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Recommended fish intake differs substantially from observed fish intake. In Denmark, ~15% of the population consumes the state-recommended fish intake. How much fish individuals eat varies greatly, and this variation cannot be captured by considering the fish intake of the average population. We developed a method intended to provide realistic and achievable personalized dietary recommendations based on an individual's body weight and current fish intake. The objective of the study was to propose specific fish intake levels for individuals that meet the recommendations for eicosapentaenoic acid, docosahexaenoic acid, and vitamin D without violating the permitted intake recommendations for methyl mercury, dioxins, and polychlorinated biphenyls. Two mathematical optimization models were developed that apply quadratic programming to model personalized recommended fish intake, fulfilling criteria on nutrients and contaminants, while simultaneously deviating as little as possible from observed individual intake. A recommended intake for 8 fish species was generated for each individual in a group of 3016 Danes (1552 women and 1464 men, aged 18-75 y), whose fish intakes and body weights were known from a national dietary survey. Individual, personal dietary recommendations were successfully modeled. Modeled fish intake levels were compared to observed fish intakes. For women, the average proposed increase in fish intake was 14 g/wk for lean fish and 63 g/wk for fatty fish; and for men these numbers were 12 and 55 g/wk, respectively. Using fish intake as an example, we show how quadratic programming models may be used to advise individual consumers how to optimize their diet, taking both benefits and risks into account. This approach has the potential to increase compliance with dietary guidelines by targeting the individual consumers and minimizing the need for large and ultimately unrealistic behavior changes.

General information
State: Published
Organisations: National Food Institute, Division of Risk Assessment and Nutrition , Research Group for Risk-Benefit, MS-Nutrition, Technical University of Denmark
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Pages: 275-284
Publication date: 2018
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Nutrition
Volume: 148
Issue number: 2
ISSN (Print): 0022-3166
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): CiteScore 4.24 SJR 2.191 SNIP 1.395
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.93 SJR 2.025 SNIP 1.336
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.107 SNIP 1.517 CiteScore 4.08
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.121 SNIP 1.581 CiteScore 4.13
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.15 SNIP 1.615 CiteScore 4.6
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.94 SNIP 1.657 CiteScore 4.45
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.908 SNIP 1.6 CiteScore 4.32