EConDA Conference

Brussels
22 September 2015

#EConDAconf
www.econdaproject.eu

This presentation arises from the project EConDA which has received funding from the European Union in the framework of the Health Programme

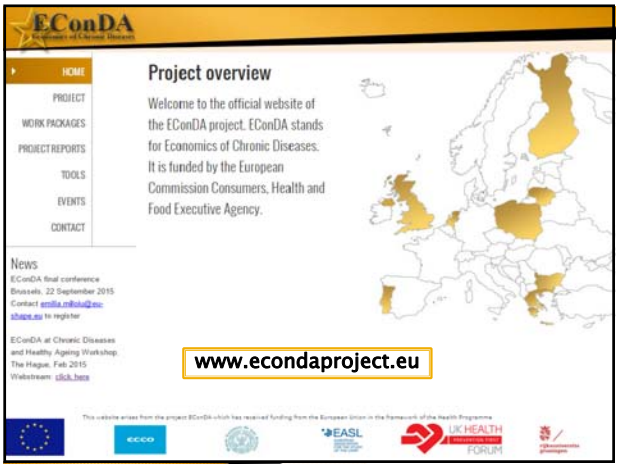
EConDA

Key objectives

- Aid EU member states to develop, select, implement more cost-effective policies to improve chronic disease prevention
- Reduce health inequalities in chronic disease prevalence

Partners

- Associated partners
- Collaborating partners



Specific objectives

1. Achieve consensus on the **methodology** for measuring cost-effectiveness of chronic disease interventions
2. Develop an **epidemiological** disease model
3. Develop a demonstration model for integrated approaches to address **cost-effectiveness** of various interventions for **chronic disease prevention**
4. Implementation of the model in **specific** countries
5. **Validation** of the model
6. Publish and **disseminate** an evaluation of the study
7. Develop a demonstration model of **integrated approaches** to address cost-effectiveness of various interventions, in particular the differential effects of interventions on various sub groups

Countries and diseases

Country	Diseases
Bulgaria	Type 2 diabetes
Finland	COPD
Greece	CKD
Lithuania	CHD
Netherlands	Stroke
Poland	Hypertension
Portugal	
UK	

Outline of the day

- The value of NCD modelling and the role of EConDA
- Review of cost effectiveness methods
- Consensus on standardisation of cost effective studies
- Presentation of the disease model
- Presentations of the cost effectiveness simulation model and related simulation tools
- Feedback from national workshops with interventions testing
- Concrete applications for policy makers at EU and national level

Acknowledgments

- European Commission – CHAFEA
- Project partners and collaborating partners
- Country collaborators
- Participants

The value of NCD modelling and the role of EConDA

Prof. Klim McPherson

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EConDA

What is NCD modelling?

- Computer model that simplifies reality
- Estimates the extent different inputs (e.g. behaviours) affect different outcomes (e.g. disease).
- NCD modelling estimates the extent to which one or more risk factor (e.g. smoking and obesity) affects the incidence of NCDs.

The value of NCD modelling

Eur J Epidemiol (2014) 29:867–870
DOI 10.1007/s10654-014-9978-0

COMMENTARY

The Brighton declaration: the value of non-communicable disease modelling in population health sciences

Laura Webber · Oliver T. Mytton · Adam D. M. Briggs · James Woodcock · Peter Scarborough · Klim McPherson · Simon Capewell

87% deaths due to NCDs in Europe

How will the burden change over time?

What are the effects of policy interventions?

Modelling is key for resource planning, surveillance, responding to the NCD epidemic

Methods – What is microsimulation?

- A range of different methods used
- Microsimulation methods simulate a virtual population.
- Reproduce the characteristics and behaviour of a large sample of individuals
- Characteristics can evolve over the life course, for example births, exposure to risk factors.
- ….

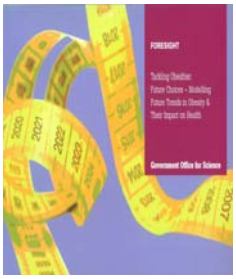
Why microsimulation?

- Best method for risk factor and chronic disease modelling by the OECD (Oderkirk, 2012).
- Can simulate entire populations.
- Offer flexibility to test a range of 'what if' policy scenarios related to prevention, treatment and the organisation and financing of care.
- more capable of answering a greater variety of challenging policy questions.
- Take account of history – which matters when considering NCDs.
- Account for dynamical changes in risk factors over time.

Toward a New Comprehensive International Health and Health Care Policy Decision Support Tool

Where we started

McPherson K, Marsh T, Brown M. *Foresight tackling obesities: Future choices – modelling future trends in obesity and the impact on health.* Foresight Tackling Obesities, 2007: Future Choices http://www.foresight.gov.uk.



Reports and papers

Cost Effectiveness modelling

NICE National Institute for Health and Care Excellence

Managing overweight and obesity among children and young people: lifestyle weight management services

Overview and resources | Guidance | Download | Share | Print

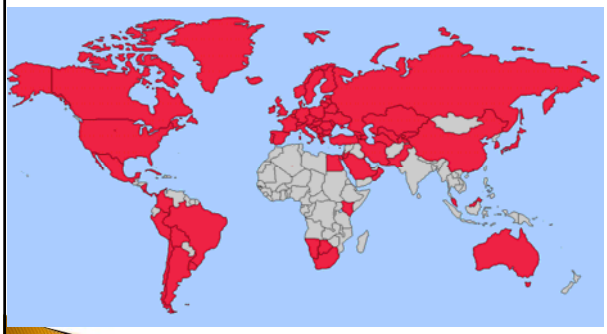
NICE guidelines [PH47] Published date: October 2013

Managing overweight and obesity in adults – lifestyle weight management services

Overview and resources | Guidance | Download | Share | Print

NICE guidelines [PH53] Published date: May 2014

Work throughout the World



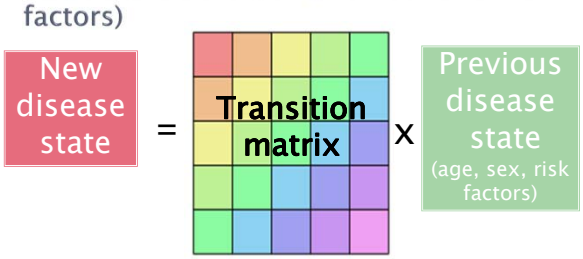
Further development – EConDA

- Extended existing microsimulation to include **multi-stage** diseases
- Includes the ability to test **prevention, screening** and **treatment** interventions within **the same** model
- Tests the cost-effectiveness of a range of policy interventions across 8 countries
- Monitors future burden of behavioural risk factors by social groups
- Provides **tools** for use by policy makers to make the case for prevention policies for NCDs

The future

- Multi-risk, multi-stage disease model to include:
  - Additional diseases (cancers, liver disease)
  - Additional combined risk factors (alcohol, salt, physical activity, cholesterol)
- New data

The future: Multiple disease and disease stage transitions (for given sex and risk factors)



Each individual state is updated each year. The probability of getting a disease, dying from a disease. Age increases by 1 year each year.

EConDA WorkShop

Economics of Chronic Diseases

This presentation arises from the project EConDA which has received funding from the European Union in the framework of the Health Programme

WP4: Consensus

- EConDA Work Package 4: consensus building of methodology for measuring cost-effectiveness of interventions to prevent, screen and treat chronic diseases.
- Literature review, qualitative interviews and a consensus meeting

WP4: 3 phases

- Phase 1: literature review on cost-effectiveness of interventions to prevent, screen, treat COPD, CHD, CKD, T2DM
- Phase 2: Qualitative study – interviews with experts (n=13)
- Phase 3: expert meeting, form a consensus

RUG1

Review of Cost-Effectiveness Methods

Basic methodology

- Several methods are available to do health-economic evaluations.
- Cost-consequence analysis and budget impact are non-informative for our purpose.

Basic methodology

- Cost-benefit analysis (CBA)
  - INMB = λ * Δ Health – Δ Costs
  - INMB > 0 → Cost-effective
- Cost-effectiveness analysis (CEA)
  - ICER = Δ Costs / Δ Health
  - ICER < threshold → Cost-effective

Slide 4

RUG1 To set the date:
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RUG, 30/08/2007

Thresholds: consensus

- EConDA does not make CE assessment
  - No threshold is given
- Instead: simply report outcomes.
- Therefore CBA not useful for EConDA

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WHO Threshold

- In order to compare outcomes today: WHO has proposed a threshold of 3 times the GDP per capita (approximates, 2013):
  - Bulgaria: лв 33.000 / QALY

WHO Threshold

- In order to compare outcomes today: WHO has proposed a threshold of 3 times the GDP per capita (approximates, 2013):
  - Lithuania: € 58.000 / QALY

WHO Threshold

- In order to compare outcomes today: WHO has proposed a threshold of 3 times the GDP per capita (approximates, 2013):
  - Netherlands: € 106.000 / QALY

WHO Threshold

- In order to compare outcomes today: WHO has proposed a threshold of 3 times the GDP per capita (approximates, 2013):
  - Poland: zł 225.000 / QALY

WHO Threshold

- In order to compare outcomes today: WHO has proposed a threshold of 3 times the GDP per capita (approximates, 2013):
  - Portugal: € 62.000 / QALY

WHO Threshold

- WHO has proposed a threshold of 3 times the GDP per capita (approximates, 2013):
  - Bulgaria: лв 33.000 / QALY
  - Finland: € 90.000 / QALY
  - Greece: € 59.000 / QALY
  - Lithuania: € 58.000 / QALY
  - Netherlands: € 106.000 / QALY
  - Poland: zł 225.000 / QALY
  - Portugal: € 62.000 / QALY
  - UK: £ 73.000 / QALY

Cost-effectiveness analysis

- EConDA therefore uses cost-effectiveness analysis (CEA).
- N.B.: most other methods are (relatively) easily added afterwards, if deemed necessary, since they mostly require the same data.

Perspectives: theory

- Healthcare system: considers costs and outcomes associated with providing care without differentiating between categories of providers and payers.
- Societal perspective: broadest possible perspective, includes all costs and consequences, regardless of who experiences them.

Source: cdc.org

Cost categorization

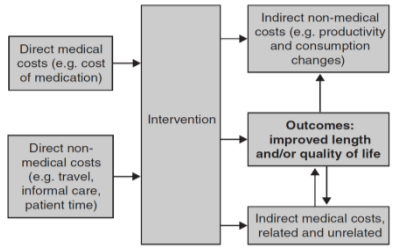

Fig. 1. Different costs in economic evaluations as input in and resulting from an intervention.

Rappange (2008)

Perspectives: consensus

- Where possible: societal perspective
- Different kinds of costs are presented separately.
- When possible:
  - Include absenteeism/presenteeism.
  - Friction cost method, instead of human capital.

Perspectives

- Literature review: societal perspective in 16 / 134 studies (12%)
- So, in practice societal perspective is not often taken into account.

Literature review

- Societal perspective in:
  - Prevention of T2DM: 2/12 studies
  - Screening for T2DM: 0 / 11 studies
  - Management of T2DM: 0 / 2 studies
  - Prevention of CHD: 6 / 46 studies
  - Screening for CHD: 4 / 8 studies
  - Treatment of CHD: 0 / 11 studies
  - Prevention of COPD: 1 / 15 studies
  - Screening for COPD: 0 / 2 studies
  - Management of COPD: 2 / 11 studies
  - Prevention of CKD: 0 / 1 studies
  - Screening for CKD: 1 / 9 studies
  - Management of CKD: 0 / 6 studies

Two ways of costing

- Costing of a lump sum:
  - How much does an intervention cost in total?
  - From literature; apply exchange rates/PPPs.
- Costing of resource use:
  - What resources are used in the intervention?
  - What are the unit costs (prices) of each unit?

Indirect costs: consensus

- Human-capital (HC): patient's perspective and counts any hour not worked as lost.
- Friction-cost (FC): employer's perspective, and only counts as lost those hours not worked until another employee takes over.
- Most countries use HC methodology.
  - Dutch guidelines: friction costs.

Interventions

- Models were build to accommodate several types of interventions:
  - Screening
  - Lifestyle interventions
  - Prevention
  - Treatment

Screening, lifestyle, prevention: consensus

- Prefer lump sum pricing over resource use costing.
  - Latter needs a very specific description of what is done, and this is very (health) system specific.
- Alternative: expert opinion

Treatment: consensus

- Best option: resource use costing
  - Dosage: same as for source of efficacy data.
  - Administration/dispensing partly country-specific.
  - Country specific unit prices

Discount rates: consensus

- Use country-specific discount rates
- Possible source: HE guidelines for each country.

RUG1

Applying the consensus

Data availability

- A possible lack of (and limitations to) available data was discussed by the qualitative interviews.
  - E.g.: 'it is necessary to get prospective data which is very difficult, its very limited in our countries'

PV1

Cost Data

Cost Data: Bulgaria

	Bulgaria (BG)		
Direct cost	cost/pop-yr	cost/patient-yr	source
CHD	120,345,292	5,767	NL proxy, European Cardiovascular Disease Statistics 2012
CKD	x	360	NL proxy
CKD (stage 1)	x	242	NL proxy
CKD (stage 2)	x	242	NL proxy
CKD (stage 3)	x	363	NL proxy
CKD (stage 4)	x	472	NL proxy
CKD (stage 5)	x	472	NL proxy
ESRD	x	131,567	NL proxy
COPD	901,398,506	2,209	NL proxy
COPD (stage 1)	x	1,065	NL proxy
COPD (stage 2)	x	2,497	NL proxy
COPD (stage 3)	x	8,166	NL proxy
COPD (stage 4)	x	8,166	NL proxy
Hypertension	x	306	NL proxy
Stroke	97,191,626	43,195	NL proxy, European Cardiovascular Disease Statistics 2012
T2DM	x	901	IDF Atlas poster 2014
IGT	x	127	NL proxy
Indirect cost	cost/pop-yr	cost/patient-yr	source
CHD	299,942,663	14,374	NL proxy, European Cardiovascular Disease Statistics 2012
CKD	x	14,374	Assumed equal to CHD
COPD	x	10,742	UK proxy
Hypertension	x	444	NL proxy
Stroke	205,550,760	91,777	NL proxy, European Cardiovascular Disease Statistics 2012
T2DM	x	457	NL proxy
IGT	0	0	Assumption
Economic parameters			
Currency unit	Bulgarian Lev		
Cost year	2010		
Discount rate for cost	3.0%		
Discount rate for outcomes (health)	3.0%		
Power purhasing parity (PPP)	x		
Harmonised consumer price index (HCPI)	✓		
Working age range	x		
Average disposable income, by sex & age	GPI proxy		

Cost Data: Lithuania

	Lithuania (LT)		
Direct cost	cost/pop-yr	cost/patient-yr	source
CHD	64,138,623	2,995	NL proxy, European Cardiovascular Disease Statistics 2012
CKD	x	197	NL proxy
CKD (stage 1)	x	132	NL proxy
CKD (stage 2)	x	132	NL proxy
CKD (stage 3)	x	199	NL proxy
CKD (stage 4)	x	258	NL proxy
CKD (stage 5)	x	258	NL proxy
ESRD	x	66,527	NL proxy
COPD	463,715,821	1,147	NL proxy
COPD (stage 1)	x	553	NL proxy
COPD (stage 2)	x	1,296	NL proxy
COPD (stage 3)	x	4,250	NL proxy
COPD (stage 4)	x	4,250	NL proxy
Hypertension	x	159	NL proxy
Stroke	39,338,325	22,532	NL proxy, European Cardiovascular Disease Statistics 2012
T2DM	x	827	IDF Atlas poster 2014
IGT	x	66	NL proxy
Indirect cost	cost/pop-yr	cost/patient-yr	source
CHD	165,869,376	7,750	NL proxy, European Cardiovascular Disease Statistics 2012
CKD	x	7,750	Assumed equal to CHD
COPD	x	5,562	UK proxy
Hypertension	x	253	NL proxy
Stroke	66,878,857	37,848	NL proxy, European Cardiovascular Disease Statistics 2012
T2DM	x	419	NL proxy
IGT	0	0	Assumption
Economic parameters			
Currency unit	€		
Cost year	2013		
Discount rate for cost	5.0%		
Discount rate for outcomes (health)	5.0%		
Power purhasing parity (PPP)	✓		
Harmonised consumer price index (HCPI)	✓		
Working age range	x		
Average disposable income, by sex & age	EE proxy		

Slide 26

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RUG, 30/08/2007

Slide 28

PV1 Put in a new picture, with latest data, and without the selected column.
Afraid it'll be unreadable. I also added extra slides for each of the workshop countries, which are hidden, but can be unhidden for the country where we give the presentation
P. Vemer, 26/08/2015

Cost Data: Netherlands

Netherlands (NL)			
Direct cost	costpop-yr	costpatient-yr	source
CHD	1.735.982.448	3.832	European Cardiovascular Disease Statistics 2012; Kosten van zieiten in Nederland
CKD	*	236	Expert opinion
CKD (stage 1)	*	159	Expert opinion
CKD (stage 2)	*	159	Expert opinion
CKD (stage 3)	*	238	Expert opinion
CKD (stage 4)	*	310	Expert opinion
CKD (stage 5)	*	310	Expert opinion
ESRD	*	79.846	Boersma et al. Clin Thera 2010
COPD	437.409.820	1.319	Suijkerbuijk et al. NTvG 2012; RIVM Maatschappelijke kosten voor Astma
COPD (stage 1)	*	538	Suijkerbuijk et al. NTvG 2012; RIVM Maatschappelijke kosten voor Astma
COPD (stage 2)	*	1.491	Suijkerbuijk et al. NTvG 2012; RIVM Maatschappelijke kosten voor Astma
COPD (stage 3)	*	4.887	Suijkerbuijk et al. NTvG 2012; RIVM Maatschappelijke kosten voor Astma
COPD (stage 4)	*	4.887	Suijkerbuijk et al. NTvG 2012; RIVM Maatschappelijke kosten voor Astma
Hypertension	*	193	Kosten van zieiten in Nederland
Stroke	1.486.205.849	27.326	Hoogendoorn et al. NTvG 2006
T2DM	*	5.230	IDF Atlas poster 2014
IGT	*	83	Expert opinion
Indirect cost	costpop-yr	costpatient-yr	source
CHD	2.147.685.204	4.495	European Cardiovascular Disease Statistics 2012; Kosten van zieiten in Nederland
CKD	*	4.495	Assumed equal to CHD
COPD	*	6.396	UK proxy
Hypertension	*	172	European Cardiovascular Disease Statistics 2012; Kosten van zieiten in Nederland
Stroke	1.071.550.249	19.662	European Cardiovascular Disease Statistics 2012; Kosten van zieiten in Nederland
T2DM	*	2.551	IDF Atlas poster 2014, https://www.idf.org/sites/default/files/Atlas-poster-2014_EN.pdf.
IGT	0	0	Assumption
Economic paramters			
Currency unit		€	
Cost year		2013	
Discount rate for cost		4.0%	
Discount rate for outcomes (health)		1.5%	
Power purhasing parity (PPP)		✓	
Harmonised consumer price index (HCPI)		✓	
Working age range		*	
Average disposable income, by sex & age		✓	

Cost Data: Poland

Poland (PL)			
Direct cost	costpop-yr	costpatient-yr	source
CHD	4.462.113.744	7.874	NL proxy; European Cardiovascular Disease Statistics 2012
CKD	*	521	NL proxy
CKD (stage 1)	*	350	NL proxy
CKD (stage 2)	*	350	NL proxy
CKD (stage 3)	*	525	NL proxy
CKD (stage 4)	*	683	NL proxy
CKD (stage 5)	*	683	NL proxy
ESRD	*	175.933	NL proxy
COPD	1.133.129.295	3.515	NL proxy
COPD (stage 1)	*	1.454	NL proxy
COPD (stage 2)	*	3.408	NL proxy
COPD (stage 3)	*	11.175	NL proxy
COPD (stage 4)	*	11.175	NL proxy
Hypertension	*	418	NL proxy
Stroke	2.653.995.380	59.244	NL proxy; European Cardiovascular Disease Statistics 2012
T2DM	*	3.357	IDF Atlas poster 2014
IGT	*	184	NL proxy
Indirect cost	costpop-yr	costpatient-yr	source
CHD	9.308.247.319	16.425	NL proxy; European Cardiovascular Disease Statistics 2012
CKD	*	16.425	Assumed equal to CHD
COPD	*	14.624	UK proxy
Hypertension	*	513	NL proxy
Stroke	4.840.995.396	106.062	NL proxy; European Cardiovascular Disease Statistics 2012
T2DM	*	1.702	NL proxy
IGT	0	0	Assumption
Economic paramters			
Currency unit		zł	
Cost year		2013	
Discount rate for cost		5.0%	
Discount rate for outcomes (health)		3.5%	
Power purhasing parity (PPP)		✓	
Harmonised consumer price index (HCPI)		✓	
Working age range		*	
Average disposable income, by sex & age		✓	

Cost Data: Portugal

Portugal (PT)			
Direct cost	costpop-yr	costpatient-yr	source
CHD	207.363.232	2.682	NL proxy; European Cardiovascular Disease Statistics 2012
CKD	*	175	NL proxy
CKD (stage 1)	*	118	NL proxy
CKD (stage 2)	*	118	NL proxy
CKD (stage 3)	*	177	NL proxy
CKD (stage 4)	*	230	NL proxy
CKD (stage 5)	*	230	NL proxy
ESRD	*	59.169	NL proxy
COPD	379.801.445	1.027	NL proxy
COPD (stage 1)	*	495	NL proxy
COPD (stage 2)	*	1.151	NL proxy
COPD (stage 3)	*	3.807	NL proxy
COPD (stage 4)	*	3.807	NL proxy
Hypertension	*	198	NL proxy
Stroke	167.846.010	26.181	NL proxy; European Cardiovascular Disease Statistics 2012
T2DM	*	1.515	IDF Atlas poster 2014
IGT	*	62	NL proxy
Indirect cost	costpop-yr	costpatient-yr	source
CHD	496.405.220	6.421	NL proxy; European Cardiovascular Disease Statistics 2012
CKD	*	6.421	Assumed equal to CHD
COPD	*	4.962	UK proxy
Hypertension	*	147	NL proxy
Stroke	396.175.708	46.431	NL proxy; European Cardiovascular Disease Statistics 2012
T2DM	*	768	NL proxy
IGT	0	0	Assumption
Economic paramters			
Currency unit		€	
Cost year		2013	
Discount rate for cost		5.0%	
Discount rate for outcomes (health)			
Power purhasing parity (PPP)		✓	
Harmonised consumer price index (HCPI)		✓	
Working age range		*	
Average disposable income, by sex & age		✓	

Assumptions regarding Cost data

- Consistency between sources is lacking.
- E.g.: two different sources for direct costs of T2DM in The Netherlands (2013)

IDF Atlas Poster 2014	Van der Heijden et al. 2014
€ 5,230	€ 2,873

Human capital vs Friction Cost

- Data found show mostly HC, only FC for COPD in The Netherlands
- HC used for all countries, for consistency
- FC methodology can be implemented if data issues are solved.

Human capital vs Friction Cost

- Note:
  - European Cardiovascular Disease Statistics 2012 basis indirect costs CHD, Stroke and Hypertension for all countries.
  - Based on a study that used FC for the lost productivity due to morbidity, and HC for lost productivity due to the mortality.
  - (As yet unpublished.)

Assumptions regarding Cost data

- No estimates were found for indirect cost of CKD
- They were therefore assumed equal to the indirect cost of CHD

Assumptions regarding Cost data

- Data availability is a big issue.
- UK and NL:
  - Pharmacoeconomics part of decision process
  - Years of experience with collecting cost data, e.g. "Kosten van Ziekten"[Cost of Illness] study in NL.
- Almost no data was found for BG, FI, GR, LT, PL and PT.
- Proxy data (mostly based on NL) was used where necessary.

Assumptions regarding Cost data

- Data collection is an ongoing project.

Interventions: 3 broad categories

- Pharmaceutical/Medical interventions
  - E.g.: ACE-inhibitors, smoking cessation
- Screening
- Lifestyle/policy interventions
  - E.g. Exercise, tax on cigarette packages

Source of costs (HE guidelines)

- NL: Official reference price list.
- UK:
  - England/Wales: Current official listing (Department of Health and/or Welsh Assembly Government).
  - Scotland: Reflect Scottish context, or a UK setting.
- FI: Reflect Finnish conditions.

Source of costs (HE guidelines)

- PT: Market prices. Alternatively, DRGs or convention tables as the approximate price of health care (shadow prices) or fixing standard cost.
- PL: Consistent with payer perspective.
- Baltic: Adapt local cost.
- BG/GR: no guidelines

Discount rates

- No HE guidelines for BG
- Used 3%
  - Based on (Greek papers) Athanakis, Clin Ther 2015, Athanakis, Rheumatol Int 2015, Makras Osteoporos Int 2015.

Discount rates

- HE guidelines NL: 1.5% outcomes, 4% costs

Discount rates

- HE guidelines Baltic states: 5%

Discount rates

- HE guidelines PL: 3.5% outcomes, 5% costs

Discount rates: HE guidelines

- PT: 5%

Discount rates: HE guidelines

- NL: 1.5% outcomes, 4% costs
- UK:
  - England/Wales: 3.5%
  - Scotland: 1.5% outcomes, 6% costs
- FI: 3%
- PL: 3.5% outcomes, 5% costs
- PT/Baltic: 5%
- BG/GR: no guidelines.
  - Used 3%
  - Based on Athanakis, Clin Ther 2015, Athanakis, Rheumatol Int 2015, Makras Osteoporos Int 2015.

Intervention cost: Screening for albuminuria

- Population is screened for the presence of albuminuria.
- Those with elevated albumin receive treatment, which leads to lower probability to worse CKD.

- Costs based on Dutch study.

Intervention costs: Roflumilast for severe COPD

- Roflumilast is a COPD treatment option, as an add-on to other (usual care) medication.
- Available for some time, not reimbursed in most countries.

- Costs based on daily treatment with 500 mg.
- Reduction in costs, due to less exacerbations, based on Dutch study.
- Lower probability of going from severe to very severe COPD.

Presentation of the disease model: WP5

Dr. Martin Brown

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This presentation arises from the project EConDA which has received funding from the European Union in the framework of the Health Programme

EConDA

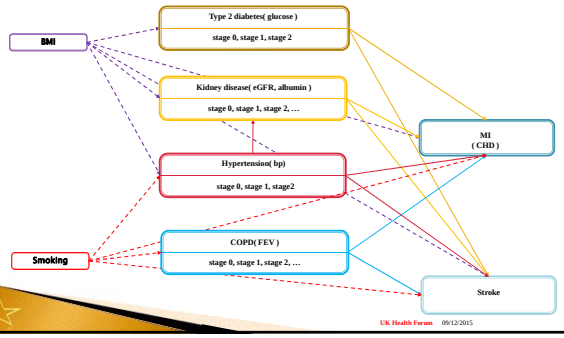
WP5: Development of the disease model

- Develop an epidemiological disease model
  Obesity and smoking to 2050
  COPD, CHD, T2DM, CKD
- Test in 8 EU member states
  Bulgaria, Finland, Greece, Netherlands, Lithuania, Poland, Portugal, UK

EConDA WP5: Brussels 2015 \ context

- →Continued development of UKHF Multiple Interacting Disease and Risk Factor model→(MIDRiF)
- (MIDRiF) → EConDA tool (not a microsimulation but otherwise the same structures and methods)
- Specific disease models (COPD, CHD,..) are implemented as instances of general disease structures
- Diseases can be **multi risk, multi state** and **interacting**

Risk factor + Disease (Stage) Interactions



ECONDA (UKHF\MIDRiFS) System Architecture

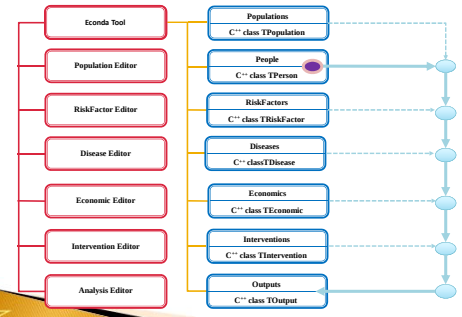
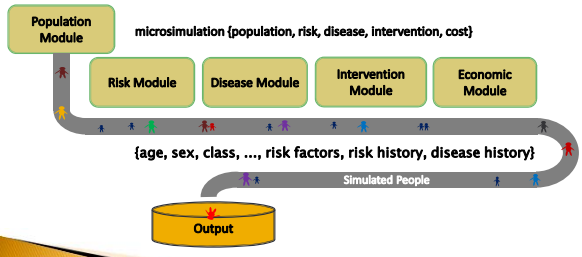


Diagram of the microsimulation model



Population distributions

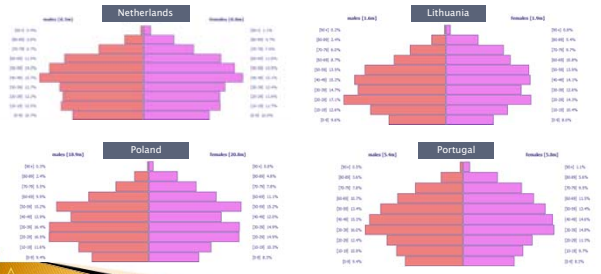
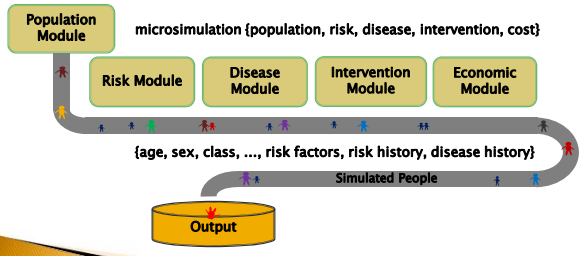
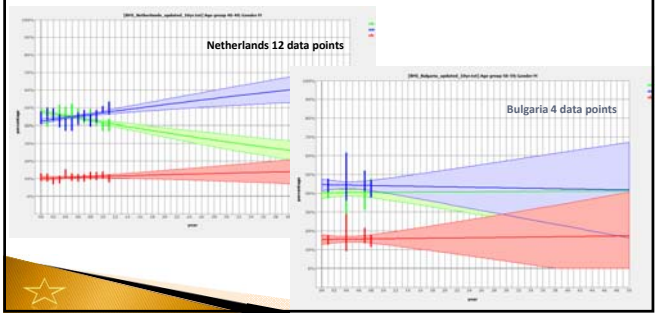


Diagram of the microsimulation model

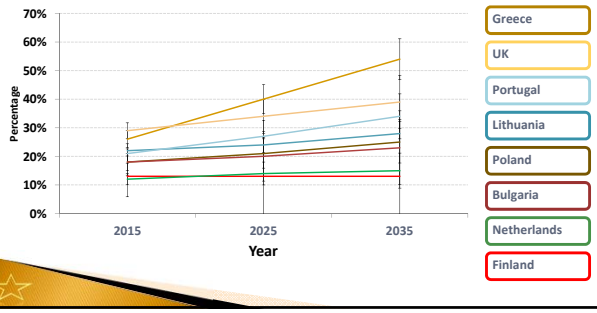


BMI projections: UK males (14 data points)

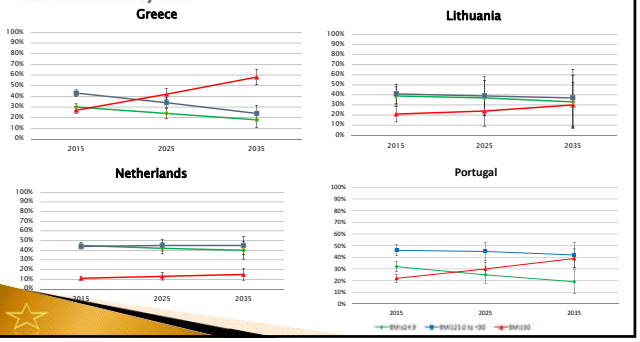
BMI projections: 50-50yr old males



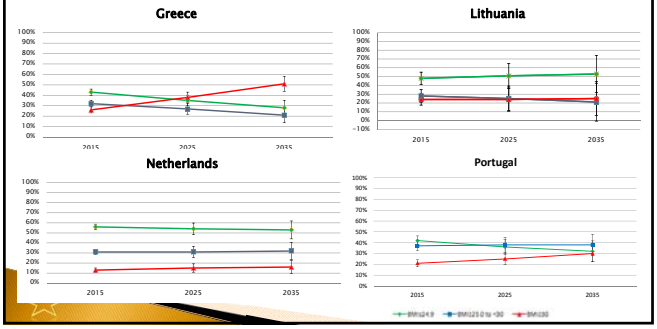
Obesity projections - 8 countries



Males 20-100years



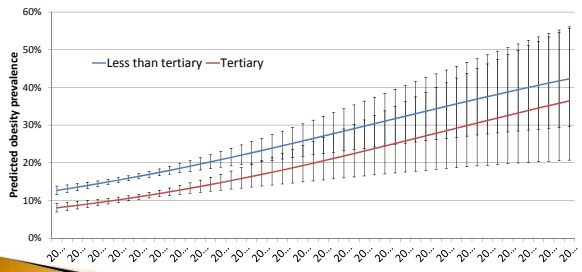
Females 20-100years



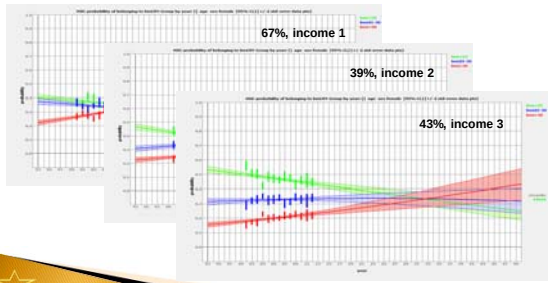
SES data by BMI

Country	Education*BMI	Income*BMI
Bulgaria	X	X
Finland	√	X
Greece	√	X
Lithuania	√	X
Netherlands	√	X
Poland	√	X
Portugal	X	X
UK	√	√

Finland –obesity projections by education, females

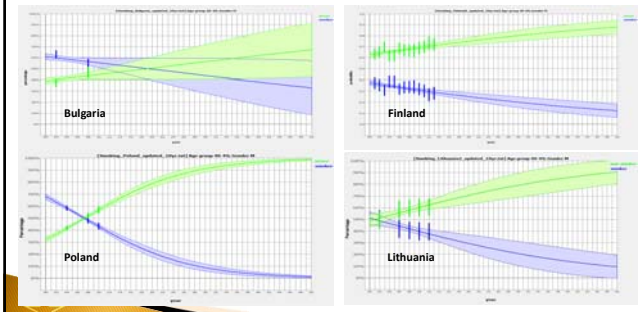


Female, UK 20-100, Income 1,2,3

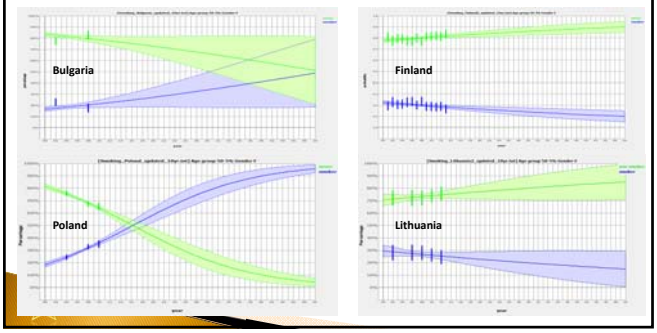


SMOKING

Projected smoker prevalence 40-49yr olds males



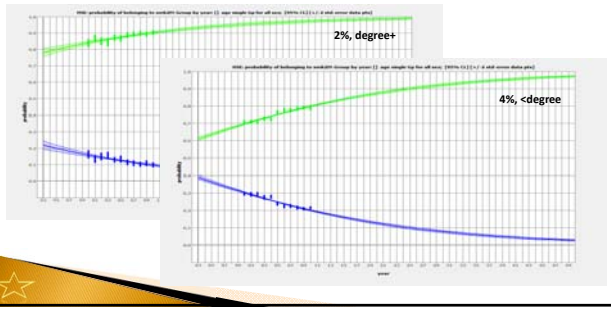
Projected smoker prevalence – 50-59yr old females



SES data by Smoker status

Country	Education*Smk	Income*Smk
Bulgaria	X	X
Finland	√	X
Greece	√	X
Lithuania	√	X
Netherlands	√	X
Poland	√	X
Portugal	X	X
UK	√	√

Smoking education group, Female, UK



ECONDA (+MIDRiFS) Multiple Relative Risk structure

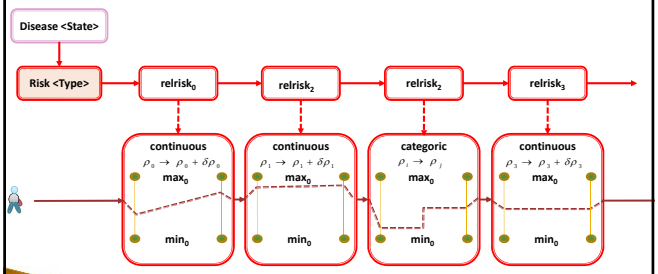
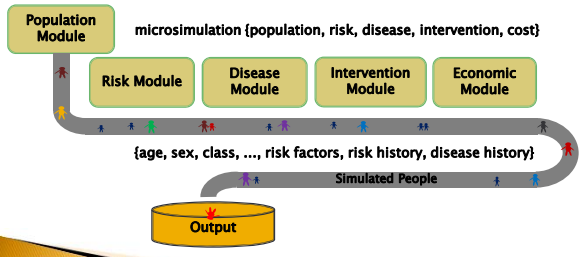
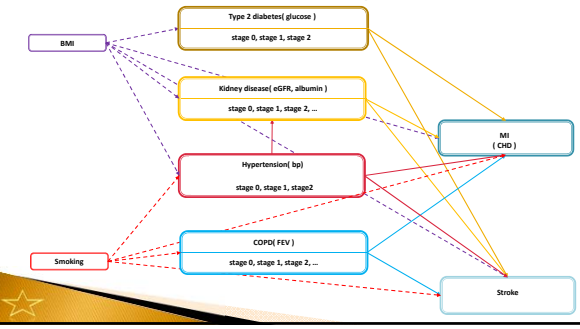


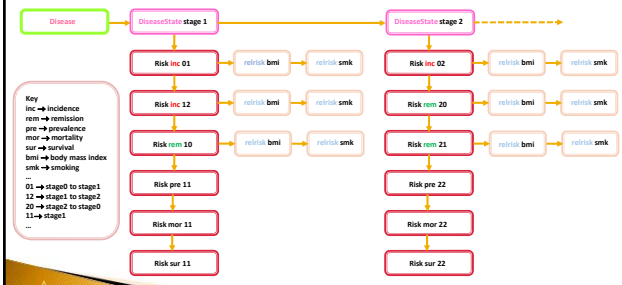
Diagram of the microsimulation model



EConDA WP5: Risk factor + Disease (Stage) Interactions



ECONDA multistate disease: risk architecture



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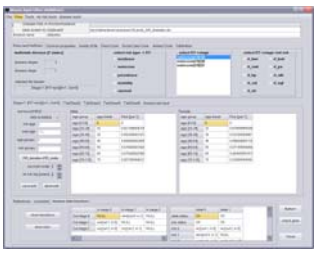
Data collection

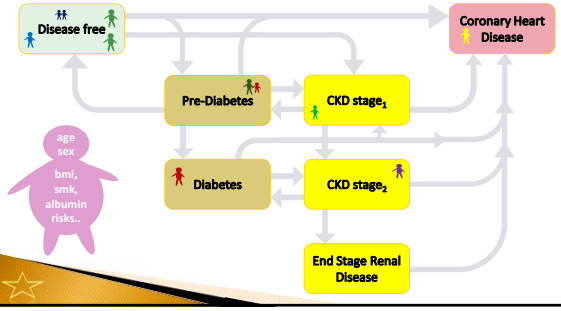
Country/nr of data points

Diseases	BL	GR	FL	LT	NL	PL	PT	UK
CHD								
incidence			2011	2012	2007			2010
prevalence	2007	2006	2011	2010	2007	2009		2010
mortality	2012	2008	2011	2012	2011	2008	2008	2010
case fatality/survival			2011	mid 80s	2007	2009	2008	2010
IGT								
incidence								
prevalence	2012	2012	2012	2012	2012	2012	2012	2012
Type 2 diabetes								
incidence				2012	2000			2010
prevalence	2012	2012	2012	2012	2012	2012	2012	2012
mortality	2012	2012	2012	2012	2012	2012	2012	2012
COPD								
incidence				2012	2007			2005
prevalence	2008	2008	2011	2010	2007	2009	2008	2008
mortality	2012	2008	2008	2012	2008	2008	2008	2010
case fatality/survival	can use aggregate data from meta-analyses							
Kidney disease								
incidence				2012	2008			1994
prevalence					2008	2009		2010
mortality	2012			2012				
case fatality/survival								

Multi Stage Disease \ Data Input Editor

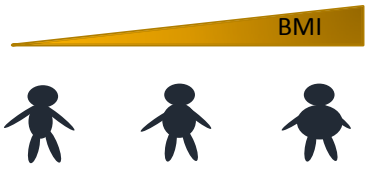


Multi-stage diseases & CHD and … Interventions



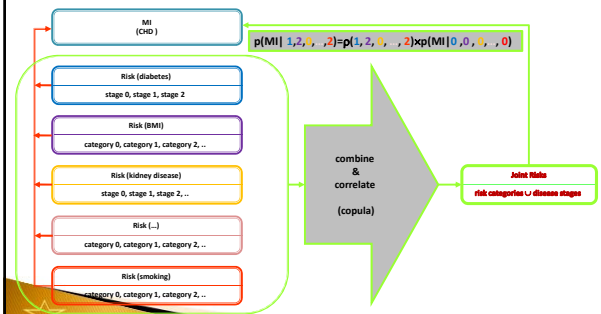
Example: PRE-DIABETES RELATIVE RISKS

Impaired Fasting Glucose (IFG) ≥6.1 and <7 mmol/L



Normal Weight 18.5 – 24.9 kg/m²	Pre-obesity 25 – 29.9 kg/m²	Obesity ≥ 30 kg/m²
1	1.46 (± 0.02)	3.62 (± 0.04)

EConDA Heart Disease & Stroke model …



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Multi (correlated) risk, multi-stage disease+cost model

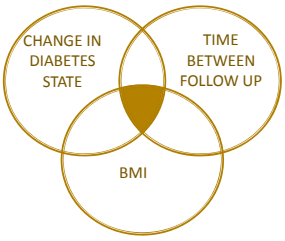
Conclusion - Data collection – Limitations- next steps

- Risk factors by education and income over time
- Stage dependent disease transition data (Diabetes, COPD and CKD) are difficult to uncover
- Stage dependent relative risk data (more longitudinal datasets needed)
- Time lags between RF and disease
- EConDA is not over – more data are available
- EConDa 2 could profitably exploit the structures Correlations

End

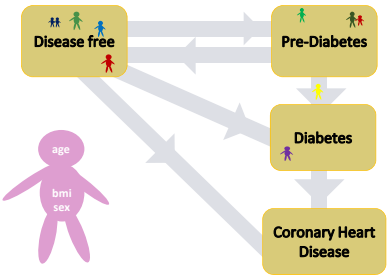
PREVEND a longitudinal study

- The **PREVEND longitudinal study** was used to approximate **relative risks**.
- Study contained **~4200 participants** over **four follow ups**.
- The **duration** between a follow up varied for each **individual** between 1 and 5 years.
- Variables such as **BMI**, **IFG**, and the use of **medication** to regulate glucose levels were monitored.

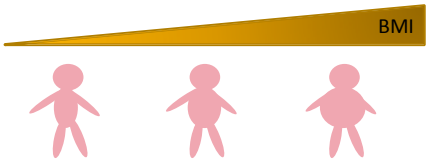


Multi-stage diabetes & CHD

- **BMI categories**
  - Healthy weight
  - Overweight
  - Obese
- **Diabetes disease stages**
  - Normoglycaemia
  - Pre-diabetes
  - Diabetes



DIABETES RELATIVE RISKS
defined as an impaired fasting glucose (IFG) ≥7 mmol/L



Normal Weight 18.5 – 24.9 kg/m²	Pre-obesity 25 – 29.9 kg/m²	Obesity ≥ 30 kg/m²
	1.37 (± 0.04)	7.60 (± 0.18)
1	2.39 (± 0.11)	2.73 (±0.12)

Presentations of the cost effectiveness simulation model and related simulation tools: WP6

Dr Abbygail Jaccard

#EConDAconf
www.econdaproject.eu

This presentation arises from the project EConDA which has received funding from the European Union in the framework of the Health Programme

EConDA

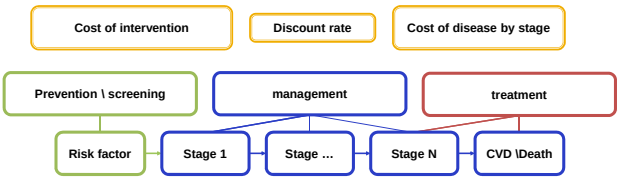
WP6: Development of the cost-effectiveness model

OBJECTIVES
- Develop a **demonstration model** of cost-effectiveness
- Develop a **tool** to evaluate the cost-effectiveness of an **intervention** applied to a **cohort** of interest.

ACTIVITIES
- **Collection** of cost-effectiveness and intervention **data**
- **Implement** and **simulate** various interventions
- Implement the model in **7 EU countries**

DELIVERABLES
- Develop a cost-effectiveness simulation model and tool.

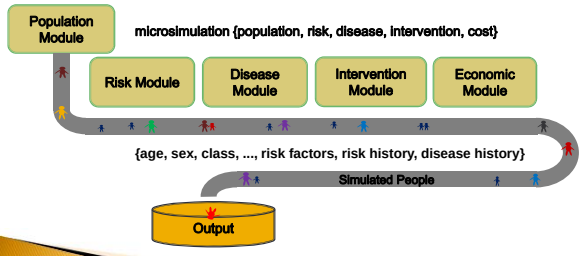
Cost-effectiveness of interventions



Outputs: prevalence, incidence, QALY, DALY, total health care cost, indirect cost, ICER

Proxy data (NL, UK) general cost-of-illness study, as the RIVM has performed for The Netherlands since 2003

Diagram of the microsimulation model



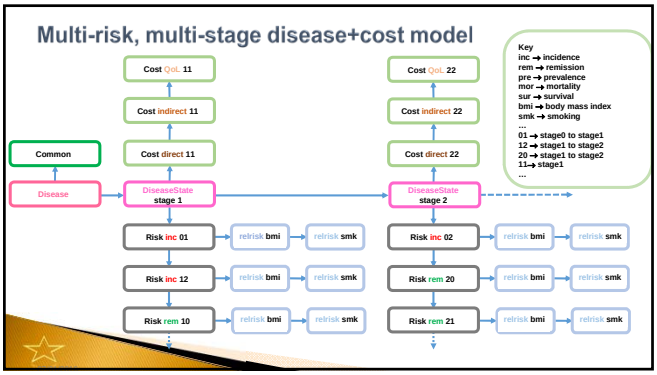
Interventions

- Hypothetical e.g. 1% or 5% reduction in BMI
- Policy interventions
- Prevention, screening and treatment

Disease data and stages

Epidemiological data	Disease data stage transition
inc → incidence	01 → stage0 to stage1
rem → remission	12 → stage1 to stage2
pre → prevalence	20 → stage1 to stage2
mor → mortality	11→ stage1
sur → survival	
bmi → body mass index	
smk → smoking	
…	
…	

Multi-risk, multi-stage disease+cost model



Interventions modelled in EConDA

Upstream
- Sugar-sweetened beverage tax (SSB tax)

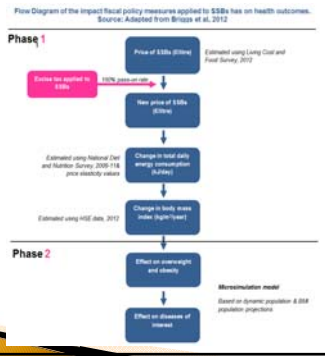
Community-based prevention
- Multi-component lifestyle interventions
- Smoking cessation services

Screening
- Albumin screening for chronic kidney disease

Treatment
- Romiflast for COPD

Hypothetical
- 'What if' scenarios

SSB Tax



SSB Tax

Country	Mean reduction in BMI (kg/m^2)
Bulgaria	-0.01
Finland	-0.01
Greece	-0.01
Lithuania	0
Netherlands	-0.02
Poland	-0.01
Portugal	-0.01
UK	-0.05

Multi-component lifestyle interventions (MCLI)

- Definition:

A programme that aims to **reduce a person's energy intake** and help them to be more physically active by **changing their behaviour** (NICE, 2013).

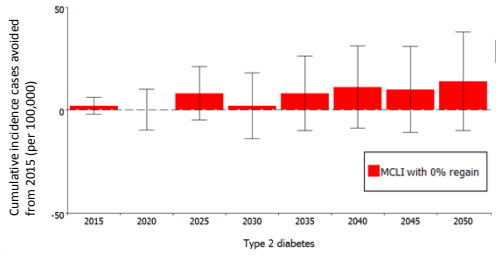
A MCLI must include the following components:
- Diet
- Physical activity
- Behavioural therapy (for example, counselling, goal setting, action planning, barrier identification and problem solving, self-monitoring of behaviour, feedback)

MCLI - assumptions

Country	Reduction in BMI*	% BMI lost regained after 5 years	Cost of intervention per patient
Greece	0.6	100	175 Euros
UK	0.7	100	£91.87
Finland	1.6	100	110 Euros (Proxy)
Netherlands	1.1	100	110 Euros (Proxy)
Portugal	2.2	100	110 Euros
Lithuania	Greece Proxy	Greece Proxy	Greece Proxy
Poland	Greece Proxy	Greece Proxy	Greece Proxy
Bulgaria	Greece Proxy	Greece Proxy	Greece Proxy

* Absolute units of BMI; reduction in intervention group at 12 moths for UK, Finland, Netherlands and Portugal and at 3 months for Greece

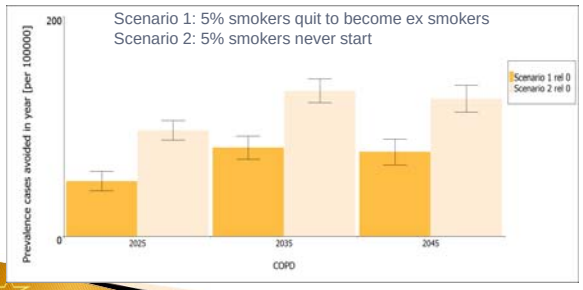
UK Results – cumulative incidence cases avoided



Smoking cessation scenario (hypothetical)

- What if 5% smokers became ex-smokers (smoking cessation)
- What if 5% smokers had never started
- Poland as an example

Poland COPD prevalence: cases avoided



The downloadable tool (WP6)

- Downloadable tool
- Deterministic model
- Download here: econdaproject.eu
- Survey monkey: https://www.surveymonkey.com/r/EConDATool

Tool: Deterministic person(s) simulation

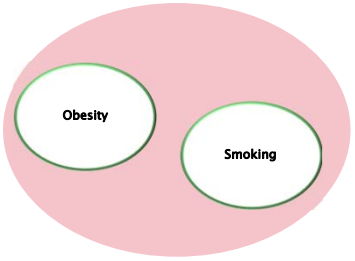
Deterministic simulation of individual person & groups of individuals

Person=person(age, sex, class, education, ..., risk factors, risk history, disease history}

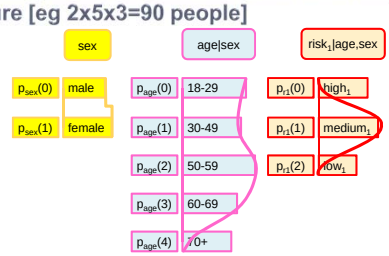
Crucially –identical distributional data and methods as in the micro simulation

Groups (possibly weighted) of persons can be made into cohorts

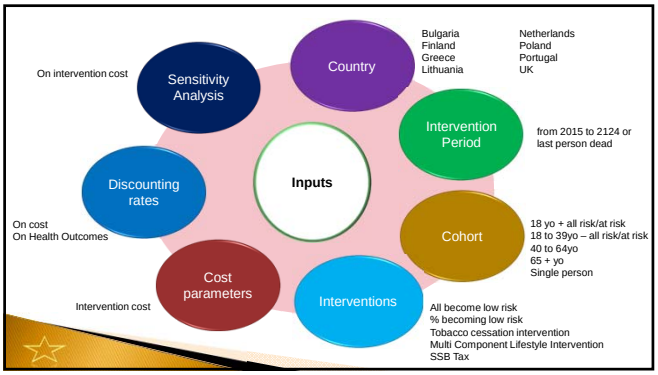
Tool



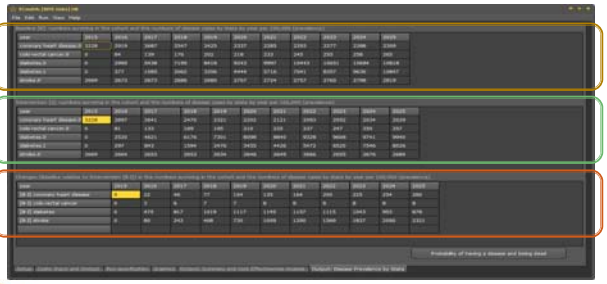
MIDRiFs System Architecture (ECONDA Tool) \ cohort structure [eg 2x5x3=90 people]



cohort member[i, j, k, l] weight = $p_{sex}(i) \times p_{age}(j|i) \times p_{r1}(k|i,j) \times p_{r2}(l|i,j)$
where i∈[0,1], j∈[0,4], k∈[0,2], l∈[0,2]

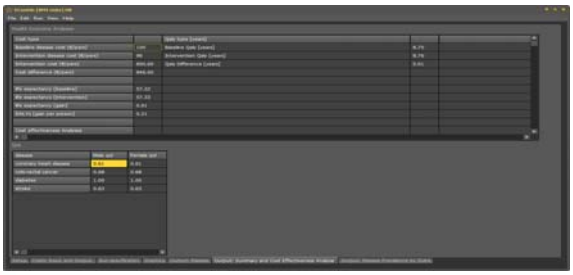


Prevalence of a disease per 100,000



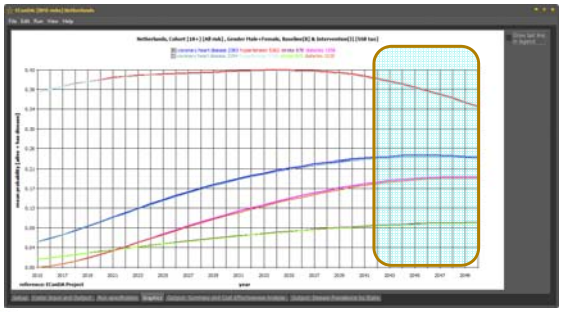
Probability of having a disease

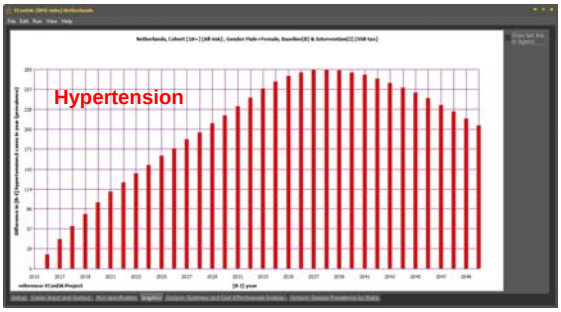
Life expectancy, DALY and Health Economic Analysis

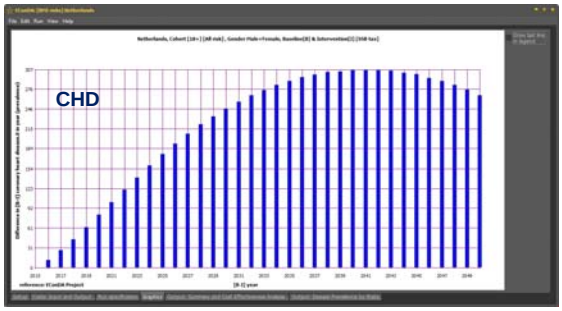


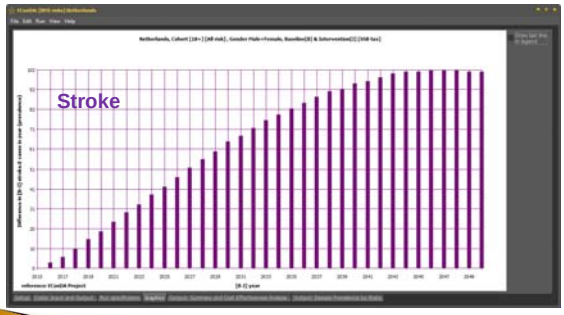
Netherlands: 20% SSB Tax

- Assuming a **0.03% reduction** in the prevalence of **obesity**.
- SSB tax applied to **adults** (≥18 year olds).
- **Cohort** of individuals who are healthy weight, overweight and obese.







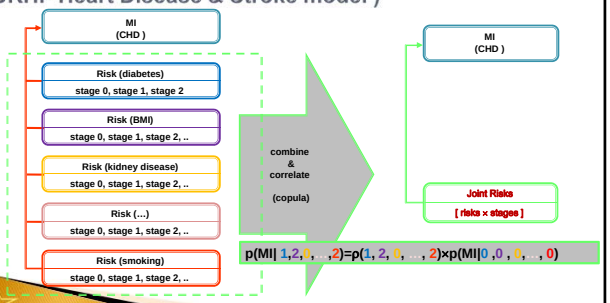


SSB tax in the Netherlands

Key	Value
ICER	-34,800 Euro/qol ➔ DOMINANT
DALY gain per person	0.08 year
Life Expectancy gain per person	0.01 year (from 74.84 year)

Key	Value
Disease Expectancy reduction for CHD	29 days
Disease Expectancy reduction for diabetes	30 days
Disease Expectancy reduction for hypertension	26 days
Disease Expectancy reduction for stroke	9 days

Future work - Multi Risk Diseases (eg MI – EConDA & UKHF Heart Disease & Stroke model)



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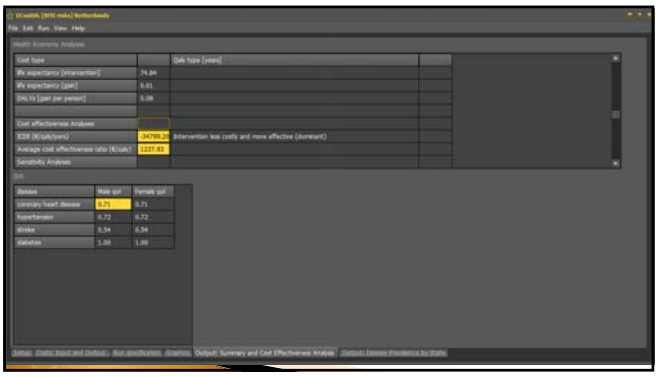
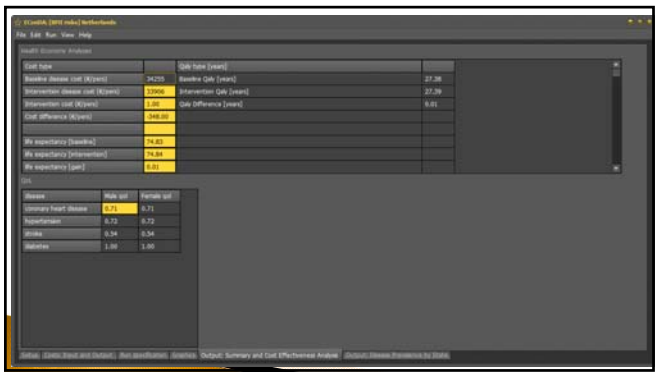
  - Andre Knuchel-Takano
  - Carolina Pérez Ferrer
  - John Murray

SSB Tax

Country	Baseline consumption of SSB (g/day)	Price elasticities for SSBs	Reduction in consumption of SSB (%)	Reduction in consumption of SSBs (g/day)	Reduction in energy intake from SSBs (kJ/day)	Reduction in total energy intake accounting for substitutions (kJ/day)	Reduction in body weight (kg)	Reduction in BMI (kg/m^2)
Bulgaria	19.92	-0.798	-15.96	-3.18	-4.77	-2.86	-0.03	-0.01
Finland	19.74	-0.798	-15.96	-3.15	-4.73	-2.84	-0.03	-0.01
Greece	13.1	-0.798	-15.96	-2.09	-3.14	-1.88	-0.02	-0.01
Lithuania	5.2	-0.798	-15.96	-0.83	-1.25	-0.75	-0.01	0
Netherlands	37.38	-0.798	-15.96	-5.97	-8.95	-5.37	-0.05	-0.02
Poland	19.8	-0.798	-15.96	-3.16	-4.74	-2.84	-0.03	-0.01
Portugal	21.42	-0.798	-15.96	-3.42	-5.13	-3.08	-0.03	-0.01





SSB Tax Results – UK BMI reduction

Baseline	Male			Female			Both		
	NW	OW	OB	NW	OW	OB	NW	OW	OB
2025	23.50%	41.15%	35.35%	33.31%	33.39%	33.30%	28.50%	37.19%	34.30%
2050	17.06%	31.65%	51.30%	25.12%	29.99%	44.89%	21.18%	30.80%	48.02%

SSB	Male			Female			Both		
	NW	OW	OB	NW	OW	OB	NW	OW	OB
2025	23.09%	41.94%	34.97%	33.50%	33.46%	33.04%	28.40%	37.61%	33.99%
2050	12.42%	36.46%	51.12%	19.25%	36.00%	44.76%	15.91%	36.22%	47.86%