Dealing with Uncertainty in Risk-Benefit Analyses: Balancing Health Benefits and Risks

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Helen Owen

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Outline

- Risk-Benefit Analysis
- QALIBRA Project
- QALIBRA Approach
- Case Study: fish
- QALIBRA Software
- Closing Remarks

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Risk-Benefit Analysis

- Changes in diet may pose risks and benefits to consumers
- The balance of risk and benefit is of interest to:
  - food authorities developing food policy and consumer advice
  - businesses developing new food products
  - consumers considering dietary changes

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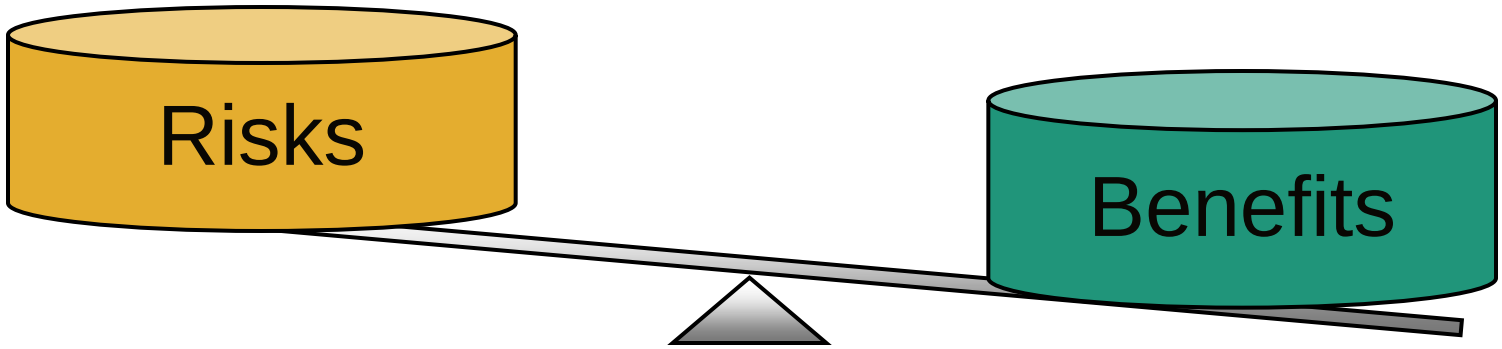
Risk-Benefit Analysis



- Usually, the risks and potential benefits associated with eating a particular food are presented separately
- This is unsatisfactory, because the recipient will not be able to combine the risks and benefits in an objective way
- Information on risk and benefit should be combined to provide an indication of the overall effect of particular dietary choices i.e. the net health impact

Risk-Benefit Analysis

- Risks and benefits may be affected by many sources of variability and uncertainty e.g.

Variability	Uncertainty
Between individuals': • diets • normal life expectancy • duration of health risk or health benefit	Consumption amounts
	Dose-response function/shape
	Disease severity
	Disease duration

- This may cause uncertainty about the direction and magnitude of the net health impact

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QALIBRA Project

- Develop an improved approach to assess the potential net health impacts from dietary choices that takes account of variability and uncertainty
- Implement the approach in web-enabled software
- Develop effective strategies for risk/benefit communication
- Validate through comprehensive case studies on oily fish and functional foods

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QALIBRA Project

QuAlity of Life – Integrated Benefit-Risk Assessment

- Matis (IS, coordinator)
- Food and Environment Research Agency (UK)
- RIVM (NL)
- Wageningen University (NL)
- University of Patras (GR)
- Altagra (HU)
- IPIMAR (PT)
- Website: www.qalibra.eu

FOOD-CT-2006-022957

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QALIBRA Approach

- Various measures of net health impact exist
  - Disability-adjusted life years (DALYs)
  - Quality-adjusted life years (QALYs)
  - Willingness to pay (WTP)
  - Etc.
- Qalibra focussed on **DALYs** (*following WHO,NL*)
- Qalibra tool can also calculate **QALYs**

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QALIBRA Approach

- Years lived with disease: YLD
- Severity of disease: w (DALY weight, 0-1)
- Years of life lost: YLL

$$DALY = YLD \times w + YLL$$

More DALYs bad, less DALYs good…

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QALIBRA Approach

Data Requirements

- Population info (age, sex, etc.)
- Life expectancies
- Intakes*
- Dose-response functions*
- Recovery probabilities*
- Mortality probabilities*
- Disease weights*
- Disease durations*

* Needed for each risk or benefit considered

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QALIBRA Approach

Uncertainty is propagated through multiple columns of values – one per uncertainty iteration

Variability is propagated through multiple rows of values – one per individual

0	0	3.975428	3.975428	3.975428	0	3.975428
0	0	0	1.300451	1.300451	0	1.300451
0.837479	0	0.837479	0	0	0	0
0	1.455588	0	1.455588	0	0	1.455588
0	0	0	0	0	0	0
0	0	0.852039	0.852039	0	0.852039	0.852039
0	2.620807	2.620807	0	0	2.620807	2.620807
2.806523	2.806523	0	2.806523	0	0	2.806523
0	0	0	0	0	0	0

- For every individual, a DALY value is calculated
- QALIBRA repeats this calculation many times, using different combinations of the uncertain values

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QALIBRA Approach

- QALIBRA uses “directly attributable health loss” method
- Takes an average over alternative outcomes for each individual
- Results are an *indication* of the *potential* average annual health impact of a long-term* dietary change
  - Reflect knowledge & assumptions used
  - Limited by what is unknown or excluded

*steady-state

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Case Study: fish

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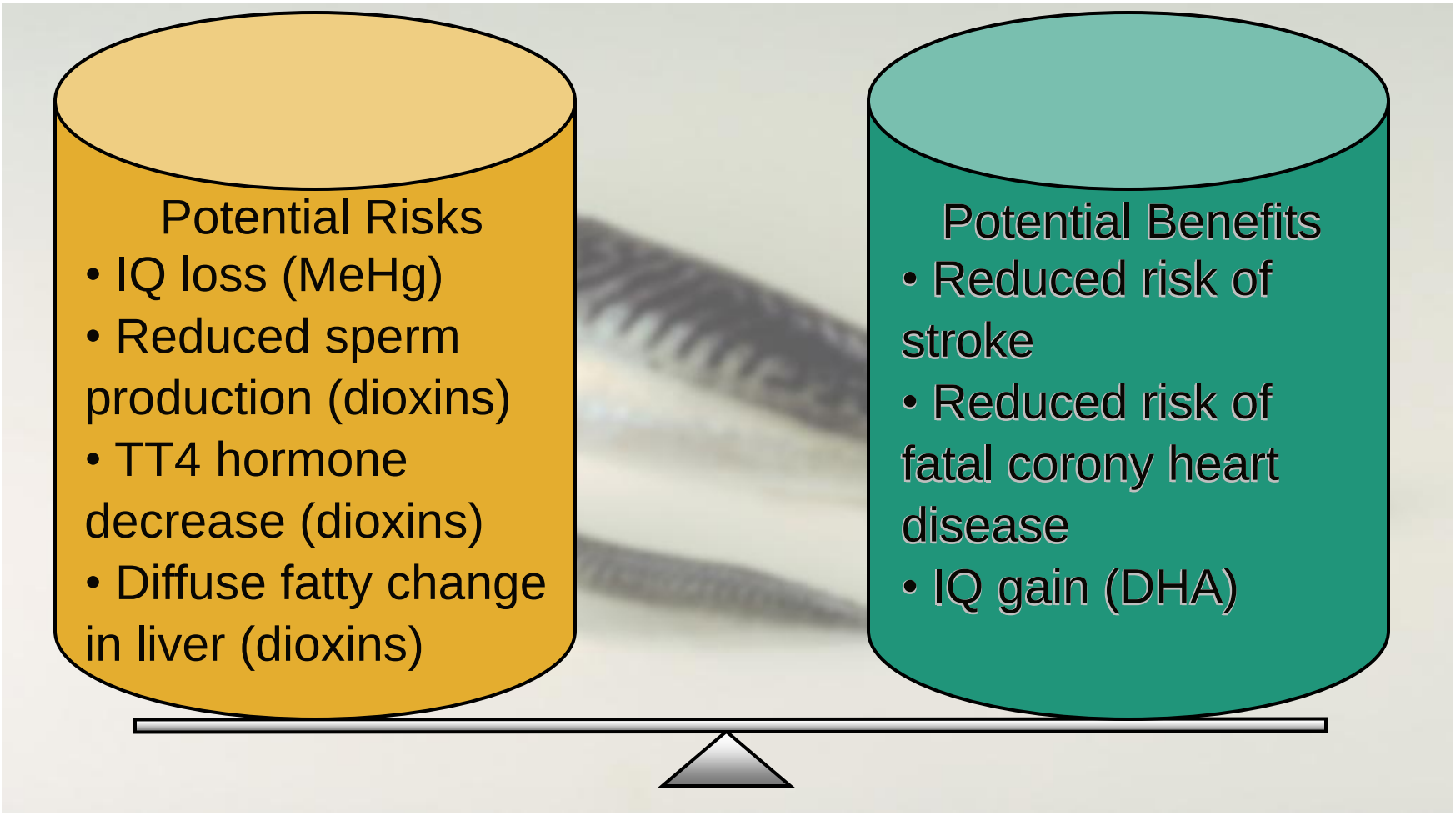
Case Study: fish



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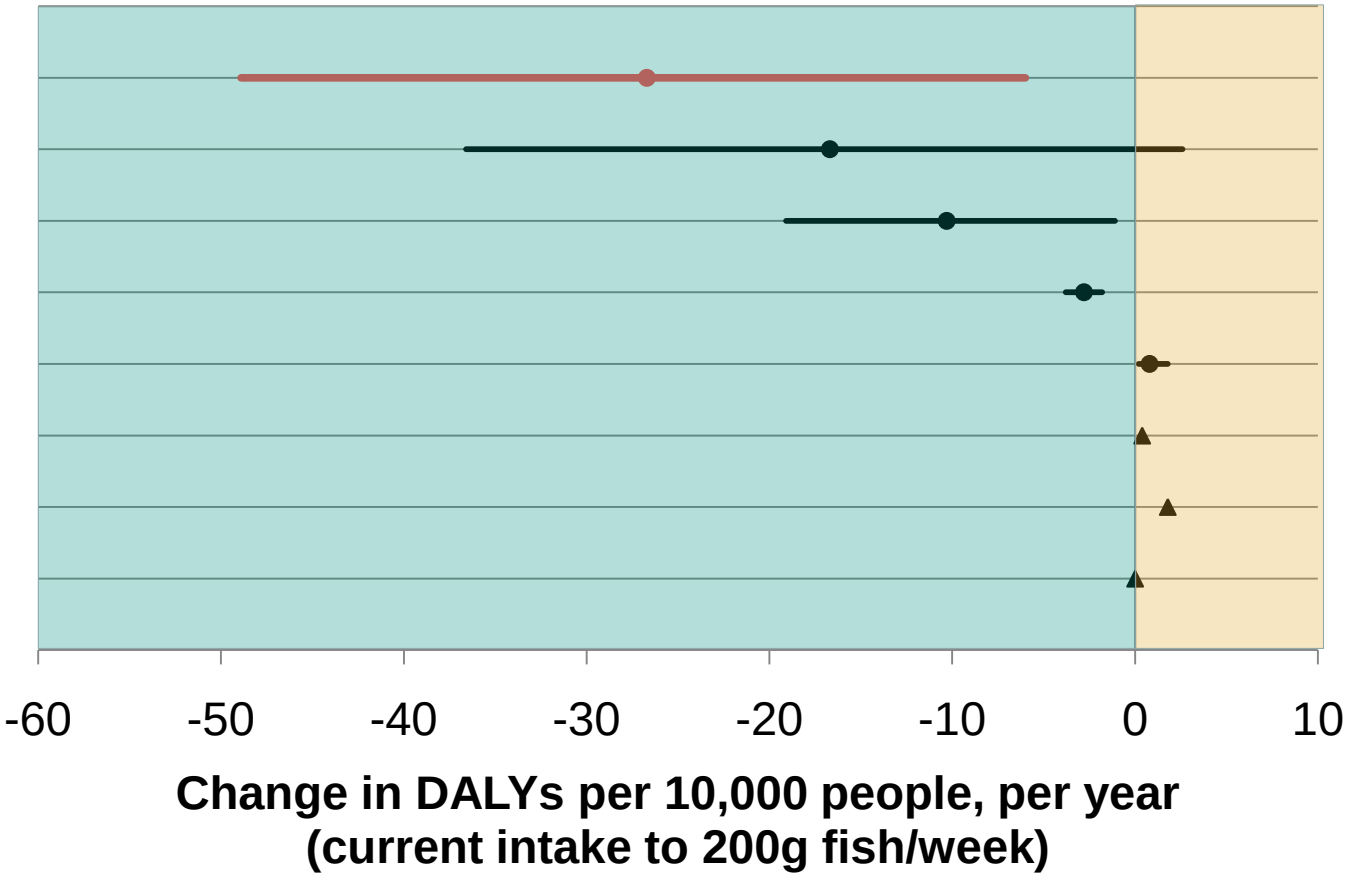
Graphical presentation of overall net health impact



Estimate + 95% uncertainty interval

Estimate, uncertainty not quantified

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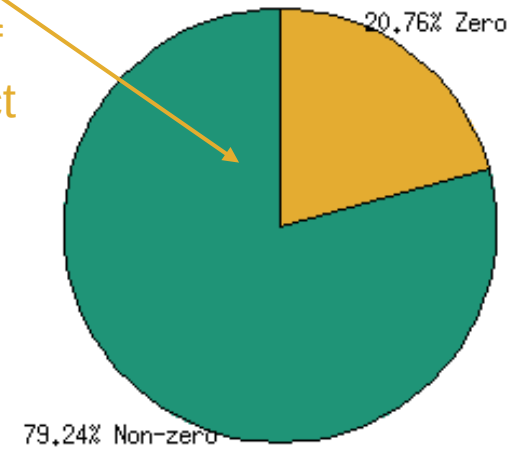
Results

The majority of individuals experience some kind of health impact



Of these people, more experience positive health impacts than negative

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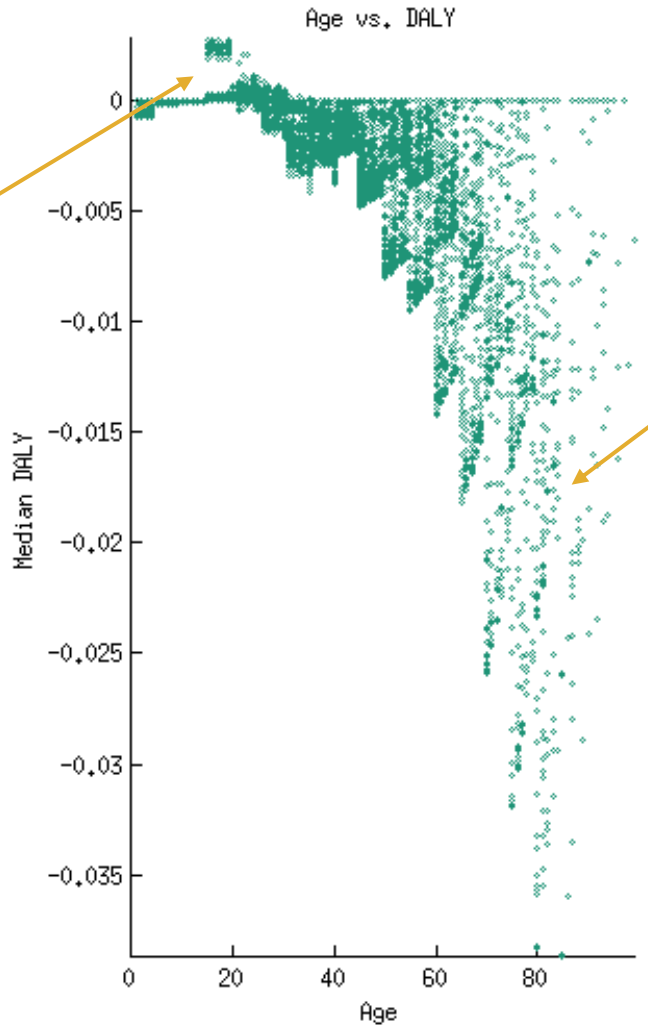
DALY changes in relation to age



For a long-term dietary change of eating more fish, the average annual impact for some individuals aged 18 to 35 is slightly negative

But for older individuals, the average annual impacts are positive

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QALIBRA Software

User-friendly design

- 'Wizard' for new users
- Extensive help screens
- Glossary
- Choice of tabular and graphical outputs, and guidance on their interpretation
- Optional sharing of assessments & data

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QALIBRA Software

- Free to registered users after completing an online training session
- Training workshops available
- Collaborative projects welcome

- For further details visit www.qalibra.eu

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Closing remarks

- Risk-benefit assessment is not easy
  - *the difficulties are present whatever method is used*
  - need high level of expertise in several fields
  - requires substantial data and/or assumptions
  - affected by many uncertainties
- Potential benefits of QALIBRA
  - provides a common conceptual framework
  - helps to identify important issues
  - progressive refinement from deterministic to probabilistic
  - helps organise input data, saves writing own programs
  - can use outputs of other tools (e.g. MCRA)

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Thank you

Any Questions?

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