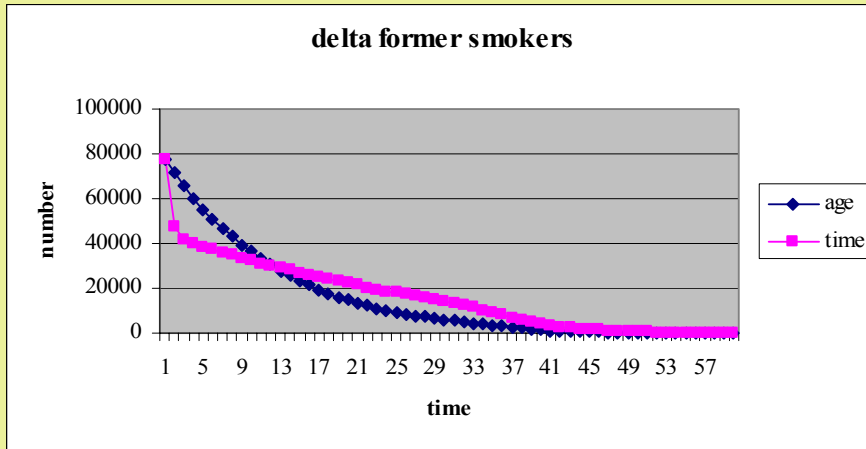
Analyses and results

- Two scenarios on 50 years old current smokers:
 - (1) current practice
 - (2) all current smokers quit at start of simulation period
- Two models: relapse rates and disease incidence rates that depend on
 - (1) age
 - (2) time since smoking cessation
- Results: effects of smoking cessation on:
 - (1) life years gained
 - (2) smoking prevalence numbers
 - (3) disease incidence numbers

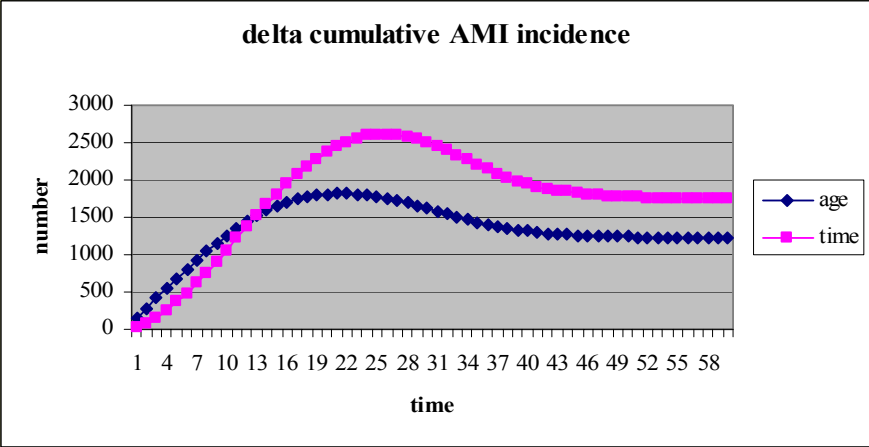
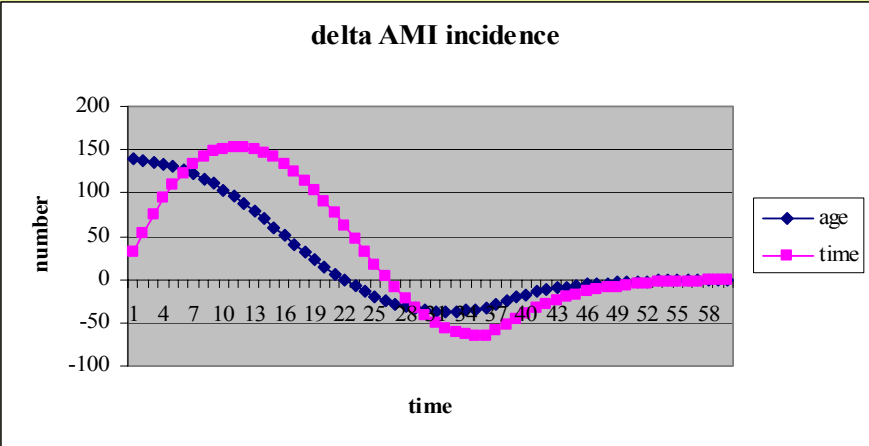
- Life years gained for any quitter

	dependency model	age	time
total		1,2	2,0
quality-adjusted			
smoking-related diseases only		1,4	2,5
all diseases (# 71)		1,2	2,0

- Former smoking prevalence numbers and rates



Current and cumulative incidence numbers of acute myocardial infarction (AMI)



Conclusions and discussion

Not taking into account smoking cessation time results in biased effect measures of interventions

Results from simulation models can be sensitive to assumptions regarding the model structure, i.e. transition rates for former smokers that depend on age or on time since cessation

Sensitivity results are not uniform, e.g. they depend on the outcome variable and time horizon chosen

More complex models require more detailed data, e.g. relative risks used for second model were specified by age **and** by time since smoking cessation

- Colleagues involved with this CDM application

RIVM PZO P van Baal, T Feenstra, R Hoogenveen

RIVM VTV N Hoeijmans,

RIVM IMA H Boshuizen,

StiVoRo M Willemsen,