DYNAMO-HIA

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On behalf of DYNAMO-HIA team

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Outline of presentation

Part A:

1. Background of the model:
   - Persons and institutions involved; Associated projects; Date of completion; Availability
2. Objective:
   - Target audience; Application spectrum
3. Model structure and principles:
   - Intrinsic (default) data; Data input requirements; Model results; Model validation/evaluation; Model sensitivity
4. Demonstration

Part B:

1. Predefined case

FIRST: What is DYNAMO, what does it do, and how does it work

What is DYNAMO-HIA?

DYNAMO-HIA is a ready-to-use tool to project the effects of changes in risk factor exposure due to policy or intervention on disease-specific and summary measures of population health

- Is generic
- Is dynamic
- Simulates a real life population
- Provides different outcome measures
- Can be used for users without programming skills

Note: It does not calculate how a policy affect risk factor exposure

DYNAMO: how does it work?

DYNAMO-HIA projects how changes in risk factor distribution affect disease-specific and summary measures of population health

- Situation with current risk factor exposure
  = reference scenario
  initial exposure + future transitions
- Situation with changed risk factor exposure
  = intervention scenario
  - change in initial exposure and/or future transitions
- Comparison gives effect of policy action/intervention
  - Disease-specific measures
  - Summary measure of population health

For all age groups
For both genders
For future years!

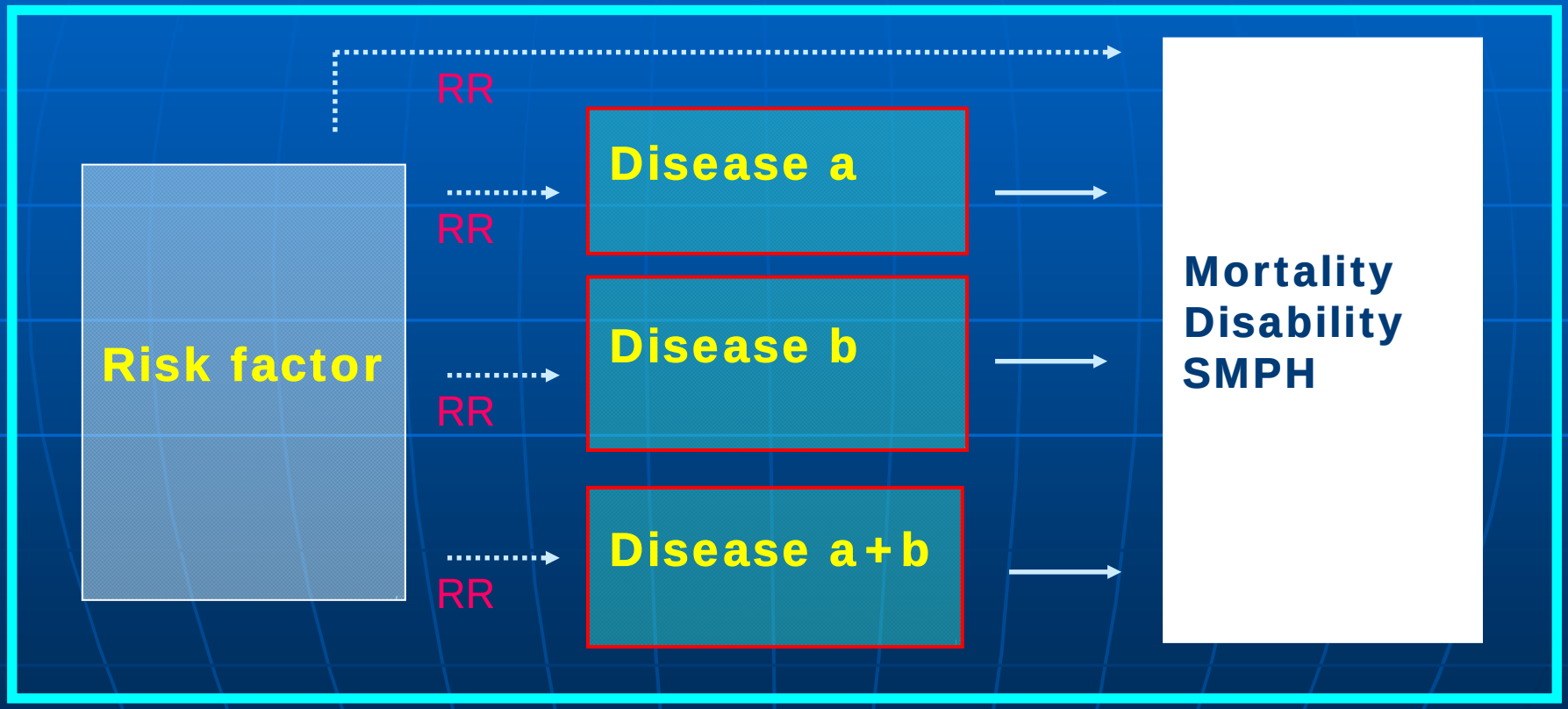
A look behind the scenes

- Standard causal pathway in epidemiology

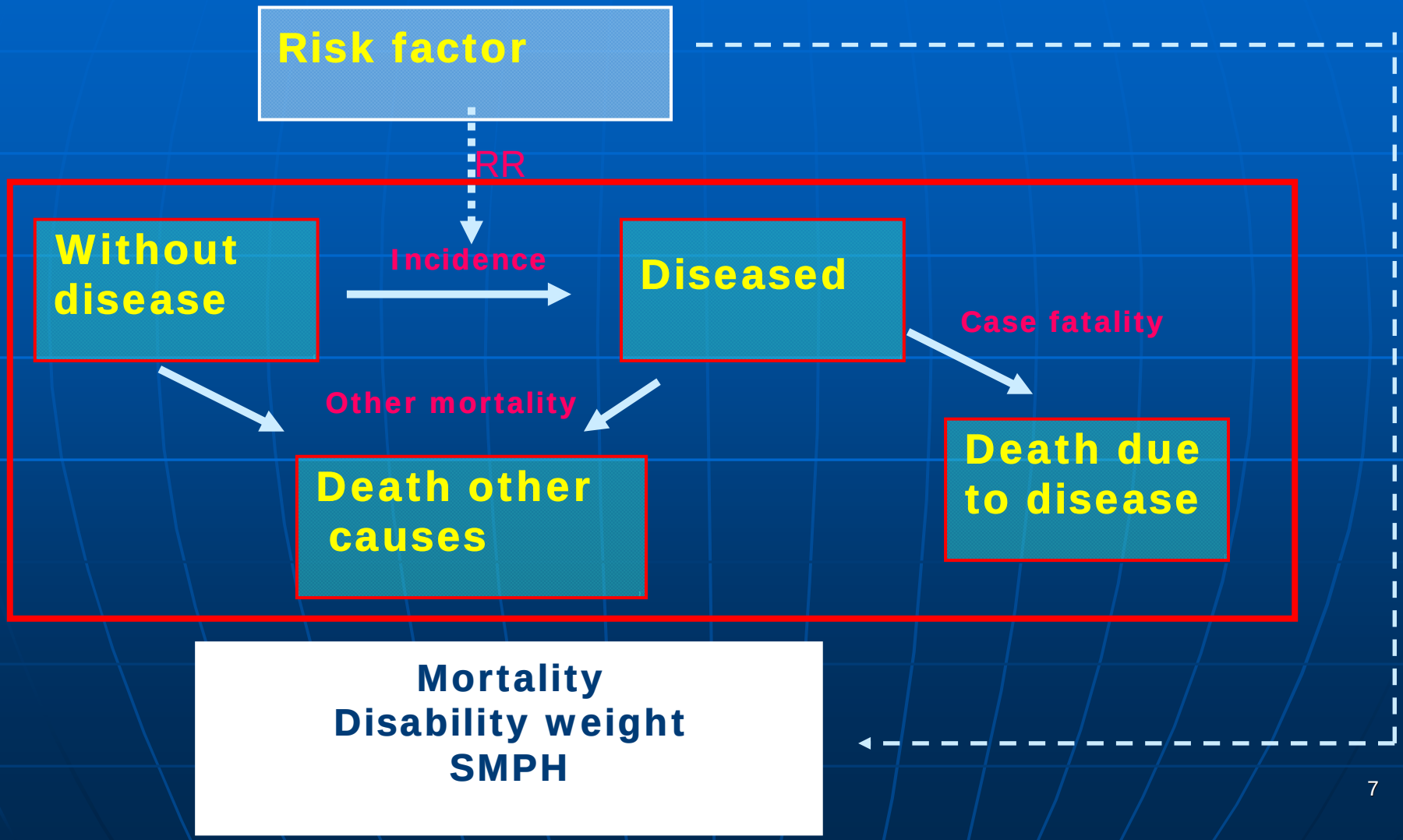
- Markov modeling framework
  - Explicit risk factor states
  - Disease states: incidence, prevalence, mortality
  - Competing risks are taken into account

- Technical realization
  - Discrete time frame using a multi state model (disease process)
  - Dynamic micro simulation (risk factor)

Synthesizing according to causal pathway



Causal pathway in more detail



Part A: Background of the model

1. Persons and institutions involved
2. Associated projects
3. Date of completion
4. Availabiltiy

1. Persons and institutions involved

1. Coordinator: Erasmus MC Rotterdam, the Netherlands

2. Coordinating Center:
   - ErasmusMC, Rotterdam, The Netherlands
     J.P. Mackenbach, W.J. Nusselder, S. Lhachimi, M. Kulik
   - National Institute of Public Health, Bilthoven (RIVM), The Netherlands
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3. Other Associate Partners:
   - Catalan Institute of Oncology, Barcelona, Spain
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   - International Obesity task force, London,UK
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   - London School for Hygiene and Tropical Medicine, London, UK
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   - Haughton Institute, Ireland, Dublin
     K. Bennett
   - Instituto Tumori, Italy, Milan.
     - P. Baili, A. Micheli

2-4: Associated projects, date of completion, availability

2. Associated projects:
   - RIVM: Chronic Disease Model
   - EMC/RIVM: JA EHLEIS: Dynamo-HIA with HLY as outcome (proposal submitted)

3. Date of completion:
   - November 30, 2010 (original April 28, 2010, amendment pending)

4. Availabiltiy
   - Free available from internet (end 2010)
   - Launched: at final conference: EUPHA November 10-13, 2010, Amsterdam, The Netherlands

Target groups and application spectrum

1. Target groups:
   - Directly using the tool: experienced public health official/researcher
   - Using the outcomes of the tool: policy makers, EU officials

2. Application spectrum:
   - Health Impact Assessment
   - Health evaluations of policies and interventions (priority setting)

   -> DYNAMO-HIA starts from change in risk factor exposure, defined by the user

Model structure and principles

1. Intrinsic (default) data
2. Data input requirements
3. Model results
4. Model validation/evaluation
5. Model sensitivity

1. Intrinsic data

For large number of EU countries:

- Population numbers (all MS)
- Projected Newborns (all MS)
- Incidence, prevalence and mortality for 5 cancers, IHD, stroke, COPD, diabetes (10 MS)
- All-cause mortality (all MS)
- All-cause disability (all MS)
- Exposure distribution of smoking (3 categories + time since quitting), BMI (mean, 3 categories, alcohol (5 categories) (at least 18 MS)
- RRs linking exposure to health outcomes (one set)

2. Data input requirements

Type of data

- Population numbers
- Newborns (optional)
- Incidence, prevalence and mortality for relevant diseases
- All-cause mortality
- All-cause disability (optional)
- Exposure distribution of risk factors
- RRs linking exposure to health outcomes

General:

- All data by single-year of age (0-95 years) and sex
- Flexibility in choice risk factor exposure, disease type and transitions between risk factor states

DYNAMO HIA

a Dynamic Model for Health Impact Assessment

…but flexibillity

- Risk factor exposure:
  - Categories: never, current, former smokers
  - Continuous: mean BMI
  - Compound: former smokers by time since quitting
- Diseases: 3 types of disease processes
  - Chronic disease
  - Partly acute fatal disease
  - Disease with cured fraction
- Transitions between risk factor states:
  - Approximation assuming net transitions
  - Approximation assuming zero transitions
  - User-defined transitions

and population-based data

Tool back-calculates from population-based data

Data need is not:

- Incidence of diabetes in 40 year old women with overweight

Often not available

But data need is:

- Incidence of diabetes in 40 year old women
- % overweight for 40 year old women
- RR association between overweight and diabetes

Available & Used in DYNAMO-HIA

3. Model results

- Future risk factor prevalence
  - By age or calendar year
- Future disease prevalence
  - By age or calendar year
- Future mortality/survival
  - By age or calendar year
- Summary measures of population health
  - Life expectancy
  - Life expectancy with(out) diseases
  - Disability-adjusted Life expectancy
- Structure of population:
  - Age, sex, diseased vs. non-diseased

4. Model validation/evaluation

- Test plan for code verification
- Comparison with excel calculations

- No formal model evaluation conducted but:
  - model structure is well founded in epidemiological evidence and demographic modeling practice
  - Software and source code will be publicly available for cross validation

5. Model sensitivity

Sensitivity:

- Imbalance between incidence, prevalence and mortality will cause implausible projections
  - DISMOD testing of input is needed

Sensitivity analyses:

- No Probabilistic Sensitivity analyses (PSA)
  - One way sensitivity analyses to assess sensitivity of outcomes for input parameters is possible
  - PSA can be built around DYNAMO

But first, let's see how it works

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