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Abstract

The objective of this research is to estimate the proportion of consumers who consider nutrients identified in the *Dietary Guidelines for Americans 2020-2025* (*DGA*) as being of public health concern during food choice using a large, population-weighted sample of U.S. residents. A question was included in a bi-monthly survey of consumer scanner panel members, asking whether respondents considered each of eight nutrients in a check-all-that-apply format. Four of these nutrients are under-consumed nutrients, while three are nutrients to avoid. Calories was additionally included, as over-consumption of calories causes weight gain. Weighted mean proportions and 95% confidence intervals were estimated. The survey was administered to a population-weighted sample of 42,018 US consumers participating in a consumer scanner panel in May-June 2021 by an online survey firm that maintains the consumer panel. Over one-quarter of respondents considered none of the nutrients. Each under-consumed nutrient of public health concern was considered by less than 30% of respondents, ranging from a low of 14.5% for potassium (95%CI=14.3-14.7%) to a high of 28.9% for dietary fiber (95%CI=28.7-29.1%). Nutrients to be avoided were considered by higher percentages of the sample, ranging from 31.8% for saturated fats (95%CI=31.6-32.0%) to 46.1% for added sugars (95%CI=45.8-46.3%). Respondents considered an average of just over 2.4 total nutrients, with a greater focus on nutrients to avoid, including calories (weighted mean=1.55), than under-consumed nutrients (weighted mean=0.89). Over one-quarter of consumers considered no nutrients of public health concern. Consumers focused more on nutrients to avoid rather than under-consumed nutrients. Promoting increased awareness of important under-consumed nutrients may improve public health.

Keywords: nutrients of public health concern; under-consumed nutrients; consumer choice; nutrients to avoid; Dietary Guidelines for Americans

I. Introduction

Diet-related diseases are one of the most pressing threats to the health of Americans and, increasingly, populations worldwide (Afshin et al., 2019). Diet-related diseases are a leading cause of mortality in the United States (Micha et al., 2017), and negatively impact people's quality of life in multiple dimensions (Taylor et al., 2013). Approximately 70% of the US adult population is overweight/obese (Wang et al., 2020). However, while individuals overconsume some nutrients, such as saturated fats, sodium, and added sugars, under-consumption of nutrient-dense foods has led to a situation where some people are simultaneously overweight/obese and malnourished (U.S. Department of Agriculture and U.S. Department of Health and Human Services, 2020).

The United States Department of Agriculture and Department of Health and Human Services has published the *Dietary Guidelines for Americans 2020-2025* (DGA) to emphasize current priorities for health-related dietary patterns (U.S. Department of Agriculture and U.S. Department of Health and Human Services, 2020). The DGA identifies important dietary components that individuals should consider while making food choices. These components include both key nutrients that provide important health benefits, but which are generally under-consumed by the public, as well as nutrients to be avoided because they are associated with negative health outcomes and are over-consumed on average. The under-consumed dietary nutrients highlighted in the DGA are dietary fiber, vitamin D, calcium, and potassium, while the dietary components to avoid are calories, saturated fats, added sugar, and sodium.

Although the U.S. federal government has been publishing these dietary guidelines for over 40 years, there is little evidence about consumer consideration of these dietary components during food choice. Evidence that does exist for consideration of specific nutrients, such as

calcium, dietary fiber, and sodium, tends to come from qualitative studies, which have limited sample sizes (Barrett et al., 2020; Kim et al., 2012; Marcinow et al., 2017). Consideration of the specific nutrients of public health concern has not been studied in a large sample of Americans. Such data are critical because attention to nutrition information during food choice leads to selection of foods with higher nutritional quality (Ollberding et al., 2011). To address this evidence gap, we use a large, weighted sample to estimate the proportion of the population that considers each of the four under-consumed nutrients of public health concern and the four dietary components to avoid.

II. Methods

IRi (https://www.iriworldwide.com), a firm that maintains a consumer panel of over 40,000 participants, included a question about consideration of the eight dietary components of public health concern in a bi-monthly survey distributed to panel members in May and June, 2021. The question posed to panel members was, "*Which of the following nutrients, if any, do you consider when you are choosing what foods to buy or eat (or have you considered in the past when establishing dietary patterns that you currently follow)*?" The wording of the question allowed for individuals who did not actively consider the nutrient at the time of completing the survey, but did when establishing current dietary patterns, to answer in the affirmative. Thus, our results provide an estimate of the proportion of the population that has ever considered nutrients of public health concern in a way that influences current food choices and not only those who actively consider each dietary component every time they make a food choice. Restrictions on the number and format of questions included in the monthly IRi consumer panel survey prevented the addition of any follow-up questions.

The list of dietary components—added sugars, calcium, calories, dietary fiber, potassium, saturated fat, sodium, and vitamin D—was presented below the question and participants indicated whether they considered (or had considered during the establishment of current eating patterns) each component during food choice using a check-all-that-apply (CATA) response format. The order of presentation of the dietary components was randomized for each participant. We received data on participants' responses for each dietary component, population weights, and participants' gender and age range.

We calculate weighted means and 95% confidence intervals for consideration of each dietary component during food choice. We also report weighted means and 95% confidence intervals of the total number of dietary components considered, the number of under-consumed nutrients of public health concern, the number of dietary components to be avoided, and the proportion of the sample that considered none of the nutrients during food choice. The research was approved by the University's institutional review board. Data were analyzed in R using the Stats package (R Core Team, 2021).

III. Results

The total number of respondents to the survey was 42,018. The weighted mean proportion considering each of the under-consumed nutrients of public health concern was less than 30% (Table 1). Nearly 29% of respondents said they considered dietary fiber, while 23% considered vitamin D, 22% considered calcium, and less than 15% reported considering potassium.

Table 1: Weighted means and 95% confidence intervals of individual and summed consideration of dietary components of public health concern in the US, May-June 2021.

	Weighted Proportion (95% CI)

Dietary Components to Avoid (Proportion (95% CI))	
Calories	0.382 (0.380, 0.384)
Saturated Fat	0.318 (0.316, 0.320)
Sodium	0.385 (0.383, 0.388)
Added Sugars	0.461 (0.458, 0.463)
Under-consumed Dietary Nutrients (Proportion (95% CI))	
Dietary Fiber	0.289 (0.287, 0.291)
Vitamin D	0.232 (0.230, 0.234)
Calcium	0.219 (0.217, 0.221)
Potassium	0.145 (0.143, 0.147)
No Nutrients Considered	0.262 (0.260, 0.264)

Data: IRi Omnibus Survey, May-June 2021

The dietary components to avoid were considered by a larger percentage of the population than the beneficial, under-consumed nutrients. Just under half the respondents reported considering added sugars during food choice (46.1%). Over 38% reported considering sodium (38.5%) and calories (38.2%), while 31.8% considered saturated fats while making food choices. Over one-quarter of respondents did not consider any of the eight nutrients during food choice (26.2%).

Next, Table 2 reports information about the weighted mean number of nutrients considered. The weighted mean number of total GDA-highlighted nutrients considered was 2.43 (out of 8), where 1.55 (64% of the nutrients considered) of these were dietary components to avoid, while only 0.89 (36%) were beneficial, under-consumed nutrients. This indicates a

stronger focus on avoiding "negative" components of foods rather than seeking out "positive" nutrients.

Table 2: Weighted mean and 95% confidence interval of the consideration of total nutrients of public health concern considered during food choice, total under-consumed nutrients, and total nutrients to avoid

	Weighted Mean (95% CI)
Total Nutrients Considered	2.431 (2.421, 2.442)
Total Under-consumed Nutrients Considered	0.885 (0.879, 0.891)
Total Nutrients to Avoid Considered	1.546 (1.539, 1.553)
N	42,018

Data: IRi Omnibus Survey, May-June 2021

Figure 1 displays the numbers of positive versus negative nutrients considered by percentages of respondents. Markedly more respondents consider few—zero or one—positive nutrients (75%) than negative nutrients (52%). Nearly half (48%) consider more than one of the nutrients to avoid, but only 25% consider more than one of the under-consumed nutrients.

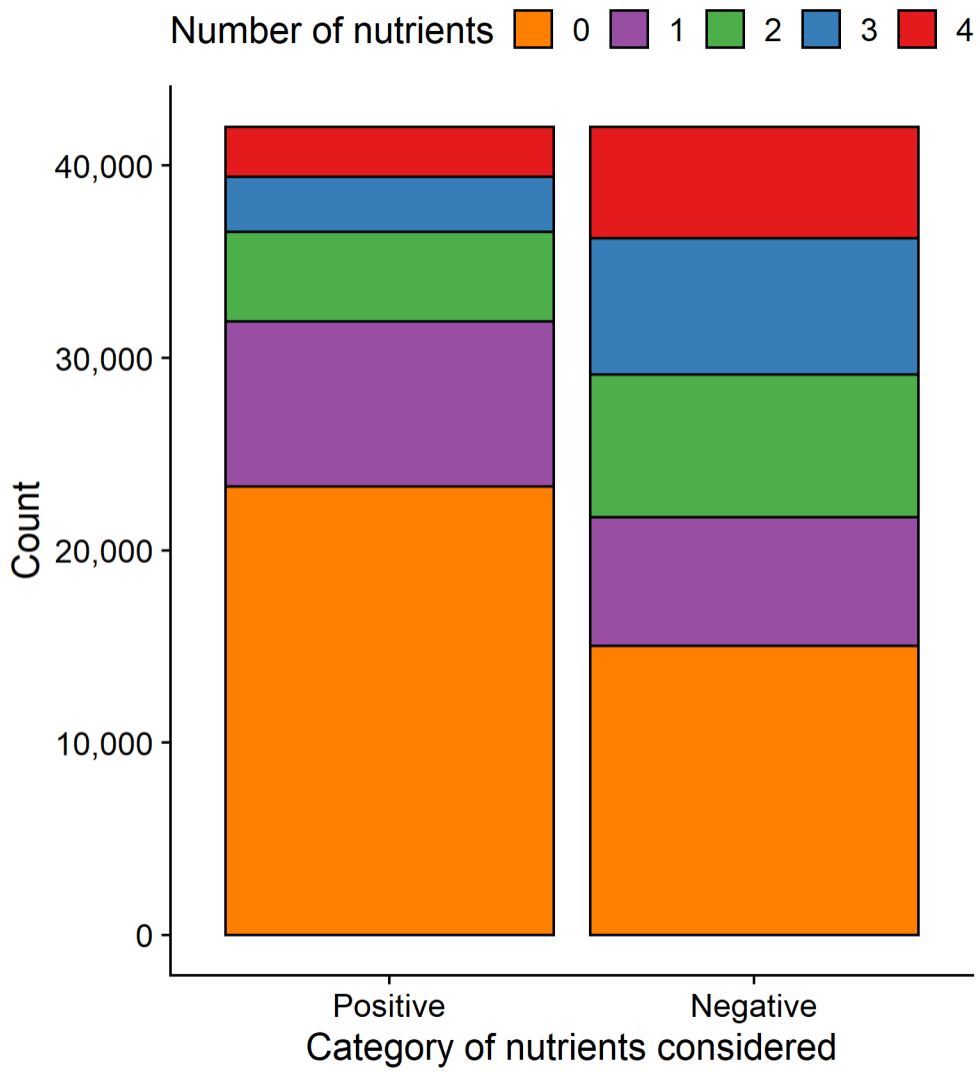

Figure 1: Proportion of the number of positive (under-consumed nutrients) and negative (nutrients to avoid) nutrients considered during food choice by participants in the consumer scanner panel shows greater consideration of negative nutrients during food choice.

Figure 2 presents the relative distribution of the number of under-consumed (or, positive) nutrients minus the number of nutrients to avoid (i.e., negative nutrients) considered by each respondent. Those respondents who reported considering none of the eight nutrients included in the study are omitted from this graph; thus, the "0" on the graph represents respondents who reported considering an equal, non-zero number of positive and negative nutrients during food choice. The figure demonstrates that consideration of nutrients of public health concern is

skewed towards the nutrients to be avoided. However, there is also notable heterogeneity in consideration of nutrients, with non-negligible numbers of participants focusing more on under-consumed nutrients than on nutrients to be avoided.

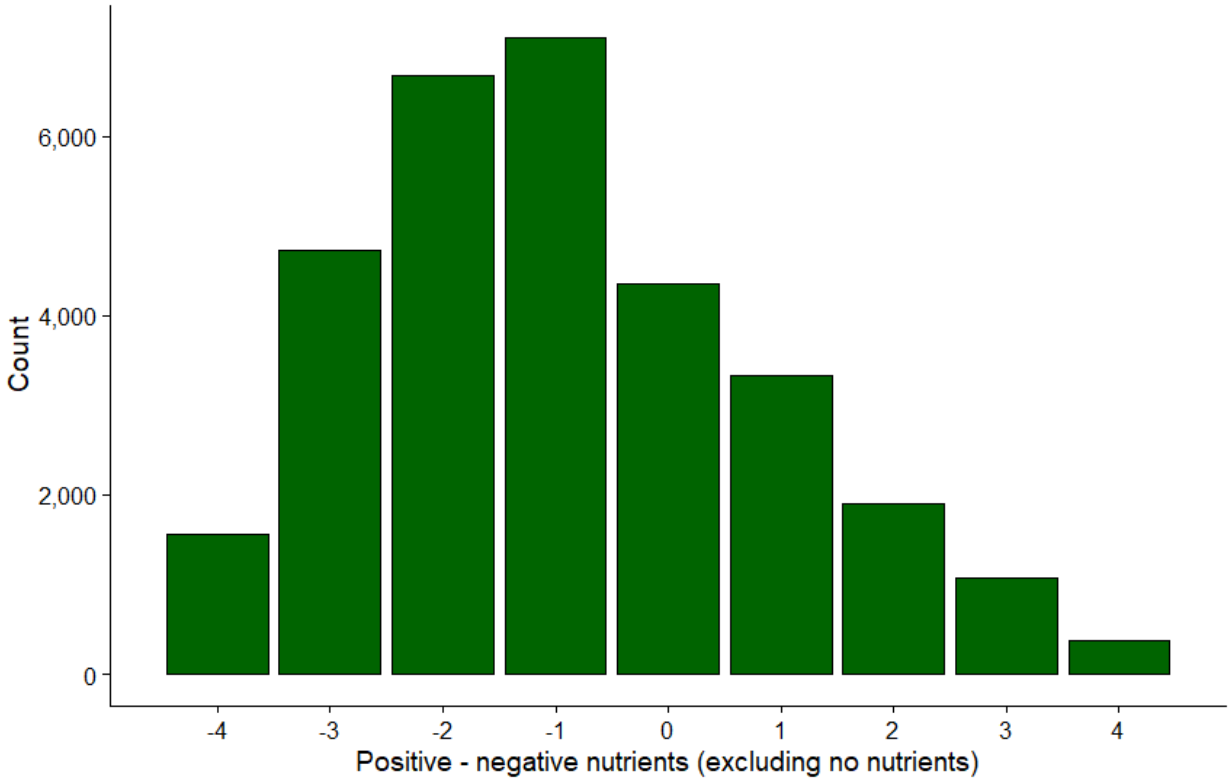

Figure 2: Relative consideration of positive vs. negative nutrients, omitting responses from participants who reported considering none of the listed nutrients during food choice

IV. Discussion

The results present robust evidence of limited consideration of nutrients that have been identified as important for public health during food choice. Based on this weighted sample, each of the nutrients was considered by less than 50% of the public and more than 25% of people considered none of the eight focal components highlighted in the *Dietary Guidelines for Americans 2020-2025* (U.S. Department of Agriculture and U.S. Department of Health and Human Services,

2020). This is remarkable considering that we phrased the question to include people that had ever considered these nutrients in the past or present, as long as that consideration influenced current consumption patterns. Therefore, these estimates likely represent the upper-bound limits of the proportion of the population that considers nutrients of public health concern when making food choices.

The findings show that there is a strong tendency to pay more attention to dietary components to avoid rather than to beneficial, under-consumed nutrients that should be sought out. While there is substantial literature about people's perceptions, meanings, and beliefs about food, there is little known about differential relationships with food that might arise when people have an orientation towards viewing foods as sources of beneficial nutrients versus sources of dietary components that need to be limited or avoided. A recent study reported four primary lay philosophies about healthy foods (Yarar & Orth, 2018). Two of these belief systems categorized healthy foods as inconvenient, expensive, or not the foods that the individuals desire to eat, while a third system included consumers focused on avoiding fats and calories in order to stay slim/muscular. These negative associations with healthy foods contained the majority of respondents. A minority of the sample (20%) identified healthy foods as being rich in vegetables and made at home and ate higher (self-reported) quality diets. Qualitative research with individuals with obesity suggests that many hold contradictory feelings towards food, finding it to be simultaneously a source of comfort and guilt (Broers et al., 2021).

Our study also revealed that more than 1 in 4 people do not consider any nutrients of public health concern when making food choices, which may represent the proportion of the population that is not concerned about the quality of their diet (Kraus et al., 2017). Furthermore, many people have beliefs about the overall healthiness of foods that seem not to account for

actual nutritional profiles of those foods (Arslain, Gustafson, Baishya, et al., 2021; Oakes, 2005), which matches with our finding that many people consider few or none of the nutrients we studied. The lack of attention to nutrients of public health concern is alarming because when accurate nutritional benefits are known or communicated, people pay more attention to the dietary component in question during the choice process, leading to increases in choice of foods containing those components (Arslain et al., 2020; Gustafson & Rose, 2022; Marcinow et al., 2017) A recent qualitative study on dietary fiber, for instance, found widespread awareness that experts advised people to consume dietary fiber, but little understanding of the benefits that would accrue to the individual from consumption (Barrett et al., 2020). However, individuals who perceive health benefits from dietary fiber are significantly more likely to consider dietary fiber during food choice—and the likelihood of consideration increases with each additional benefit perceived (Gustafson & Rose, 2022). Our results emphasize that additional efforts are needed to motivate consumers to consider important, under-consumed nutrients, leading ultimately to healthier food choices.

While nutrition information has been required by law to be provided on packaged food products in the US for over 25 years, there is little evidence that the provision of objective nutrition information is an effective means of slowing the growth of overweight/obesity and diet-related diseases (Ikonen et al., 2020; Sinclair et al., 2014). A limitation of strategies that rely on provision of objective information is that many people do not make use of nutrition information during food choice (Elbel et al., 2009; Ollberding et al., 2011). Recent research suggests that attention-prompting messages focused on health that are delivered at the point of decision can lead to increases in healthy food choices by promoting the use of nutrition information during food choice, along with promoting other beneficial changes in the decision process (Arslain,

Gustafson, & Rose, 2021; Gustafson, 2022). Targeting messages to consumers that provide motivating information about the benefits of important dietary components to consumers may lead to positive changes in the nutritional quality of foods consumed.

In conclusion, our study revealed that more than one-quarter of US consumers do not consider any nutrients of public health concern and may thus have low motivation to consider nutritional information when making food choices. Furthermore, among consumers that considered at least one nutrient, there is a strong tendency to consider nutrients to avoid rather than nutrients that are beneficial but often under-consumed. Future research should examine relationships between dietary quality and relative attention to positive, but under-consumed nutrients versus negative, over-consumed nutrients. To address the public health crises caused by poor diet, the design of nutritional programs and policies may need to emphasize the positive nutritional and health impacts of foods in order to motivate consumers to consider nutritional information during food choice and, ultimately, choose healthier foods.

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Ethical Standards Disclosure: The study was conducted in accordance with the Declaration of Helsinki and approved by the Institutional Review Board of the University of Nebraska-Lincoln (IRB protocol #20201020721EX). All participants provided electronic informed consent before participating in the research.

Data code and availability statements: The data presented in this study are available on request from the corresponding author.

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