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PROTOCOL FOR A SYSTEMATIC REVIEW

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Green defaults to reduce meat consumption? A systematic review protocol

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Abstract

Background: To limit global warming to 1.5°C above pre-industrial levels, substantial reductions in greenhouse gas (GHG) emissions are necessary in a variety of sectors, one of them being the food system. Current diets, particularly those high in meat and other animal protein, and the production practices that support them are estimated to account for about one third of total GHG. On the demand-side, policies based on behavioural insights have been identified as a promising tool to promote more environmentally friendly food choices in general and reducing meat consumption in specific. Designing choice settings with so-called "green defaults" has been shown to be effective in various consumption contexts, robust across cultures and target groups, and highly accepted by consumer citizens. While the body of evidence and syntheses on behavioural interventions in general is growing, to the best of our knowledge, no comprehensive systematic review has been conducted to date that focuses on the effectiveness of defaults in the area of food consumption. The primary aim of the proposed research is therefore to compile the empirical evidence regarding whether and in which specific contexts which type of green defaults work that aim to reduce the GHG emissions resulting from meat consumption.

Methods: The systematic review will examine empirical studies that provide primary data on the implementation of defaults to reduce meat consumption. To identify relevant studies, we use the database of a prior systematic mapping study. We extend this database by updating the literature using pre-defined search strings in eleven bibliographic databases, Google Scholar, a theses repository, specialised academic journals, and specialist websites as well as conducting backward searches in the literature of review studies identified via search. Search results are screened for inclusion in a three-stage process at title, abstract, and full-text level in accordance to a set of predetermined inclusion and exclusion criteria. We critically appraise all studies included after full-text screening and exclude those of low quality. We extract descriptive and statistical information from all studies included after critical appraisal and account for their validity in the evidence synthesis.

Background

To limit global warming to 1.5°C above pre-industrial levels, substantial reductions in greenhouse gas (GHG) emissions are necessary in a variety of sectors (IPCC 2019). In addition to structural changes and technological improvements, changes in human behaviour are critical to achieve the necessary emissions reductions (Gram-Hanssen 2013, Hedenus et al. 2014). The way individuals in affluent societies travel, consume energy and eat have been identified to be the most relevant behaviours to mitigate climate change (Ivanova 2018). Indeed, current diets and the production practices that support them are estimated to account for about one third of total greenhouse gas emissions (IPCC 2019). However, emissions vary significantly across different food products with livestock and animal products being responsible for more GHG emissions than all other food sources (Poore and Nemecek 2018). A recent report by the Institute for Agriculture and Trade Policy (2018) further suggests that the world's five largest meat and dairy companies are responsible for more GHG emissions than the major oil companies. In fact, overall even those animal products with the lowest environmental impact are shown to exceed the average environmental impacts of plant-based alternatives, while providing only around 37% of proteins and 18% of calories in human diets (Poore and Nemecek 2018).

In order to achieve necessary greenhouse gas reductions in the food sector, policy mixes need to address both the supply-side as well as the demand-side. Demand-side policies have recently gained attention in climate policy as the next Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report will feature a chapter dedicated to these kinds of policies. "[S]trategies targeting technology choices, consumption, behaviour, lifestyles, coupled production consumption infra-structures and systems, service provision, and associated socio-technical transitions" are amongst potential demand-side solutions to climate change pointed out by Creutzig et al. (2018, p. 260). One particular form of demand-side policies are those that are informed by behavioural insights. By carefully designing the decision environment, behavioural interventions – i.e., choice architecture and nudging – aim to subtly steer individuals to choose the preferable alternative, while at the same time being choice-preserving, cost-effective and easy to implement (Sunstein 2014a, Thaler and Sunstein 2008) as well as widely socially accepted (Sunstein et al. 2019).

One of the most discussed nudge designs are so called *defaults*, i.e., a particular choice option being pre-set. Defaults facilitate choices by not requiring individuals to make an active decision, which is often considered to be burdensome and time-consuming, but preserving the possibility to opt out (Sunstein 2014b). Defaults have been proven to be impactful in various decision-making contexts, with disparity in effectiveness depending on their area of application and psychological factors (Jachimowicz et al. 2019). In the context of sustainable consumption, *green defaults* have been found as particularly promising to nudge more environmentally friendly consumer choices, e.g. promoting the uptake of green energy (e.g., Kaiser et al. 2020, Ebeling and Lotz 2015, Pichert and Katsikopoulos 2008).

While there exist several evidence syntheses in form of reviews of the literature on behavioural interventions targeting GHG emissions resulting from meat consumption (e.g., Hargues et al. 2020, Taufik et al. 2020, Vandenbroele et al. 2020, Byerly et al. 2018, Wynes et al 2018, Bianchi et al. 2018a, 2018b), to the best of our knowledge, none of these reviews focuses on defaults exclusively to analyse their effectiveness and potential effect modifiers in detail. Therefore, the aim of this systematic literature review is to synthesize the existing evidence on the effectiveness of defaults to mitigate climate change by reducing meat consumption in a comprehensive manner. With this review, we hope

to inform policymaking in the area of climate change mitigation in the food sector as well as to contribute to the nascent yet growing conceptual debate on (green) defaults more generally (see, e.g., List and Price 2016, Sunstein and Reisch 2014). For instance, the review might provide answers to the question which type of defaults are conducive for which type of target group in which setting. We might also learn about the factors that contribute to the general finding that people tend to "stick" with the default option (see, e.g., Kaiser et al. 2019).

Identification of review topic

The proposed systematic review is based on the findings of a systematic map that is currently under review (Reisch et al. 2019). Similar to systematic reviews, systematic maps provide a standardized and comprehensive procedure of synthesizing existing research on a selected research topic (Haddaway et al. 2016). Rather than evaluating the efficacy or effectiveness of interventions, systematic maps catalogue an overview of existing knowledge gaps and clusters to guide future research as well as policymaking. The evidence and gap map by Reisch et al. synthesizes existing research on behaviourally informed policies with the aim of reducing GHG emissions resulting from food consumption and consumer food waste. For food consumption, the focus of the systematic map is on animal protein consumption in general, i.e., meat, fish, dairy, eggs, and their respective substitutes. The selection of the map's topic and specific research question followed the engagement of various stakeholders and expert groups. As a result, a total of 56 independent studies were mapped describing changes in levels of animal protein consumption and consumer food waste induced by the implementation of different behavioural interventions and their combinations. Defaults are considered as one of many behavioural interventions.

On the basis of knowledge clusters identified by Reisch et al., a range of intervention types were identified as potential candidates for a systematic review due to first, high relevance and second, sufficient coverage of existing evidence. Given substantive prior research on defaults in other consumption domains (e.g. Loeb et al. 2017, Sintov and Schultz 2017, Johnson and Goldstein 2003), we decided to focus on this specific behavioural intervention for the purpose of this review. We focus on changes in levels of meat consumption as behavioural intervention studies focusing on other types of animal protein are still limited or missing completely.

Objective of the review

The purpose of the proposed systematic review is thus to analyse if, and how, behavioural interventions in the form of defaults are effective to reduce meat consumption. The particular research question of the review is as follows: *What is the effect of defaults that target individuals as well as private and large households with the aim to reduce their greenhouse gas emissions resulting from meat consumption?*

Methods

The proposed systematic review follows the standards for evidence synthesis provided by the Collaboration for Environmental Evidence (CEE; Collaboration for Environmental Evidence 2018) and we publish this protocol following the RepOrting Standards for Systematic Evidence Syntheses (ROSES). ROSES, similarly to PRISMA, is a widely accepted reporting standard for evidence synthesis to support transparency and rigour of research (Haddaway et al. 2018). We use this protocol to further guide our review study and to make our search and screening strategy as well as approach to data extraction and analysis transparent to other researchers and interested practitioners. By the time this protocol is published, the search and screening process are already completed, all subsequent steps will be carried out in a timely manner.

Searches

The search strategy described below outlines the steps taken to compile the evidence relevant to the topic of this review whilst making use of the systematic map database (Reisch et al. 2019). To ensure a consistent and comprehensive literature search, the steps outlined below were carried out following the approach of the systematic map.

Studies identified by the systematic map

The systematic map on which this review is based upon describes the existing evidence base on behavioural interventions aimed at reducing GHG emissions in the areas of food consumption and food waste (Reisch et al. 2019). In order to identify relevant publications, the search string presented in Figure 1 was used in the systematic map. A total of 56 studies were identified, nine of which investigated the effects of defaults in reducing meat consumption.

Figure 1. Search string used in the systematic map by Reisch et al.

((nudg OR bias* OR "choice-architecture") OR (behavio$r* AND (stimul* OR polic* OR interven*)))*
AND (((food OR meat* OR beef OR bovine OR veal OR cattle OR lamb OR ovine OR pork OR poultry OR chicken OR turkey OR egg* OR fish OR fisher* OR seafood OR dairy OR milk OR "animal protein" OR "non-plant" OR "plant-based" OR vegetabl* OR vegetar* OR vegan* OR flexitarian*) AND (consum* OR intak* OR intention* OR purchas* OR choos* OR select* OR prefer* OR demand* OR buy* OR avoid* OR choice* OR use OR using OR eat OR eating OR drink* OR diet*OR "reduc*"))*
OR ("food waste" OR "food wast" OR "food loss" OR "food scrap*" OR "food remain*" OR compost* OR recycl* OR "source separat*" OR "source segregat*" OR "waste" OR dispos* OR rubbish OR "left over*" OR "throw* away*" OR bin* OR garbage OR loss OR leftover* OR "over-consumption" OR uneaten OR "doggy-bag*" OR "waste-prevent*" OR "ugly-food")) AND ("climate change" OR "global warming" OR "greenhouse gas*" OR carbon OR methane OR "low-carbon" OR emission* OR CO2 OR CH4 OR sustainab*)*

Search update for the systematic review

To identify more recent publications on defaults to reduce meat consumption, a comprehensive search update was conducted up to December 2019. To account for potential update lags, the time limit restriction was set to articles published in January 2018 or later. This way, publications on food consumption from 2018 and 2019 that were included in the final sample of included studies in the map could serve as benchmark articles. The search string presented in Figure 2 was based on the one used for the systematic map, but adapted to reflect the focus on food consumption, i.e., excluding all search terms that were exclusively related to food waste. To ensure a consistent literature search, the adapted string was not targeted at defaults specifically in order to be as close as possible to the original

search string. Where databases did not allow for using the full Boolean search string, a shortened and adapted version was applied (Figure 3). The search update for this review was performed by the lead author of the present study.

Figure 2. Full Boolean Search String

((nudg OR bias* OR "choice-architecture") OR (behavio$r* AND (stimul* OR polic* OR interven*)))*
AND ((food OR meat* OR beef OR bovine OR veal OR cattle OR lamb OR ovine OR pork OR poultry OR chicken OR turkey OR egg* OR fish OR fisher* OR seafood OR dairy OR milk OR "animal protein" OR "non-plant" OR "plant-based" OR vegetabl* OR vegetar* OR vegan* OR flexitarian*)*
AND (consum OR intak* OR intention* OR purchas* OR choos* OR select* OR prefer* OR demand* OR buy* OR avoid* OR choice* OR use OR using OR eat OR eating OR drink* OR diet*OR "reduc*"))*
AND ("climate change" OR "global warming" OR "greenhouse gas" OR carbon OR methane OR "low-carbon" OR emission* OR CO2 OR CH4 OR sustainab*)*

Figure 3. Short search string

((nudg OR bias* OR "choice-architecture") OR (behavior$r* AND (stimul* OR polic* OR interven*)) AND (food* OR meat* OR fish OR dairy OR milk) AND (climate OR emission* OR "greenhouse gas*" OR carbon OR methane))*

Bibliographic databases

The main search was conducted in the bibliographic databases listed below and as described in Reisch et al.:

- ABI/Inform Collection
- Academic Search Premier
- Business Source Premier
- International Bibliography of the Social Sciences
- Medline and associated databases
- PAIS Index
- PsychInfo
- Science Direct
- Scopus
- Sociological Abstracts
- Web of Science Core Collections

Google Scholar search

An additional search was carried out in Google Scholar using the short version of the search string. Moreover, due to uncertainty about the exact algorithm used in the search engine – i.e., how wildcards and asterisk are treated – another adapted version was applied (Figure 4). For both searches, the first 1,000 results were examined for relevance.

Figure 4. Google Scholar Search String

((nudge OR bias OR "choice-architecture") OR (behaviour OR behavior AND (stimuli OR policy OR policies OR intervention)) AND (food OR meat OR fish OR dairy OR milk) AND (climate OR emission OR "greenhouse gas" OR carbon OR methane))

Organizational searches

Grey literature, which refers to documents not published by commercial publishers, and references to relevant publications were manually searched for on the specialist and practitioner-oriented websites listed below:

- Behaviour and Health Research Unit, University of Cambridge, UK, https://www.bhru.iph.cam.ac.uk/
- Behavioural Economics in Action at Rotman University of Toronto, CA, http://www.rotman.utoronto.ca/FacultyAndResearch/ResearchCentres/BEAR
- Behavioural Economics Team of the Australian Government, AUS, https://behaviouraleconomics.pmc.gov.au/
- Behavioural Insights Team, UK, https://www.bi.team/
- Behavioural Science and Policy Association, https://behavioralpolicy.org/
- Deloitte Insights, https://www2.deloitte.com/insights/us/en.html
- Department for Environment, Food & Rural Affairs, UK, https://www.gov.uk/government/organisations/department-for-environment-food-rural-affairs
- Environment Agency, UK, https://www.gov.uk/government/organisations/environment-agency
- Environmental Protection Agency, USA, https://www.epa.gov/
- European Commission Joint Research Centre, EU, https://ec.europa.eu/jrc/en
- European Environment Agency, EU, https://www.eea.europa.eu/
- Federal Environment Agency, GER, https://www.umweltbundesamt.de/
- Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, GER, https://www.bmu.de/
- Federal Ministry of Food and Agriculture, GER, https://www.bmel.de/
- Harvard Kennedy School Centre for Public Leadership, Behavioural Insights Group, US, https://cpl.hks.harvard.edu/behavioral-insights-group
- ideas42, http://www.ideas42.org/
- International Institute for Environment and Development, https://www.iied.org/
- NSW Government Behavioral Insights Unit, AUS, https://bi.dpc.nsw.gov.au/
- Organisation for Economic Co-operation and Development, https://www.oecd.org/
- PBL Netherlands Environmental Assessment Agency, NL, https://www.pbl.nl/en/
- Rare, https://www.rare.org
- The European Nudge Network, http://tenudge.eu/
- The Food and Agriculture Organization of the United Nations, http://www.fao.org/home/en/
- The London School of Economics and Political Sciences (LSE), Centre for Analysis of Risk and Regulation, UK, http://www.lse.ac.uk/accounting/CARR
- The World Bank, https://www.worldbank.org/
- Thünen-Institute, GER, https://www.thuenen.de/
- United Nations Development Programme, https://www.undp.org/
- United Nations Environment Programme, https://www.unenvironment.org/
- United Nations Framework Convention on Climate Change, https://unfccc.int/
- United States Department of Agriculture, USA, https://www.usda.gov/

Supplementary searches

An additional search for relevant studies was conducted by screening the bibliographies of existing reviews on behavioural interventions to reduce meat consumption. Being not covered in the bibliographic databases but considered to be highly relevant, a supplementary search was also made in the academic journal *Behavioural Public Policy*. Moreover, a search was performed in the theses repository *ProQuest Dissertations and Theses*.

Article screening and study inclusion criteria

Screening process

Search results were screened for inclusion on three successive levels, i.e. title, abstract and full-text level, and in accordance to a set of predetermined inclusion and exclusion criteria. The criteria were developed along the so-called PICO criteria (Collaboration for Environmental Evidence 2018), an acronym for *population*, *intervention*, *comparator*, and *outcome*, and extended by two additional elements, namely *framing* and *study type* as described in Reisch et al. The screening entailed the careful reading of each title, abstract and full-text contained in the respective screening stage and the decision on inclusion or exclusion of the study. In case of doubt, studies were included in the next stage. Since the screening was performed by only one of the authors of the present study, no consistency checks were necessary for this process. The review will include a flow diagram that reports the number of articles included and excluded at each screening stage. Moreover, a list of articles excluded at full-text level with reasons for exclusion will be published as supplementary material.

Eligibility criteria

Eligible studies had to fulfil each of the following criteria:

- *Relevant populations*: individual consumers, private households as well as large households that consume meat products or substitutes
- *Relevant interventions*: defaults initiated by public or private actors
- *Relevant comparators*: comparison of levels of meat consumption or its substitutes, either against a control group or in a before-after intervention comparison
- *Relevant outcomes*: reported changes in meat consumption or substitutes
- *Framing*: some sort of climate frame as motivation
- *Study type*: all types of empirical studies providing primary data, both quantitative or qualitative, as well as all types of academic literature reviews

Moreover, full-texts had to be retrievable and written in English or German.

Study quality assessment

For all studies included after full-text screening, critical appraisal will be conducted to rate the studies' quality by identifying all possible sources of bias in the study. Based on the assessment of their validity, their susceptibility to bias will be evaluated using an a-prior defined critical appraisal sheet. We will develop the latter based on the Cochrane risk-of-bias assessment tools (Sterne et al. 2019, Sterne et al. 2016) and adapt it to fit the review. The assessment categories under consideration will be the selection of study subjects, deviations from intended interventions, missing data, confounding, methods and measurements, and selection of reported results. The scale used for the risk-of-bias judgement in each category will be as follows: low, some concerns, and high. Taking into consideration

the assessment of all categories, the overall appraisal of the study quality will be as follows: high quality, acceptable, low quality, and unacceptable.

Each paper will be critically appraised by at least two authors independently. The results will then be compared and deviations discussed until agreement in the rating is reached. Studies categorized as having an unacceptable quality will be excluded from the final analysis sample of the review. The critical appraisal tool and ratings of all studies will be provided in the supplementary material of the review.

Data extraction

Relevant descriptive information and statistical data will be extracted from the full-texts of all studies included in the final analysis sample of the review. Where necessary, supplementary materials, linked studies or contact to the authors will be used to complete information on the studies. Information and data to be extracted will include:

- type of the intervention, i.e., defaults and combinations with other intervention types
- description of the intervention, i.e., design, context and conditions
- description of the outcome variable, i.e., dependent variable
- effect size in comparison to the respective comparator, i.e., control group or baseline measure
- size and description of the sample
- measures of variation, i.e., standard deviation, standard error, confidence intervals, etc.
- study duration and location

To reduce errors, information and data extraction will be double-checked by at least one other author. The review will provide a table reporting the extracted information and data.

Data synthesis and presentation

The review will describe and analyse the evidence base on defaults that aim to reduce GHG emissions resulting from meat consumption. First, the evidence will be synthesized narratively. A brief characterization of all included studies will be provided, considering distribution and quantity of evidence, methods and outcomes. Studies will be discussed individually and in groups, taking into account differences like study contexts and combinations of interventions to identify potential modifiers of the effects found. Visual presentations of study findings will be made using plots of mean effect size and variance. Meta-analysis will be conducted if possible. Moreover, if enough information and data is provided in the studies included, we will estimate the reduction in GHG emissions achieved by the default interventions.

Literature

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