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The importance of nutritional nudges in restaurant food environments: Insights from two contrasting countries

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ABSTRACT

Restaurant food choices result from interactions between individual preferences and establishments' food environments. Different ecological-based strategies (nutritional nudges) have been suggested to push restaurant consumers toward healthier choices. This research analyzed key nutritional nudges from the restaurant and consumer perspectives and how they may differ. The study examined thirty-five nudges classified into three categories: 1) Decision Structure Nudges (DSNs: e.g., available menu items) (n = 21), 2) Decision Information Nudges (DINs: e.g., menu labeling) (n = 7), and 3) Decision Assistance Nudges (DANs: e.g., smaller portions with a lower price) (n = 7). Two comparative studies were conducted in two contrasting countries (Colombia and the U.S.) to identify the restaurant industry's prevalence of nutritional nudges adoption in health-focused and other-focused restaurants (HFRs and OFRs) and consumers' perceived importance of those nudges. Study 1 (n = 127 restaurant observations) showed that restaurants' adoption of DSNs was higher than DINs and DANs. Differentiation in adopting nudges between HFRs and OFRs was identified in both countries. Colombian HFRs adopted significantly more DSNs than U.S. HFRs. Study 2 (n = 819 consumer responses) found that DANs are relevant for consumers when selecting a restaurant. For U.S. consumers, DANs are significantly more important than DSNs. For Colombian consumers, DANs are as important as DSNs and are more important than DINs. When comparing the two studies, differences between restaurants' adoption and consumers' perceived importance were evident. Ultimately, this study emphasizes the potential of nudges like DANs to encourage healthy food consumption given their importance across various contexts.

1. Introduction

Individuals make hundreds of food-related decisions daily (Claassen et al., 2025).Unfortunately, many of those decisions do not align with healthy eating recommendations, potentially increasing chronic disease and mortality risk (Afshin et al., 2019). However, food choices are complex, influenced by consumers' individual factors (e.g., habits, taste preferences, or perceptions of nutritional value) and multidimensional environmental conditions such as social networks, physical environments, practices, and policy actions (Chen & Antonelli, 2020; Schneider & Hoffmann, 2011; Schwartz et al., 2017). Understanding the ecological relationships of environmental conditions, along with consumer perspectives is critical for developing government and private sector policies that encourage healthier food choices (Schwartz et al., 2017).

Restaurants present a set of ecological conditions that differ from eating at home, resulting in differences in food choices. Ecological conditions refer to the interplay of various factors that influence health and nutrition, emphasizing how people interact with and are affected by their surrounding environments (Story et al., 2008). Although causality has not been established (Albalawi et al., 2020; V. Kraak et al., 2019), an association between frequent restaurant food consumption and a higher intake of energy and nutrients adverse to health has been established

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(Alexander et al., 2020; Bhutani et al., 2018). The ecological conditions of restaurants have been suggested to be an influential factor in this association, and restaurant consumer food choices (V. Kraak et al., 2019; Petimar et al., 2020).

Various ecological-based strategies, meaning approaches that involve designing or modifying the food environment in which people make decisions, have been tested and described to improve restaurant consumers' food decisions (Lindstrom et al., 2022). Behavioral economics calls these strategies "nudges" (Thaler & Sunstein, 2009). A nudge is a factor that alters the decision-making context to "push" individuals toward desirable behaviors without their complete awareness (Thaler & Sunstein, 2009).

According to Münscher et al., nudges may be classified into three broad categories: 1) those that change the decision structure by modifying the available options (Decision Structure Nudges: DSNs), 2) those that provide decision-relevant information (Decision Information Nudges: DINs), and 3) those that offer decision assistance (Decision Assistance Nudges: DANs) (Münscher et al., 2015). When nudges are used to persuade people to make better-for-you food choices, they can be considered nutritional nudges (Diaz-Beltran, 2021).

The Dual Process Theory describes how humans use both automatic (Type 1) and deliberative (Type 2) cognitive processes in judgment and decision-making (Evans & Stanovich, 2013). Nudges can persuade individuals by targeting either process (Peng et al., 2025). In restaurants, DSNs make healthy options more accessible, leading to automatic or deliberate choices. Strategies like reminders (DANs) guide behavior by interrupting automatic thoughts. Nudges mainly rely on automatic responses but can also engage deliberative thinking. DINs provide information to support rational choices, but sometimes they trigger automatic decisions driven by emotions. Nutritional info as a nudge affects cognitive processing in various ways (Sanjari et al., 2017). Overall, consumer responses show nudges' potential to influence behavior, emphasizing the need for different nudges to address how people process information in the food environment.

Most restaurant studies evaluating healthy eating promotion have focused on testing specific nutritional nudges and their effect on food selection. For example, studies have tested individual nudges like menu labels (e.g., DINs) (Buratto & Lotti, 2024),improving food offerings with specific menu items (e.g., DSNs) (Dos Santos et al., 2020), default options (e.g., DSNs) (Reinders et al., 2024), and discounts (e.g., DANs) (Deliens et al., 2016), among other factors that may influence individual decisions. However, the prevalence of restaurant adoption of these nudges and the importance of those strategies to consumers is unclear.

When considering nutritional nudges based on Münscher's categorizations (Münscher et al., 2015), restaurant food environment research has primarily underscored the need to increase the availability of healthy options (i.e., DSNs) (Fuster et al., 2023). In contrast, environmental facilitators or "enablers"(i.e., DINs and DANs) have received less research attention (Fuster et al., 2021). Additionally, the comparative prevalence of these nutritional nudge types in restaurants and the relative importance to consumers is unknown. Testing different levels of adoption and importance across the three nudge categories could help restaurants better understand what really matters. Since"nudges" cost money, this new avenue of analysis potentially could help restaurateurs prioritize certain nudge types such that they are beneficial for the business and public health.

Notably, restaurant food "healthiness" is heterogeneous, with some restaurants targeting a health-conscious consumer and marketing themselves as "health-focused." From a brand image perspective (Sukma Wijaya, 2013), health-focused restaurants (HFRs) intentionally project health-related associations through marketing communication, menu design, and brand identity. Restaurant industry reports indicate that the better-for-you approach is on the rise (National Restaurant Association, 2019). However, no study has tested whether HFRs' food environments differ from those of other establishments. Research on business perspectives for enhancing nutritious restaurant environments and how they influence better food choices is still limited (Fuster et al., 2022).

Most research on restaurant food choice ecology has been done in high-income countries (Huang et al., 2022; Roberts et al., 2018). However, restaurant ecological conditions may differ substantially depending on the nation (Claassen et al., 2025). Given that divergent regulatory frameworks, distinct levels of consumer purchasing power, and cultural values may shape restaurant food offerings (i.e., DSNs) and enablers (i.e., DINs and DANs) across nations, it was hypothesized that this could potentially result in differences in adoption and importance of restaurant nutritional nudges. Yet, there is limited comparative evidence among economically different countries. While studies have considered enablers of food choices in transnational chain restaurants within high-income countries, Kraak concluded that further transnational restaurant research is needed (V. Kraak et al., 2019). A comparative analysis in different contexts might reveal unique dynamics or similar patterns that can enhance understanding of the spectrum of food environments.

In sum, no study has systematically compared the prevalence, consumer importance, and cross-national variation of different types of nutritional nudges in restaurants. Therefore, this research utilized two studies to examine the prevalence of adoption of nutritional nudges in independent restaurants and the perceived importance of those nudges by consumers in two countries: Colombia (a middle-income country) and the U.S. (a high-income country) (World Bank, 2024). Furthermore, two restaurant segments were considered: Health-focused restaurants that strategically emphasize wellness, nutrition, and balanced eating as core components of their brand image, and other-focused restaurants that do not explicitly incorporate health-related cues or values in their brand communication. The results of this research contribute to the study of restaurant food choices' ecology and inform potential changes in restaurant business practices to better meet consumers' priorities related to nutritional nudges in nations with different economies and contrasting focus on better-for-you food strategies.

2. Study 1

2.1. Methods

2.1.1. The nutritional nudges assessment tool

This study utilized the Nutritional Nudges Inventory at Restaurants (NNIR), which was developed in English through a thorough literature review and a content validation with a committee of five restaurant industry experts. (Diaz-Beltran, 2021) (see Table A1, supplementary material). The tool was based on the concept of "food environment" presented by Glanz et al., 2005, along with their follow-up checklist with ecological-based strategies for restaurants (NEMS-R) (Glanz et al., 2005; Saelens et al., 2007). The inventory helped identify nudges discussed in prior research within established tools and allowed compilation of traditional strategies alongside new initiatives in emerging tools. As a result, it became in a more comprehensive instrument encompassing initiatives that influence food choice through automatic and/or deliberative thinking and that are very practical for the restaurant industry.

NNIR was used as an observational checklist (0 points if the nudge was not present; 1 point if it was) to measure restaurants' adoption of nutritional nudges. NNIR's thirty-five items were categorized into 3 groups based on the taxonomy of choice architecture techniques presented by Münscher et al. (2015), with modifications applied to suit the context of this study. The three groups included 1) Decision Structure Nudges (DSNs: e.g., available menu items) ($n = 21$), 2) Decision Information Nudges (DINs: e.g., menu labeling) ($n = 7$), and 3) Decision Assistance Nudges (DANs: e.g., smaller portions with a lower price) ($n = 7$).

DSNs are mainly healthy options that are easily accessible and make it more likely for people to remember and consider them as alternatives (i.e., availability heuristic) (Thaler & Sunstein, 2021). Adding healthy options was seen as a nudge because they alter the typical choice architecture in restaurants; without them, any other mechanism

(automatic or deliberate one) can be activated to create a healthy food environment. DSNs do not involve removing unhealthy food, since avoidance or prohibition does not constitute a nudge. Regarding DINs, they focus on presenting decision-relevant information to facilitate healthy food choices, while DANs aim to help people follow healthy intentions by acting as helpers or reminders.

2.1.1.1. Validity tests. NNIR's content and cross-cultural validity were established through expert review. The original English version was translated into Spanish with cultural adaptations aligning with World Health Organization (WHO) guidelines (World Health Organization., n. d.). Specifically, the original version (in English) was translated into Spanish by a Colombian bilingual researcher with expertise in nutritional nudges. Subsequently, another bilingual researcher, a native English speaker, back-translated. Then, a comparison of the back-translation with the original document was made by a third translator. After checking and adjusting discrepancies in both English and Spanish versions, a committee of three Colombian Registered Dietitian Nutritionists (RDNs) with expertise in foodservice reviewed the Spanish version. The committee conducted the checklist's final grammatical, linguistic, and semantic assessment, considering its feasibility in the Colombian context.

Convergent validity was assessed for both the English and Spanish versions by comparing NNIR's findings with the Full Restaurant Evaluation Supporting a Healthy (FRESH) Dining Environment Audit results. FRESH is a validated checklist with 28 items that assess the healthfulness of foods and environmental supports in dining venues using a 4-point scale (Horacek et al., 2019). A subset of 25 % of restaurants in the final sample was used for the convergent validity test. The FRESH score was converted to a percentage based on the number of points awarded divided by the total possible (112). For NNIR, the total adoption rate was calculated as a percentage by counting nutritional nudges adopted in each restaurant, divided by the total possible nudges. Pearson correlation was used to compare 32 restaurant-scored pairs and found a moderate and significant correlation between the tools ($r(30) = 0.571$, $p < 0.001$), confirming the convergent validity of NNIR.

2.1.1.2. Data collector training. Data collectors with backgrounds in hospitality and dietetics were recruited in two U.S. and two Colombian cities. In each city, a research team member with expertise in dietetics and foodservice management served as supervisor of the data collectors' training and environmental assessments. For the training, data collectors participated in 20 h of training in English (for the U.S.) or Spanish (for Colombia). The training included instructional videos, review of the NNIR & FRESH assessment tools, data entry of information into Qualtrics, and three practice visits accompanied by the supervisor.

2.1.1.3. Pilot tests. After training, each data collector independently visited at least two restaurants in each city. Inter-rater reliability was evaluated, and discrepancies were resolved by and with the expert supervisor when needed. Pilot visits were repeated until all data collectors achieved an IRR > 0.80.

2.1.2. Sampling and fieldwork procedures

2.1.2.1. Sampling. A multistage purposive sampling (Fig. B1 in supplementary material) was conducted to select independent restaurants in Bogota and Medellin, Colombia, and Lafayette, IN, and Kent, OH, in the U.S. The selection of countries and cities was driven by convenience and practical considerations regarding accessibility and the ability to gather rich, focused data, rather than an intent to statistically represent the entirety of either nation. The two countries also provided a means to compare a high-income country with a middle-income country to meet a primary objective of examining the adoption of nutritional nudges in contrasting conditions and illustrate how diverse restaurant food environments may utilize different strategies to promote healthy eating. Non-chain establishments, defined as single restaurants or chains with less than 20 locations under the same name, were selected. These establishments were selected as they are not commonly a focus of healthy eating research, have fewer resources than a chain, and have different regulatory requirements in menu labeling in U.S. (the law requiring menu labeling is only for chains with 20 or more locations).

The sample was further delineated as health-focused restaurants (HFRs) and other-focused restaurants (OFRs). To identify the sample restaurants a convenience strategy was used by, initially, Google Maps was used to find HFRs within a three-hour drive from the research centers in the target cities. The search used the keywords: "healthy restaurant in {*the respective city*}." To ensure a preliminary sample of at least 100 restaurants per city, researchers examined the first 20 pages of Google. The target of 100 was chosen to account for potential exclusions and unreachable establishments, exceeding the planned sample size of 30. A minimum sample size of 30 was defined because, at that point, the sample distribution of the mean tends to approximate a normal distribution, regardless of the shape of the population distribution. Exclusion criteria included specialty shops selling only beverages, or desserts, snacks (rather than meals), drugstore food counters, mobile food trucks, vending, and catering-only services. Restaurants located in food courts or university dormitories, those offering carry-out or take-out only, and non-restaurants that may be listed as a restaurant during a Google search were also excluded. The identified HFRs' websites and/or social media were checked to determine if they were currently operating. Establishments with no activity were considered closed and excluded.

Next, other sources were reviewed to confirm the restaurant was marketed as "healthy." Specifically, restaurant review websites were searched using the keyword "healthy" for the cities where the research centers were located. In U.S., TripAdvisor and Yelp were utilized, while in Colombia, TripAdvisor and Degusta were consulted. Additionally, the restaurant's website and/or its social media platforms (Facebook or Instagram) were used as sources to verify if the establishments emphasized "health" narratives. Restaurants were considered HFRs when more than one source (Google AND (1) a restaurant review website OR, (2) the restaurant's website, OR (3) the restaurant's social media platforms) indicated such. Once the HFRs were finalized, the same number of OFRs were identified in the same geographic area as the HFRs using Google Maps.

2.1.2.2. Data collection. In U.S., Purdue University's Institutional Review Board (IRB) deemed this study as exempt. In Colombia, all study procedures were approved by the IRB led by the School of Science in Pontificia Universidad Javeriana (Approved on April 21, 2022, with the reference code "Acta 4"). Permission was sought and granted by the restaurants to complete the observation. During the visit, menus and the restaurant's physical location were examined to identify healthy available menu items (DSNs), information (DINs), and reminders (DANs) that were present or not. Sampled restaurants were independently examined by two trained data collectors from February to May 2023. A supervisor compared the two observations; in case of discrepancies, comments were analyzed, or a third visit was conducted to resolve incongruencies. A final profile per restaurant was defined with the nudges adopted or not.

2.1.3. Statistical analysis

Analysis was based on adoption rates of nutritional nudges per nudge category. Rates were calculated as a percentage by enumerating the presence of the nudges that change the decision structure (DSNs), provide decision information (DINs), or offer decision assistance (DANs) divided by the total nudges the for specific category in NNIR. Differences among categories, countries, and types of restaurants were evaluated to test the hypotheses Friedman test with Dunn's pairwise post-test was used to compare the three categories. The Mann-Whitney *U* test was

calculated to identify differences between HFRs and OFRs per nudge category. Rank-biserial correlations were used to identify the effect sizes of the comparisons conducted. In addition, chi-square tests of independence were conducted to assess the association between adopting nudge categories and a specific country or type of restaurant.

2.2. Results

Results are based on the assessment of 127 restaurants and the variety of nudges implemented at the restaurant level. In Colombia, 32 health-focused restaurants (HFRs) and 32 other-focused restaurants (OFRs) were visited, 87.58 % of the establishments offering full service and Colombian cuisine. In the U. S., 32 HFRs and 31 OFRs were visited. Of those, 71.4 % of the establishments offered full service, and the most typical cuisine was American.

In the visits conducted, the nudge category most frequently used by the restaurants was DSNs. In both countries, 100 % of restaurants adopted at least one strategy to influence the food decision structure. After this category, 81.1 % of the sample used at least one DAN. Conversely, only 38.6 % of establishments adopted at least one DIN.

Analysis revealed significant variability of nudge adoptions among the three nudge categories ($X^2(2) = 210.04$, $p < 0.001$). Specifically, post hoc tests with Bonferroni correction showed that the diversity of DSNs adopted was significantly higher than DANs and DINs in both countries. The DSN adoption rate median (Mdn) was 52.38 (IQR = 42.86–61.90). This indicates that half of restaurants in both countries adopted less than or more than 52 % of the DSNs in the inventory. In contrast, DANs and DINs adoption rates were lower, with DANs-Mdn = 14.29 (IQR = 14.29–28.57) and DINs-Mdn = 0.00 (IQR = 0.00–14.29), implying an adoption rate of 14 % and 0 % for DANs and DINs, respectively. Post hoc tests showed that a wider range of DANs was implemented compared with DINs.

Fig. 1 shows the adoption rates for categories per country and type of restaurant. No relationship was found between countries and the adoption or not of DINs, DSNs, and DANs. However, when comparing countries, Colombian HFRs had a higher DSNs adoption rate (Mdn = 66.67) than U.S. HFRs (Mdn = 54.76), U = 168.500, $p \leq 0.001$, with a large effect $r = 0.671$. No other difference was detected between HFRs in the two countries. For OFRs, no significant variation was identified.

In Colombia, the diversity of DSNs and DANs varied significantly between HFRs and OFRs (Fig. 1). DSNs adoption rate was higher in HFRs (Mdn = 66.67) than in OFRs (Mdn = 42.86), U = 74, $p \leq 0.001$, $r = 0.855$ with a large effect. Similarly, DANs also displayed superior values in HFRs (Mdn = 28.57) than in OFRs (Mdn = 14.29), U = 226.50, $p \leq 0.001$, $r = 0.558$. Additionally, the results indicated a significant association between the type of restaurant and the adoption of DSNs and DANs. The proportion of restaurants that adopted more than half of the DSNs was 2.73 times higher in HFRs than in OFR, 95 % CI [1.68, 4.44] ($\chi^2(1, N = 64) = 24.5$, $p \leq 0.001$). Likewise, the HFRs that adopted at least one DANs were 1.35 times more than OFR 95 % CI [1.08, 1.69]. No differences or associations were found between Colombian HFRs and OFRs for DINs.

Table 1 highlights individual nutritional nudges most adopted per category in Colombia by restaurant type. For DSNs, HFRs, and OFRs adopted the availability of low-calorie beverages and non-fried vegetables similarly. However, Colombian HFRs offered more color variety in vegetables than OFR. DINs were adopted in fewer than one-third of the restaurants. For OFRs, the most adopted initiative in this category was labeling menu items as "light fare," "light," or "heart healthy," but just in 15.6 % of restaurants. In contrast, this initiative was the second most common in HFRs, with the most adopted nudge being symbols for healthier choices, although only in 34 % of the restaurants. For DANs in both OFRs and HFRs, advertisement of the ability to make substitutions was the most prevalent.

In U.S., significant differences were found between HFRs and OFRs for DINs and DANs adoption rates (Fig. 1). The variety of DINs used was higher in HFRs (Mdn = 14.29) than in OFRs (Mdn = 0.00), with a medium effect U = 329.00, $p = 0.008$, $r = 0.337$. Similarly, the presence of at least one DIN was associated with HFRs, χ^2 (1, $N = 63$) = 6.02, $p = 0.014$. The percentage of restaurants that adopted at least one DIN was 2.18 times greater in HFRs than in OFR, 95 % CI [1.11, 4.26]. For DANs, despite similar medians, HFRs had significantly higher values (Mdn = 14.28) compared to OFRs (Mdn = 14.28) (Fig. 1, U = 331.500 p = 0.014, $r = 0.332$. In the case of DSNs, no significant differences in adoption rates were found between HFR (Mdn = 54.76) versus OFR (Mdn = 47.61) (U = 364.500 $p = 0.068$). However, when testing the association between adopting more than half of the DSNs and type of restaurant, the proportion of HFR that adopted more DSNs was 1.64 times higher in

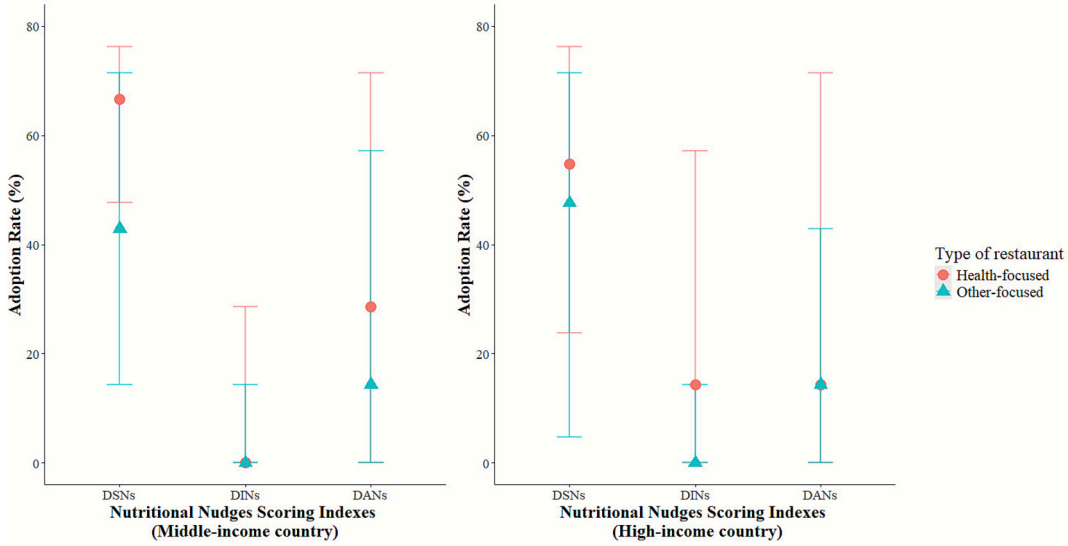

Fig. 1. Figure 1. Nutritional nudges adoption rates per category for a sample of restaurants in a middle-income country (Colombia) and a high-income country (United States). Notes: [a] Bars represents minimum, and maximum values with the median [b.] DSNs: Decision Structure Nudges; DINs Decision Information Nudges. DANs: Decision Assistance Nudges. [c] Medians signed in the middle-income country (Colombia). Health-focus restaurant DSNs:66.67 DINs:0.00 DANs:28.57 Other-focused DSNs:42.86 DINs: 0.00 DANs:14.29[d] Medians signed in the high-income country (United States). Health-focus restaurant DSNs:54.76 DINs: 14.29 DANs:14.28 Other-focused DSNs: 47.61 DINs: 0.00 DANs:14.28

Table 1
Nudges most adopted by health-focused and other-focused restaurants in a middle-income and high income-country.

Health-focused restaurants (HFR)		Other-Focused restaurants (OFR)	
Nudge	%	Nudge	%
Colombia			
Decision Structure Nudges (DSNs)			
The menu includes non-fried vegetables (red-orange and dark-green vegetables)	*100*	The menu includes other low-calorie beverages (Water or unsweetened tea or coffee)	100
The menu includes other low-calorie beverages. (Water or unsweetened tea or coffee)	*100*	The menu includes other vegetables. (This group includes avocado, cucumbers, celery, zucchini and mushrooms)	96.9
Decision Information Nudges (DINs)			
Symbols for healthier choices on the menu	*34.4*	Items labeled as "light fare," "light," "heart healthy,"	15.6
Items labeled as "light fare," "light," "heart healthy,"	*15.6*	Symbols for healthier choices on the menu	6.3
Decision Assistance Nudges (DANs)			
The ability to make substitutions is advertised	*78.10*	The ability to make substitutions is advertised	59.4
Lighting or visual cues create an ambiance or atmosphere that highlights healthy food	*43.80*	Lighting or visual cues create an ambiance or atmosphere that highlights healthy food	15.6
United States			
Decision Structure Nudges (DSNs)			
The menu includes other low-calorie beverages (Water or unsweetened tea or coffee).	100	The menu includes other low-calorie beverages (Water or unsweetened tea or coffee).	96.8
The menu includes non-fried vegetables.	93.8	The menu includes diet soda.	93.5
Decision Information Nudges (DINs)			
Symbols for healthier choices on the menu	37.5	Symbols for healthier choices on the menu	12.9
Items labeled as "light fare," "light," "heart healthy,"	15.6	Items labeled as "light fare," "light," "heart healthy,"	9.7
Decision Assistance Nudges (DANs)			
Smaller portions have a lower price compared to regular portions.	59.4	Smaller portions have a lower price compared to regular portions.	41.9
The ability to make substitutions is advertised	40.60	The ability to make substitutions is advertised	32.3

Notes: Colombia: HFR (n) = 32 OFR (n) = 32; United States: HFR (n) = 32 OFR (n) = 31.
%: Percentage of restaurants that adopted the nudge.

HFRs than in OFR, 95 % CI [1.02, 2.64] ($\chi^2(1, N = 63) = 4.59$, $p = 0.032$).

Table 1 presents the most frequently adopted individual initiatives within each nudge category in the U.S. sample. The most adopted DSN was the availability of low-calorie beverages (like water, unsweetened tea, or coffee) for HFRs and OFRs. The second most common DSN was the availability of diet soda for OFRs and the inclusion of non-fried vegetables in HFRs. Adoption of DINs was quite limited among the establishments observed, with menu symbols being the most used strategy—appearing in 12.9 % of OFRs and 37.5 % of HFRs. Regarding DANs, even though the adoption rate differed between restaurant types, the most common strategy in both was offering smaller portions at a lower price than regular portions. However, approximately half of the restaurants did not offer this option.

The results of individual nudge adoption in Table 1 illustrate that even the most common nudges in the DANs and DINs categories are used by fewer restaurants than those adopting DSNs. However, while restaurants generally display a higher proportion of DNS, a detailed analysis also identified nudges in that category with low adoption frequency, such as offering smaller portion sizes for main dishes (used by only 31 % of restaurants), low-fat milk (just 10.2 %), and low-sugar desserts (28.3 %).

3. Study 2

3.1. Methods

A cross-sectional study was used to measure consumers' perceived importance of the three nudge categories in Colombia and the U.S. In Fall 2023, participants from the two countries completed online surveys regarding the three nudge categories: DSNs, DANs, and DINs.

3.1.1. Sample

The study used a non-probabilistic sample of 819 individuals who were over 18 years and dined in any restaurant at least once per week. For the planned analyses with an anticipated effect size of f2 = 0.02, at the statistical power level of 0.80 ($\alpha = 0.05$), a minimum sample size of 720 respondents was estimated initially. In the U.S., Amazon Mechanical Turk (MTurk), an online crowdsourcing platform where people complete virtual tasks, was used for recruitment. Participants were compensated with USD $1 for completing the survey, and an additional platform fee equal to 40 % of the participant's pay rate was paid. In Colombia, participants were recruited through social media advertisements on Instagram and Facebook, given that MTurk is not accessible in the region, and social media platforms are widely used for research participant recruitment. The use of different recruitment strategies is recommended to fit local digital behaviors and platform accessibility (He et al., 2012). Colombian participants received a $2 coffee gift card for completing an online questionnaire, with an additional 30 % advertisement fee paid to the social media platform. The study protocol received approval from the Institutional Review Board (IRB) in Colombia, led by the School of Science at Pontificia Universidad Javeriana, on April 21, 2022 (reference code: Acta 4). In the United States, the protocol was approved by Kent State University on September 1, 2023 (reference number: 996).

3.1.2. Survey stimuli and procedures

Before participating in the survey, participants were asked to read the informed consent and move to the next step if they agreed to participate. Inclusion criteria were limited to participants with a dining out frequency of at least once per week because this level of restaurant usage is common in the U.S.(USDA, 2025) and main cities of Colombia (NIQ, 2016). Hunger (at the moment) and health concern levels could influence participants' answers and, thus, were measured to be controlled during data analysis. Both were measured with a 7-point Likert scale (hunger,1="not hungry at all" and 7 = "very hungry"; health concern, 1 = "strongly disagree" and 7 = "strongly agree"). The health concern level included 4 items adapted from Jin et al. (Jin et al., 2017). Example items included "Self-consciousness about my health encourages me to choose healthy food" and "Concern about my personal health makes me want to purchase healthy food in restaurants." The average of the respondents' 4 answers was used as an aggregate health concern score.

Next, data were gathered using the split questionnaire survey design (SQSD) in both countries. SQSD helps minimize the response burden for respondents and is supported by previous research (Raghunathan & Grizzle, 1995). According to SQSD, participants were randomly assigned to one of three question groups related to the NNIR nudge categories: decision structure nudges (DSNs = 17), decision information nudges (DINs = 7), or decision assistance nudges (DANs = 7). In the case of DSNs, the five main color groups for vegetable nudges were combined into a question about vegetable availability importance. As a result, the

number of nudges in this category was fewer than in the NNIR. Within each group, participants were asked to rate the importance of each nudge when selecting a restaurant to visit, using a 7-point Likert-type scale (1="not important at all" and 7 = "extremely important)." This question framing was intended to capture the perspective of restaurateurs, who are primarily concerned with strategies that attract patrons.

Demographic information (age, gender, and education) was requested. They were also asked to self-report their height and weight, which were used to calculate Body Mass Index (BMI). Additionally, participants indicated whether they had a job related to adult nutrition. Controlling for participants having a job related to adult nutrition helped account for a specific market segment that might be more interested in healthy eating out. During the survey, three attention-check questions were embedded in the questionnaire; data from participants with incorrect responses to these questions were excluded.

3.1.3. Statistical analysis

To identify variations among the three groups, the respondents' demographic and psychographic profiles were analyzed using Chi-squared and Mann-Whitney *U* tests for categorical and continuous variables, respectively.

Importance scores per nutritional nudge category were determined as the mean of the importance given to each nudge within the same group to determine unique importance score for DSNs, DANs, and DINs. According to the procedures recommended for SQSD, multiple imputations were used to conduct a more robust analysis (Raghunathan & Grizzle, 1995). By drawing from the distribution of the data observed in the three NNIR question groups, twenty completed datasets were generated following Rubin's Rules to account for imputation uncertainty accurately.

Even after imputation, the responses did not meet the assumptions for parametric procedures to compare between groups. Therefore, non-parametric regression technique on ranks was used, followed by pairwise comparisons with Bonferroni correction to test hypotheses and identify specific differences. Comparisons of importance scores per nutritional nudge were performed both between and within countries, adjusting for covariates of gender, education, age, body mass index, hunger level, health concern, and job focus. These variables were incorporated as covariates because they differed between the countries, and to control for confounding effects in the analysis.

3.2. Results

The survey reached 2249 people in Colombia and U.S. (See Figs. B2 and B3 in supplementary material). After removing participants who did not meet the eating-out frequency criteria or failed to answer the three attention checks correctly, the final analytical sample included 389 and 430 responses in Colombia and U.S., respectively.

Demographics such as age, sex, gender, and education varied significantly between Colombian and U.S. respondents (Table 2). However, demographic traits were relatively homogeneous within DIN/DSN/DAN groups in their respective countries. In Colombia, participants were primarily young (18–26 years old) females with high school diplomas or some college. U.S. respondents were predominantly adults (25–59 years old), well distributed between males and females, and mostly with bachelor's degrees. The U.S. sample resembles the population, except for education level, since the most common degree in that country is a high school diploma (United states census Bureau, 2023). For Colombia, the population tends to be older than the sample and proportionally equal in sex (DANE, 2024) with high school diplomas (DANE, 2022).

Colombian and U.S. respondents differed in hunger levels, body mass index (BMI), and job focus, but showed similar levels of health concern (HC). HC significantly differed between Colombia and the U.S. in the DSN group, but there were no significant differences in HC in other groups, within each country, or in the overall sample between the two countries.

For between-country comparisons, multiple linear regressions on ranks showed that country of residence was not significantly associated with the ranked importance of the three nudge categories. Within-country multiple linear regression on ranks, controlling for covariates, showed variability in the perceived importance among nudge categories as illustrated in Fig. 2.

Specifically, for Colombia, the overall model was significant ($F(13,373) = 10.44$, $p < 0.001$), as was the omnibus effect of nudge category ($F(2,375) = 11.14$, $p < 0.001$). Post hoc tests with Bonferroni correction showed that DSNs and DANs were perceived as similarly important, both rated significantly higher than DINs. No significant statistical difference was found in the ranked importance between DANs and DSNs. DINs ranked notably lower in importance compared to DSNs ($B = -109.62$, $SE = 25.87$, $t = -4.24$, $p < 0.001$), with a small-to-medium effect size ($r = 0.22$, 95 % CI [58.75, 160.49]). DANs ranked significantly higher than DINs (B 100.71, $SE = 25.33$, $t = 3.98$, $p < 0.001$), also with a small-to-medium effect size ($r = 0.20$, 95 % CI [50.91, 150.51]).

For U.S. respondents, the overall regression model was highly significant ($F(13, 413.6) = 37.55$, $p < 0.0001$), and the omnibus test showed a significant difference in the ranked importance scores among the three nudge categories ($F(2, 416) = 6.08$, $p = 0.0025$). Post hoc tests with Bonferroni correction showed no difference between the ranks assigned to DINs and DSNs, nor between DANs and DINs. However, DANs were ranked significantly higher in importance compared to DSNs ($B = 70.35$, $SE = 20.19$, $t = 3.48$, $p = 0.001$), representing a small-to-medium effect size ($r = 0.25$, 95 % CI [30.66, 110.04]). In short, for US consumers, DANs were perceived as significantly more important than DSNs, with no other distinctions among the other nudge categories.

Table 3 displays the pooled median importance scores for each individual nutritional nudge, calculated from 20 multiply imputed datasets based on responses from Colombian and U.S. consumers when asked about the importance of nudges in choosing a restaurant. For DSNs, in both countries, consumers rated the availability of healthy main dishes as the most important in that category. Regarding DINs, Colombians and U.S. participants both rated the use of symbols highest. For DANs, consumers from both countries considered the ability to make substitutions and lower prices for smaller portions as very important. Furthermore, this nudge category had the highest importance scores.

4. Discussion

This study explored independent (i.e., non-chain) health-focused (HFR) and other-focused (OFR) restaurants' adoption and consumers' perceived importance of nutritional nudges in Colombia and the U.S. Three categories of nutritional nudges were analyzed: decision structure nudges (DSNs), decision information nudges (DINs), and decision assistance nudges (DANs). DSNs represent mainly food offerings, while DINs and DANs are "enablers" of food choices, like menu labeling or smaller portions at a lower price. Comparative analyses were conducted between and within the two countries and between restaurant types (HFR versus OFR) to identify the adoption of nutritional nudges in restaurant environments and their importance from the consumer perspective.

In study 1, results showed that the proportion of restaurants adopting and the diversity adopted was higher for DSNs than DINs and DANs. HFRs emphasized different nudges in the two countries. In a middle-income economy (Colombia), HFRs offered DSNs and DANs significantly more than OFRs; their adoption was associated with being an HFR. In a high-income economy (U.S.), HFRs offered DINs and DANs more significantly than OFRs and had a similar variety of DSNs. Despite this, there was a relationship between adopting more DSNs and DINS and being an HFR. Comparing both countries, no differences were found in the variety of DINs and DANs, but Colombian restaurants adopted significantly more DSNs, particularly in HFRs.

Table 2
Descriptive characteristics of restaurant consumers surveyed from a middle-income country (Colombia) and a high-income country (United States).

	Decision Structure Nudges' Group		*p*-values	Decision Information Nudges' Group		p-values	Decision Assistance Nudges' Group		p-values
				Frequencies n (%)[1]					
Variable	**Colombia**	**US**		**Colombia**	**US**		**Colombia**	**US**	
n	128	136		121	150		140	144	
Age									
Young (18–26 years old)	80(62.5)	11(8.1)	<0.001	66(54.5)	10(6.7)	<0.001	88(62.9)	14(9.7)	<0.001
		115			121			119	
Adult (27–59)	42(32.8)	(84.6)		52(43)	(80.7)		52(37.1)	(82.6)	
Elderly (>60)	6(4.7)	10(7.4)		3(2.5)	19(12.7)		0(0)	11(7.6)	
Sex									
Male	39(30.5)	63(46.3)	0.013	29(24.0)	75(50.0)	<0.001	22(15.7)	83(57.6)	<0.001
Female	88(68.8)	73(53.7)		92(76.0)	73(48.7)		116(82.9)	61(42.4)	
Don't Know	1(0.8)				1(0.7)				
Prefers not to answer					1(0.7)		2(1.4)		
Gender									
Male	39(30.5)	63(46.3)	0.022	28(23.1)	75(50.0)	<0.001	22(15.7)	83(57.6)	<0.001
Female	86(67.2)	73(53.7)		90(74.4)	73(48.7)		113(80.7)	60(41.7)	
Non- binary	2(1.6)			2(1.7)			2(1.4)	1(0.7)	
Transgender					1(0.7)				
Don't Know	1(0.8)			1(0.8)					
Prefers not to answer					1(0.7)		3(2.1)		
Education Level									
Some high school or less but no diploma	1(0.8)		<0.001	1(0.8)		<0.001	2(1.4)	1(0.7)	<0.001
High school diploma or equivalent	55(43.0)	12 (8.8)		47(38.8)	4(2.7)		62(44.3)	5(3.5)	
Some college or associate degree	28(21.9)	16(11.8)		22(18.2)	19(12.7)		32(22.9)	13(9.0)	
					107			109	
bachelor's degree	32(25.0)	84(61.8)		34(28.1)	(71.3)		27(19.3)	(75.7)	
Graduate degree (e.g. master's. doctorate. or professional degree)	12(9.4)	24(17.6)		17(14)	20(13.3)		17(12.1)	16(11.1)	
Race (n)[3]									
American Indian or Alaska Native					2(1.3)				
Asian		10(7.4)			7(4.7)			9(6.3)	
Black/African-American		5(3.7)			11(7.3)			6(4.2)	
Hispanic or Latino		3(2.2)			2(1.3)			5(3.5)	
		118			125			123	
White/Caucasian		(86.8)			(83.3)			(85.4)	
Two or more					2(1.3)				
Prefer not to say					1(0.7)			1(0.7)	
Mestizo/a	46(35.9)			40(33.1)			37(26.4)		
Raizal				1(0.8)					
Afro-descendent	1(0.8)						4(2.9)		
Rom or gypsy	1(0.8)								
Indigenous	1(0.8)						1(0.7)		
White	35(27.3)			33(27.3)			45(32.1)		
Does not identify with any	44(34.4)			47(38.8)			53(37.9)		
Job Focus on Adult Nutrition									
No	122(95.3)	82(61)	<0.001	108(89.3)	91(60.7)	<0.001	131(93.6)	87(60.4)	<0.001
Yes	6(4.7)	54(39)		13(10.7)	59(39.3)		9(6.4)		
				Measures of Central Tendency[2]					
Hunger level									
Mean	3.58	4.58	0.001	3.73	4.63	<0.001	3.43	4.59	<0.001
SD	1.76	1.56		1.55	1.53		1.65	1.7	
Median	4	5		4	5		3	5	
Health concern									
Mean	5.24	4.89	0.007	5.12	5.22	0.546	5.08	5.15	0.81
SD	1.4	1.31		1.3	1.19		1.33	1.25	
Median	5.63	5.25		5.25	5.5		5.38	5.5	
BMI (Kg/mˆ2)									
n	127	94		121	109		140	100	
Mean	23.4	27.8	<0.001	22.9	27.68	<0.001	23.1	27	<0.001

(*continued on next page*)

Table 2 (*continued*)

	Decision Structure Nudges' Group		p-values	Decision Information Nudges' Group		p-values	Decision Assistance Nudges' Group		p-values
SD	4.18	5.97		3.84	5.05		4.52	4.86	
Median	22.6	26.89		22.1	27.2		22.2	26.9	

Notes: [1]* Analyzed using chi-square test [2] *Analyzed using a Mann Whitney test. [3]* No statistical analyses were conducted on ethnicity because classifications are different between Colombia and U.S.

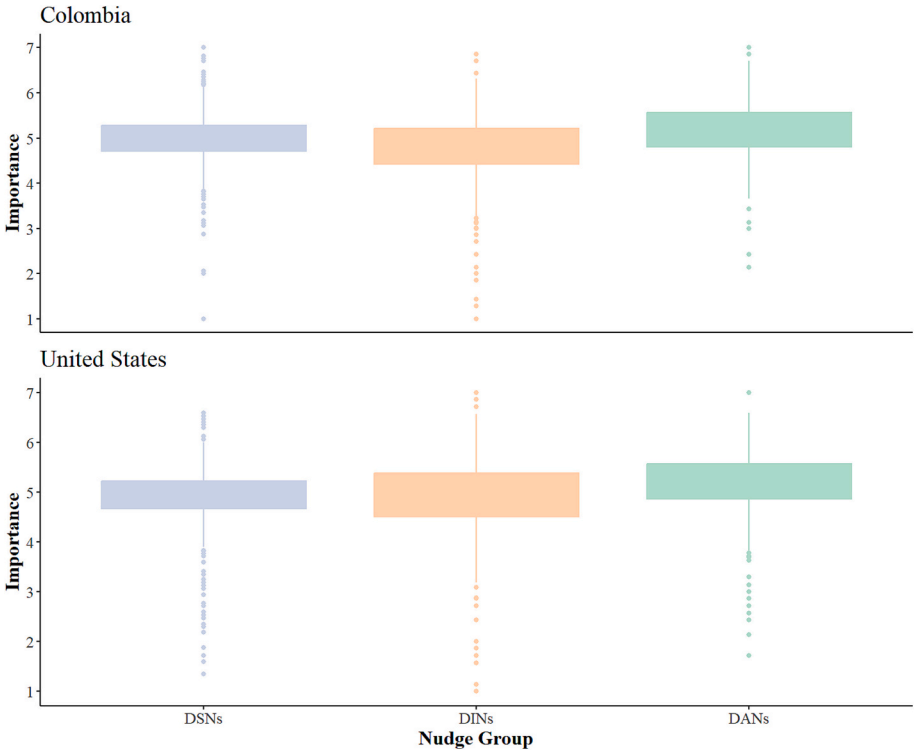

Fig. 2. Nudge group importance for Colombian and US consumers when selecting a restaurant.
Notes: [a] For importance, the response scale includes 1) Not Important at All, 2) Low Importance, 3) Slightly Important, 4) Neither important nor Unimportant, 5) Moderately Important, 6) Very Important, and 7) Extremely Important.

Study 2 found that DANs were relevant for consumers when selecting a restaurant. For U.S. consumers, DANs obtained higher importance scores than DSNs. For Colombian consumers, DANs were equally important as DSNs and more important than DINs. When selecting a restaurant for Colombians, DINs were the least important nudge category, but for U.S. consumers, DINs were as important as DSNs and DANs. The study did not find significant differences in the importance scores of nudge categories for selecting a restaurant between Colombian and U.S. consumers.

By integrating different perspectives, these studies extend the application of Dual-process Theory (Evans & Stanovich, 2013). They included the organizational and consumer perspectives of different strategies that target automatic and deliberative food decisions in restaurants. The research shows current adopted strategies that restaurant competitors may consider. It also illustrates those strategies that are lacking in real-world implementation and may be important for consumers selecting a restaurant.

When considering the findings of studies 1 and 2 together, discrepancies between restaurants' adoption and consumers' perceived importance were evident, even across different economies. Although DANs were considered the most important or of similar importance to DSNs by consumers, restaurants mainly adopted DSNs. This finding reveals a potential motivator for restaurateurs to implement additional initiatives to promote healthy eating. Often, restaurateurs express economic concerns about healthy-eating initiatives due to a lack of consumer demand (Blake et al., 2019; Kerins et al., 2020), but the findings in two different economies show that consumers value initiatives like DANs when selecting a restaurant, and some HFRs are already adopting them. This is like a recent investigation that shows that restaurant managers need not fear their customers' response to the nudges (Weijers et al., 2025). Restaurants could benefit from responding to what consumers consider important, recognizing that it is not just the availability of specific healthy food like DSNs that matters to the consumers. Although DANs are commonly suggested by researchers at independently owned restaurants (Fuster et al., 2021),this study shows that they may have the potential to be helpful and provide value for consumers and be beneficial for the industry.

Although DANs mainly trigger automatic responses for selecting food choices (Peng et al., 2025), in study 2, consumers also deliberately provided a rational reason to use them. The perceived consumer importance of DANs in selecting a restaurant can be understood through *attribution theory*. This theory suggests that individuals seek to make sense of their behavior by attributing it to personal choice or external factors (Harold H. Kelley & J. L. M., 1980). DANs, even when they alter the environment, may still preserve a sense of personal control. For example, the ability to make substitutions may empower customers. Research further supports that perceived control is a key determinant of positive consumer attitudes and behaviors in service contexts (Joosten et al., 2016; Van Raaij et al., 1998). DANS are not only good for healthy eating out but may also be associated with consumers' perceived control,

Table 3
Pooled median importance scores for nutritional nudges when asked about their significance in restaurant selection, based on responses from restaurant consumers in a middle-income country (Colombia) and a high-income country (United States). [1].

Item ID	Nudge	Pooled Median Importance Score[2]	
	Decision Structure Nudges (DSNs)	Colombia	United States
DS1	Healthy main dish options are available. Main dishes classified as healthy may include those with the descriptors baked, broiled, roasted, grilled, smoked, sautéed, stir-fried, steamed, boiled, poached, labeled: lean or extra lean, no breading or sauce, not fried, light or no mayo/sauce, broth-based.	5.3	5.3
DS14	The menu includes other low-calorie beverages. (Water, unsweetened tea, or coffee).	5.3	5.1
DS2	Healthy main-dish salad options are available. A main dish salad is of sufficient size to be the central part of a meal (or a meal in itself) and typically contains at least one protein source as an integral ingredient	5.2	5.2
DS5	The menu includes non-fried vegetables.	5.2	5.1
DS9	The menu includes at least one healthy dessert-type foods. Examples include: smoothies, soft-serve frozen yogurt, low-fat ice cream, low-fat ice cream novelties, low-fat non-dairy desserts, low-fat yogurt, sherbet, low-fat sorbet, angel food cake, low-fat cookies/cakes, mini dessert sizes; nutrient dense (at least three food groups: healthy fats, whole grains, legumes, fruits, vegetables).	5.2	5.0
DS15	Healthy choices for side dishes/beverages are included as an option for bundled meals. Items classified as healthy may include those with the descriptors baked, broiled, roasted, grilled, smoked, sautéed, stir-fried, steamed, boiled, poached, labeled: lean or extra lean, no breading or sauce, not fried, light or no mayo/sauce, broth-based or raw vegetables or raw fruits.	5.1	5.0
DS7	The restaurant has a salad bar.	5.1	4.9
DS11	The menu includes fruit juice that has no added sugar.	5.1	4.9
DS16	There are main dishes that contain animal protein alternatives with legumes, veggies, seeds, or cereals (whole or minimally processed plant protein sources. Example = black bean burger.)	5.0	4.9
DS8	The menu includes fresh or canned fruit as a side or dessert. For canned fruits/applesauce, there is an indication of "without added sugar."	5.0	4.8
DS3	Reduced-size portions are offered on the menu for main dishes. (In other words, there are at least two options of portion size).	4.9	4.7
DS6	The menu includes low-fat or fat-free salad dressings.	4.9	4.7
DS4	The menu provides whole wheat or whole grain options. For example, amaranth, barley (not pearled), brown rice, buckwheat, bulgur, millet, oats, grits, popcorn, quinoa, dark rye, whole-grain cornmeal, whole-wheat bread, whole-wheat chapati, whole-grain cereals and crackers, and wild rice.	4.8	4.7
DS18	The menu includes plant-based beverages as a replacement for milk (including but not limited to soy, coconut, almond, flax, rice, or oat beverages).	4.8	4.7
DS12	The menu includes 1 % low-fat, skim, or non-fat milk.	4.8	4.6
DS17	There are main dishes that contain animal protein alternatives from isolated protein or starch (Highly processed sources/animal protein analogs. Example = Impossible Burger TM).	4.6	4.6
DS13	The menu includes a diet soda diet or calorie-free soft drinks.	4.5	4.5
	Decision Information Nudges (DSNs)	**Colombia**	**United States**
DI2	Symbols are used to indicate healthier choices on the menu.	5.1	5.1
DI4	Posted signage states that additional nutrition information is available on request.	5.1	5.0
DI3	There are items labeled as "light fare," "light," "heart healthy," and/or "healthy," skinny, or "weight watchers."	4.9	4.9
DI1	There is calorie information on the menu (paper, posted menu, or online via QR code), available in a brochure, or posted near the point of the food selection decision.	4.8	5.0
DI7	There is other nutrient information on menus beyond calories (e.g., fat grams, sodium milligrams, protein grams, etc.).	4.7	4.9
DI5	A statement about total daily calories for general nutrition advice is present.	4.4	4.7
DI6	There is a reference to menu planning tools to adjust the nutritional value of orders. (e.g., Calculators, apps, or options on the restaurant's webpage).	4.3	4.6
	Decision Assistance Nudges (DANs)	**Colombia**	**United States**
DA1	The ability to make substitutions is advertised or promoted.	5.8	5.8
DA4	Smaller portions have a lower price compared to regular portions.	5.6	5.7
DA2	Signs/table tents/displays highlight healthy menu options. Items classified as healthy may include those with the descriptors baked, broiled, roasted, grilled, smoked, sautéed, stir-fried, steamed, boiled, poached, labeled: lean or extra lean, no breading or sauce, not fried, light or no mayo/sauce, broth-based or raw vegetables or raw fruits.	5.3	5.3
DA7	The restaurant uses lighting or visual cues to create an ambiance or atmosphere highlighting food and beverage products supporting healthy dietary guidelines.	5.0	5.0
DA6	The restaurant places fruits, vegetables, salads, and/or whole grains near the point of the food selection decision.	4.9	5.0
DA5	Healthy main dishes are identified in a separate section on the menu.	4.8	5.0
DA3	There are signs that have a statement related to healthy eating (e.g., dietary guidelines or messages about moderation, balance, or variety). -	4.7	4.9

Notes
[1] Medians are averages of the 50th percentile calculated across 20 imputed datasets and are rounded to one decimal place.
[2] For importance, the response scale includes 1) Not Important at All, 2) Low Importance, 3) Slightly Important, 4) Neither Important nor Unimportant, 5) Moderately Important, 6) Very Important, and 7) Extremely Important.

which could explain why consumers considered them important when selecting a restaurant.

Results reinforce the idea of the need to continue working on healthier food environments. Although healthy options have been emphasized as needed in restaurants (V. I. Kraak, 2018, 2020), low nutritional quality of restaurant foods is common (Liu et al., 2020). Similarly, study 1 revealed that even when DSNs were primarily adopted, only 52 % of them were used in restaurants, leaving room for improvement. Despite this, findings on DSNs matched dietary traits in both countries. A report of global diet assessment showed a Colombia's higher Alternative Healthy Eating Index than the U.S. one (Miller et al., 2022). Thus, it is reasonable to find that Colombian HFRs adopted more nutritional nudges focused on food offerings.

Similarly, the results about DINs may illustrate some degree of influence of regulation in each country. In the U.S., the menu labeling regulation has been in effect at chain restaurants (those with 20 or more units) since May 2018 (U.S. Food and Drug Administration, 2019). The regulation's intent was to provide information on menus to help customers make more informed and healthier food choices. In the case of non-chain restaurants (i.e., the restaurant type in the present study), they are encouraged to provide this information, but it is voluntary. The findings of the present studies show that, in US HFR, DINs were part of the differential offering regarding OFR; similarly, US consumers ranked this category as necessary like the other two groups. It seems possible that these results may be due to the US familiarity with these kinds of initiatives. This finding may provide support for changes observed when food environments are regulated, as is the case of US.

The findings show that HFRs do appear to differentiate themselves from OFRs, even in different economies. Although the sampling strategy targeted HFRs and OFRs based on their marketing communications, after examining establishments in two countries, HFRs differed significantly in their adoption of strategies to persuade consumers to make healthier food choices. The observed differences may be explained by the trend of consumers becoming increasingly concerned about the healthiness of food and prioritizing restaurants with a health focus (Lalley, 2022; National Restaurant Association, 2019; Northern Wind LLC, 2023;; Wellard-Cole et al., 2022). Adopting a more salient variety of strategies to make healthier choices is beneficial for restaurants because they can improve their image and increase loyalty and consumers' value perception (Jeong et al., 2017; Kang et al., 2015; Oh, 2000). By making these strategies their standard, restaurants can actively create and reinforce a social norm in their establishments that encourages healthier eating. Research has shown that environments that communicate an expected way of behaving may influence food choices (Salmivaara et al., 2021; Thomas et al., 2017).

Highlighting that HFRs vary in their use of different nutritional nudges is relevant because it reveals a subset of the restaurant industry making progress toward healthier food environments and potentially open to more strategies. Multiple studies indicate that efforts are necessary in the restaurant sector to encourage healthy eating (Alexander et al., 2020; Huang et al., 2022). This research shows that, despite room for improvement, some restaurants aim to make a difference. Given the limited evidence on restaurant interventions (Mandracchia et al., 2021), these two studies can help prioritize strategies for businesses targeting health-conscious consumers. This is especially important because the use of nudging in restaurants remains quite low (Weijers et al., 2025), even though evidence suggests it is more effective in this context than in others (Cadario & Chandon, 2019).

The primary strengths of this research include that the nutritional nudges evaluated were based on strategies suggested by previous literature and included restaurants that marketed themselves as healthy establishments. The findings may be used as guidance for the conceptualization of a “healthy restaurant.” Also, this cross-cultural study contributes to a more inclusive body of global knowledge by incorporating a middle-income economy —Colombia—alongside the United States. It provides insights into the applicability of nutritional nudges, which have primarily been tested in high-income countries. Cultural factors play a critical role in both business management and consumer behavior, as individuals' acceptance of products and services is influenced by personal attributes, as well as social and psychological processes shaped by their cultural background (de Mooij & Hofstede, 2011). Therefore, understanding how restaurants operate and how patrons engage with them across different cultural settings is essential.

Although this study makes several important contributions, it is not free from limitations. The classification of nudges in the inventory may look controversial. For example, the availability of healthy items may be considered only as a change in the offering, or smaller portions with a lower price may seem like a new option. The rationale behind synthesizing an inventory was mainly to help restaurateurs identify how to promote healthy eating from a practical perspective. In that sense, decisions about categorization were made by restaurant industry experts who may have been seen from the perspective of the study population. Münscher et al. pointed out that their categorization itself was not free of subjectivity and that raters may disagree on the correct classification of interventions (Münscher et al., 2015). Beyond the classification, the inventory signifies an endeavor to systematize and consolidate measures aimed at encouraging consumers to make healthier choices within restaurant environments.

Other limitation is the lack of available sources for comparison, as there have been few attempts to conduct comparative studies in restaurant food environments. No studies comparing restaurant food environments between contrasting countries were found. Similarly, most research has tested individual nutritional nudges. At the same time, the definition of ‘healthy’ restaurants does not exist, so Study 1 relied on Google's and other restaurant review sites' algorithms (which are not publicly available) to identify restaurants marketed as healthy versus not. This does not necessarily reflect the number or types of menu offerings that are healthy at each restaurant. This work's natural progression is conceptualizing a healthy restaurant and how restaurateurs, consumers, and other stakeholders envision it improving the food consumption setting.

Equally, the results only reflect the restaurant mix and participants in the studied locations. Since restaurant selection was dependent on the proprietary algorithms of the platforms searched, some eligible restaurants may have been inadvertently excluded. Similarly, recruitment methods could influence the characteristics of consumer participants. Although similarities in results across cities and countries suggest results are robust, more studies are needed.

5. Conclusion

In conclusion, this research highlights differences between restaurants' adoption and consumers' perceived importance of nutritional nudges in two contrasting countries. Initiatives that encourage healthy food choices and that are very practical for the restaurant industry were examined through an inventory that grouped nutritional nudges into Decision Structure Nudges (DSNs), Decision Information Nudges (DINs), and Decision Assistance Nudges (DANs). The use of this inventory represents an effort to systematize and consolidate actions that can persuade consumers toward healthier choices in restaurant settings. From the consumer perspective, the importance of DANs was identified without any difference between the two countries. When selecting a restaurant, consumers valued supporting tools such as the availability of substitutes or different portion sizes offered at varying prices. However, restaurants are mainly adopting DSNs, focusing on food offerings, though there's still room for improvement. Additionally, this study shows, across two different economies, that restaurants that intentionally differentiate their image through health-oriented positioning (Health-focused restaurants-HFRs) truly adopt nutritional nudges differently than other-focused restaurants. The findings can inform marketing practices in health-oriented establishments and give insight into working with a subset of the restaurant industry interested in

improving restaurant food selections.

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CRediT authorship contribution statement

Diaz-Beltran Monica: Writing – original draft, Visualization, Supervision, Resources, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Lee Kiwon:** Writing – review & editing, Supervision, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Byrd Karen:** Writing – review & editing, Supervision, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Lievano Martha:** Supervision, Methodology, Investigation, Formal analysis, Data curation. **Orozco-Soto Diana Maria:** Supervision, Investigation, Data curation. **Young Jeremy:** Funding acquisition, Formal analysis.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Data availability

The data supporting the findings of this study can be accessed at https://doi.org/10.60790/LQXWVD upon reasonable request to the corresponding author.

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