Climate impact label design and fast-food meal selection

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Statistical Analysis Plan

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Research Question and Hypotheses:

The primary objective of this study is to test the relative effects of climate-impact menu label designs on the healthfulness of consumers' fast-food meal choices via a between subjects randomized experiment. We predict that, relative to a control label, a high impact warning label will lead to the healthiest food choices, followed by a three-level traffic-light label, then by a five-level climate impact grade, and finally a numeric carbon footprint label.

We believe the same label performance predictions will apply to our secondary outcomes, including: total greenhouse gas emissions per meal order, total calories per meal order, and selection of a sugar-sweetened beverage.

Key Variables

Primary outcome: Participants will order a hypothetical meal from an online fast-food menu via Qualtrics. Participants will be randomized to one of five label conditions that will appear on the menu: 1) a control label, 2) a high impact warning label; 3) a three-level traffic-light label, 4) a five-level climate impact grade, and 5) a numeric carbon footprint label. The primary outcome will be the healthfulness of each participant's meal selections. This score will be based on the Nutrient Profile Index (NPI) algorithm, which assigns a score from 1-100 scale based on a product's nutritional composition, with items scoring >=64 considered healthy. This measure will be determined by calculating the weighted mean NPI score of all items selected per meal, with each item's NPI score weighted by its proportionate contribution of mass in grams to the total mass of the meal. Beverages will be excluded from the modified score and assessed through secondary outcomes.

Secondary outcomes: Our first secondary outcome is total greenhouse gas emissions of the hypothetical meal ordered measured in kilograms of CO_2 equivalents. This will be calculated for each menu item using nutritional and recipe information from publicly available information combined with data on associated emissions for related food items from the World Resource Institute (WRI) CoolFood Calculator. Total estimated greenhouse gas emissions per meal will be calculated as the sum of estimated emissions for all menu items ordered in a meal.

We will also assess the total calories ordered, and whether or not a sugar-sweetened beverage was selected.

Additionally, we will measure perceived message effectiveness of the various climate-impact labels. Following the meal ordering task, participants will be asked to respond to three statements about perceived message effectiveness of the climate-impact label for which they were randomized to view on the menu. Statements are derived from the UNC-PME scale and will assess

participant levels of discouragement, unpleasantness, and concern regarding high impact menu items when paired the climate-impact label, using a 5-point Likert scale (1= Not at All, 5 = A Great Deal). Participants will also view labels from all five labeling conditions and rank the labels in order of most effective (1) to least effective (5) for communicating the high climate impact of individual menu items.

This is a between-subjects experiment in which participants will be randomized to one of five arms. All participants will view a fast-food online ordering menu, with menus for each study arm differing by the climate-impact labeling scheme applied: (1) a QR code on all items (control); (2) a high climate impact warning label on high impact items; (3) traffic light labels (high-, medium-, and low-impact) on all items by level of impact; (4) climate grade labels (A, B, C, D, F) on all items by level of impact; and (5) numeric carbon footprint labels on all items.

Statistical Analyses

To determine the effects of the four climate-impact labels compared to the control label on our continuous primary outcome of dietary quality, we will regress the outcome onto a categorical indicator representing experimental condition. If the primary outcome is not normally distributed, we will perform appropriate transformations and use robust standard error estimates to preserve valid standard errors and p- values.

We will use a similar approach for secondary outcomes and regress each secondary outcome onto an indicator of experimental arm. For the binary secondary outcome of whether a participant selected a SSB, we will use logistic regression and regress the outcome onto a categorical indicator representing experimental condition. We will compare the odds of selecting an SSB for each experimental condition compared to the control and will use post estimation margins to examine the proportion of participants in each outcome who select an SSB.

We will use predicted margins to examine predicted mean values of each outcome for each experimental condition.

Statistically significant differences will be considered at $p<0.05$ with Bonferroni-Holm correction for multiple comparisons and all tests will be two-tailed.

We will not exclude observations based on values of any of the outcome variables. We will exclude observations of participants who complete the survey implausibly quickly based on the distribution of the time to complete the survey among all participants. We will also exclude participant who fail built-in Qualtrics survey fraud detection measures.

*This analysis plan was pre-registered on AsPredicted on 11/05/2024