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## Health impact of substituting red meat by fish: addressing variability in risk-benefit assessments

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### Background:

Sufficient intake of fish and limited red meat intake is commonly encouraged by national dietary guidelines to prevent various lifestyle diseases. One way to fulfill these guidelines would be to substitute red meat by fish. However,

quantitative evidence of the public health gain of such substitution is lacking. Moreover, contaminants in these foods may compromise nutritional benefits. We aimed to estimate the health impact of substituting red meat by fish in the Danish diet in a risk-benefit assessment (RBA). Our study can support policy makers in defining evidence-based public health strategies.

**Methods:**

We quantified the health impact of substituting red meat by fish among Danish adults in terms of Disability-Adjusted Life Years (DALY) using data from a national dietary survey and food monitoring. We investigated the use of probabilistic methods to model variability in individual substitution behaviors and to assess health impact distributions in RBA of food.

**Results:**

Health impact of the substitution varied largely by the type of fish consumed and by age and sex of the consumer. We estimated that 134 (95% uncertainty interval: 102; 169) DALYs/100,000 could be averted per year if a mix of lean and fatty fish is consumed in the Danish recommended amounts and intake of red meat decreased among Danish adults. The highest benefit was estimated for women in the childbearing age and for men above 50 years of age. However, a small fraction of women were assigned an overall health loss due to methylmercury exposure during pregnancy and the associated adverse effects in unborn children.

**Conclusions:**

Our study estimated an overall health gain of substituting red meat by fish in the general Danish adult population, while providing insight in the variability in health impact at the level of individual consumers. Our approach can be applied in other RBAs and the results support the need for targeted public health strategies to ensure consumer health and safety.

**Key messages:**

- The health impact of substituting red meat by fish in Danish adults was quantified in terms of disability-adjusted life years (DALYs), while accounting for variability between individuals.
- We estimated that young women and men above 50 years of age will experience the largest health gain while a small fraction of the women were assigned a health loss due to chemical exposure.