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REPORT

The food service playbook for promoting sustainable food choices

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Foreword

In 2022, the world learned a new eye-popping statistic: climate scientists found that changing human lifestyles has the potential to reduce carbon emissions by 40-70 percent.

Yet behavioral science remains an underutilized lever for combating climate change.

There are many barriers to unlocking its full potential. Behavioral change is often mistakenly characterized and criticized for pushing the responsibility of fixing the climate crisis onto individuals. While we certainly all have a role to play in reducing emissions, the reality is that this is a problem of scale. Catalyzing behavior change at the speed and magnitude required must start with the decisions of companies, governments and other institutions.

Dining is a perfect example. Research shows that people's decisions when eating out are heavily influenced by dining environments – from what dishes chefs add to the menu, what language is chosen to describe those dishes, how the wait staff promote the dishes, to even the music playing in the background! Most of our food decisions are handled by the part of the mind that uses fast, effortless, and unconscious reasoning.

This means that chefs, culinary directors, marketers, and nearly anyone involved in shaping a dining environment has a big hand in also shaping what foods customers choose to buy, everywhere. In the grand scheme, that can make a significant contribution towards accelerating our transition to a healthier and more sustainable food future.

This Playbook offers inspiration for creating a dining environment that fosters low-carbon food choices. As the second edition of this research, this report dives into almost 350 academic studies, adding to the evidence reviewed since we first released our guide for food service in 2020.

The Playbook is also informed by a close collaboration with a wide range of food businesses through Coolfood, WRI's initiative to curb diet-related emissions by 25 percent by 2030. Since 2019, Coolfood has been working with cities, hospitals, universities, restaurants and many other food providers serving billions of meals each year to operationalize and scale the most promising behavior change strategies. Early adopters have proved this approach works, having so far reduced their per-plate emissions by 10 percent while increasing the share of plant-based ingredients on the average plate by 8 percent.

I invite you to read this research with an eye toward what strategies you can introduce into your own operations. Your dining environment can help both diners and your organization have a lower carbon footprint while delighting guests with delicious meals and a contribution to a safer collective future.

As you embark on this journey, please also share your experience using this Playbook with us. Your insights will help us continue to deliver usable, actionable research to drive behavioral change at scale.

ANI DASGUPTA
President & CEO
World Resources Institute

Executive summary

Research on how to promote healthy, sustainable food choices has grown rapidly in recent years. In this updated "playbook 2.0," we outline the behavior change techniques that are most effective and most feasible to encourage diners to choose more plant-rich dishes and less meat when dining out.

HIGHLIGHTS

- The food service sector can play a powerful role in catalyzing a transition to healthier, more sustainable diets by encouraging customers to choose plant-rich dishes when dining out.
- This playbook 2.0, an update of World Resources Institute's 2020 "food service playbook," presents 90 behavior change techniques that food service providers can use to influence diners' choices. These are organized into six categories defining the target for change: Product, Presentation, People, Promotion, Price, and Placement.
- Eighteen of these are "priority" techniques that we recommend the food service sector adopt without hesitation. This shortlist contains techniques found effective in the majority of trials in which they have been tested and have been judged feasible and impactful by a group of expert stakeholders.
- A further 34 techniques are identified as "promising"—also found effective in the majority of trials in which they have been tested but were considered less impactful and feasible by experts. Further research is required to understand the barriers to their widespread adoption and scaling into industry.
- Recommendations for advancing the healthy, sustainable diets agenda by applying behavior change techniques are presented for food service providers, researchers and academics, and government changemakers. We highlight key knowledge gaps that urgently need to be addressed to successfully accelerate a shift toward more sustainable food choices when dining out.

The daily decisions that each of us make regarding what we eat are important contributors to climate change and biodiversity loss, and the food service sector is a major stakeholder. Restaurants, canteens, cafés, caterers, and other food service businesses are in a strong position to influence diners to choose healthier, more sustainable plant-rich dishes and fewer animal-based options when dining out.

In 2020, World Resources Institute (WRI) published the first edition of the *Playbook for Guiding Diners toward Plant-Rich Dishes in Food Service*. This guide outlined 57 behavior change techniques that food service providers can use to encourage diners to shift their choices toward more sustainable plant-rich options. As of May 2024, insights from this playbook have since contributed to operational changes made by food service organizations collectively serving 8 billion meals annually.

Since the original publication, a considerable volume of new research has explored ways to promote plant-rich food choices using techniques from behavioral science. The new playbook presents a summary of the updated academic literature published between 2018 and 2023. It improves upon the original guide through new analyses of the evidence and a multistage industry consultation process. These activities have yielded more robust conclusions regarding priority behavior change techniques for adoption in food service. Furthermore, we also outline behavior change techniques that academics and researchers must now explore to address current knowledge gaps. These include techniques ranked as highly feasible and impactful by expert stakeholders yet currently lack good-quality scientific evidence of effectiveness.

Overall, 18 priority behavior change techniques are presented, drawn from a new "complete" list of 90 behavior change techniques. Our prioritization process was based on two scoring systems: the first combines judgments from 49 expert stakeholders regarding the most impactful and feasible techniques to influence diners' choices in real-life food service settings; the second uses promise ratio scores that reflect the ratio of effective-to-ineffective trials supporting each behavior change technique.

The new complete list of 90 behavior change techniques is structured into a "6P" framework. This reproduces the structure of the 2020 playbook, but with a new "P" category of "Price." Price techniques involve redesigning the cost of plant-rich dishes plus new ways to incentivize diners to choose these options or otherwise disincentivize selection of meat dishes. The remaining P categories have

been retained: "Product" (techniques that involve modifying the food being served), "Presentation" (techniques that involve modifying the language, imagery, and layout of menus, signs, and labels), "People" (techniques that target food service employees), "Promotion" (techniques that include communication, marketing, advertising, and campaign approaches), and "Placement" (techniques involving food displays and the physical food service environment).

Overall, findings from the new playbook 2.0 show that research exploring techniques to influence food choices in food service settings has diversified over time. There are now far more trials testing techniques that promote plant-rich choices for environmental and animal welfare reasons rather than solely focusing on health benefits. We also see a far wider range of behavior change techniques trialed in the new literature, especially within the categories of Presentation, Placement, and Promotion, plus the addition of an entirely new Price category. Conversely, there has been no change in the total number of techniques identified within the People and Product categories over time.

Our new priority list of 18 techniques is shorter than the original list of 23 techniques and includes fewer examples from People and Product categories. Changes to the priority list reflect growth in the research evidence as well as the influence of our new prioritization approach using both promise ratio scores and expert ratings as shortlisting criteria. Although we acknowledge some limitations to combining these two approaches, this process has enabled identification of priority behavior techniques in a pragmatic and timely way to inform both research and implementation agendas.

Taste-focused and indulgent language continue to feature among the highest-ranking techniques on both scoring systems, once again demonstrating that educating consumers on environmental and health-related aspects of food choices is not enough on its own to drive change. Interestingly, although expert stakeholders consistently regard Product and People techniques as some of the most feasible approaches to introduce in practice, available research on their effectiveness remains scarce. As we encourage people working in food service to implement techniques from our priority shortlist, we also invite academics and research organizations to conduct further research into those behavior change techniques that currently lack rigorous scientific evaluation yet are judged viable for implementation in food service settings.

The food service sector must continue to play a leading role in catalyzing a transition toward diets containing fewer animal-based and more plant-rich meals. Government bodies and policymakers can also play an important role by developing policies to facilitate this transition, and philanthropies can further support the agenda by directing funds toward behavior change innovation and research. Using the priority behavior change techniques outlined in this playbook 2.0, we hope to make it simpler and more appealing for food service providers to make changes to dining environments that will successfully shift diners toward healthier, more climate-friendly meal choices.

Introduction

Globally, demand for animal-based proteins is rising. Producing meat and dairy is associated with higher greenhouse gas (GHG), water, and land-use footprints than producing plant-based proteins such as beans, peas, and lentils. This update of World Resources Institute's 2020 playbook provides food service stakeholders with behavior change techniques to encourage diners to choose healthy, sustainable, plant-rich options when dining out.

CLIMATE CHANGE AND OUR DIETS

Our collective diets are a key contributor to climate change, with the global food system responsible for around one-third of all GHG emissions (when considering direct emissions from food production as well as land-use change, energy usage across the supply chain, and methane from wasted food in landfills) (Crippa et al. 2021). Indeed, recent research predicts that, even if fossil fuel use ceased today, the 2015 Paris Agreement climate targets would be missed before the end of this century based on emissions from the food system alone (Clark et al. 2020).

Of all aspects of the diet that impact climate, one of the most important is ruminant meat—that is, beef, goat, and lamb. This is because of the substantial environmental footprint associated with ruminant meat production. For example, producing beef emits around 20 times more GHG emissions per unit of protein than common plant-based alternatives. Beef and lamb also produce far higher GHG emissions than other types of meat, such as chicken and pork, which themselves are considerably higher emitting than plant-based sources of protein like beans (Searchinger et al. 2019).

Beyond GHG emissions, the consumption of ruminant meat also has important negative impacts on other environmental outcomes, including biodiversity. Evidence from satellite images shows that around 45 million hectares of forest—that is, land roughly the size of Germany and Portugal combined—was replaced by pastureland for cattle between 2001 and 2015 (Boehm et al. 2022). When mature forests are felled, the habitats of many diverse species are destroyed; likewise, because the resulting soil quality is often poor, it remains difficult to regenerate vegetation losses in these areas (Veldkamp et al. 2020).

WHAT IS A SUSTAINABLE DIET?

In response to mounting evidence of a link between our diets and the environment, actions are being taken by a range of actors across the food system to promote healthier, more sustainable food choices.

In 2019, one of the leading authorities on this topic, the EAT-*Lancet* Commission, published a set of guidelines that clearly identified which food choices should be prioritized. These guidelines were coined the "planetary health diet" (Willett et al. 2019) and recommend an eating pattern designed to support human health while minimizing environmental impacts.

The planetary health diet recommends intake of predominantly plant-based foods, such as whole grains, vegetables, fruits, nuts, and legumes, with very small amounts of animal-based products also included (see Box 1 for dietary definitions and Figure 1 for recommended proportions of different dietary constituents in the planetary health diet). Alternative "sustainable" dietary recommendations

BOX 1 | Dietary definitions

lacto-ovo vegetarian diet: A diet that excludes meat, fish, and seafood but may allow consumption of other animal products (eggs and dairy).

pescatarian diet: A diet that excludes meat but that permits consumption of fish and seafood. Most pescatarians are also lacto-ovo vegetarians (i.e., they also consume eggs and dairy).

plant-based food: Foods derived from plants and fungi rather than animal sources. This includes fruit and vegetables, legumes (e.g., beans, lentils, peas, soybeans), grains, mushrooms, nuts and seeds, plant oils, herbs, and spices.

Source: Attwood et al. 2020.

plant-rich diet: A diet in which plant-based food makes up the majority of total amount consumed but may allow small amounts of animal products, including ruminant meat, to be eaten. The terms *plant-forward diet* and *sustainable diet* are also commonly used to refer to the same pattern of eating, including in this report.

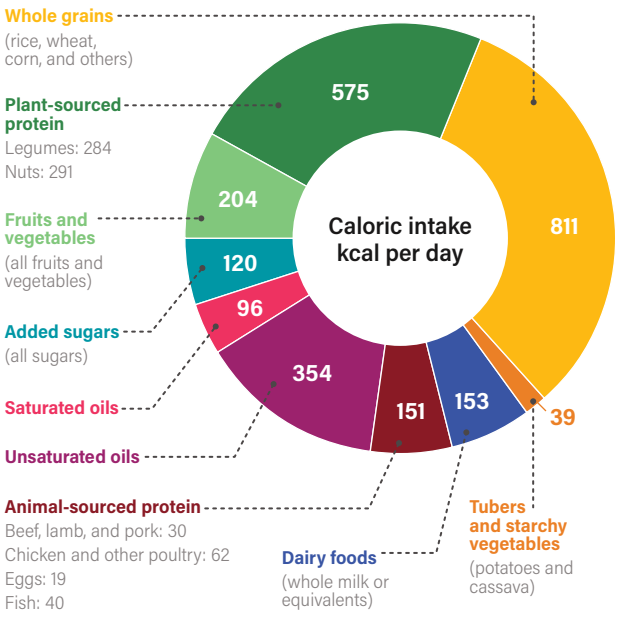
vegan diet: A diet that excludes all animal-based products and includes only plant-based foods. It is sometimes used synonymously with the term *plant-based diet* in the research literature to indicate a more sustainable eating pattern, but it is not strictly the same thing.

have also been proposed (i.e., vegan, vegetarian, flexitarian, pescatarian, Mediterranean, and others). Although the exact foods specified in each of these diets differ, a feature common to all is the recommendation to substantially reduce (but not necessarily eliminate) meat and dairy from our diets (Jarmul et al. 2020).

Upon release, the planetary health diet received a mixed reception. The guidelines were praised for being the first high-profile attempt to incorporate sustainability into dietary recommendations. Other positive feedback included the fact that the planetary health diet offers useful guidance for policymakers and those working in the food industry; that it specifically highlights the link between health, the environment, and food; and that it contributes toward a holistic food system transformation (Tulloch et al. 2023).

Conversely, the guidelines have been criticized on the grounds of nutritional balance. For example, the diet has been noted as being low in some important micronutrients (namely, vitamin B_{12}, calcium, zinc, and iodine, among other nutrients) (Beal et al. 2023). As a result, guideline changes have since been proposed. These include reconsidering the quantity of animal-based foods that is included in specific populations, lowering intake of phytate-rich foods (e.g., whole grains, legumes, and nuts), and recommending supplementation of the diet with key nutrients as required (Beal et al. 2023).

FIGURE 1 | Overview of the recommended structure of the EAT-*Lancet* planetary health diet



Source: Willett et al. 2019.

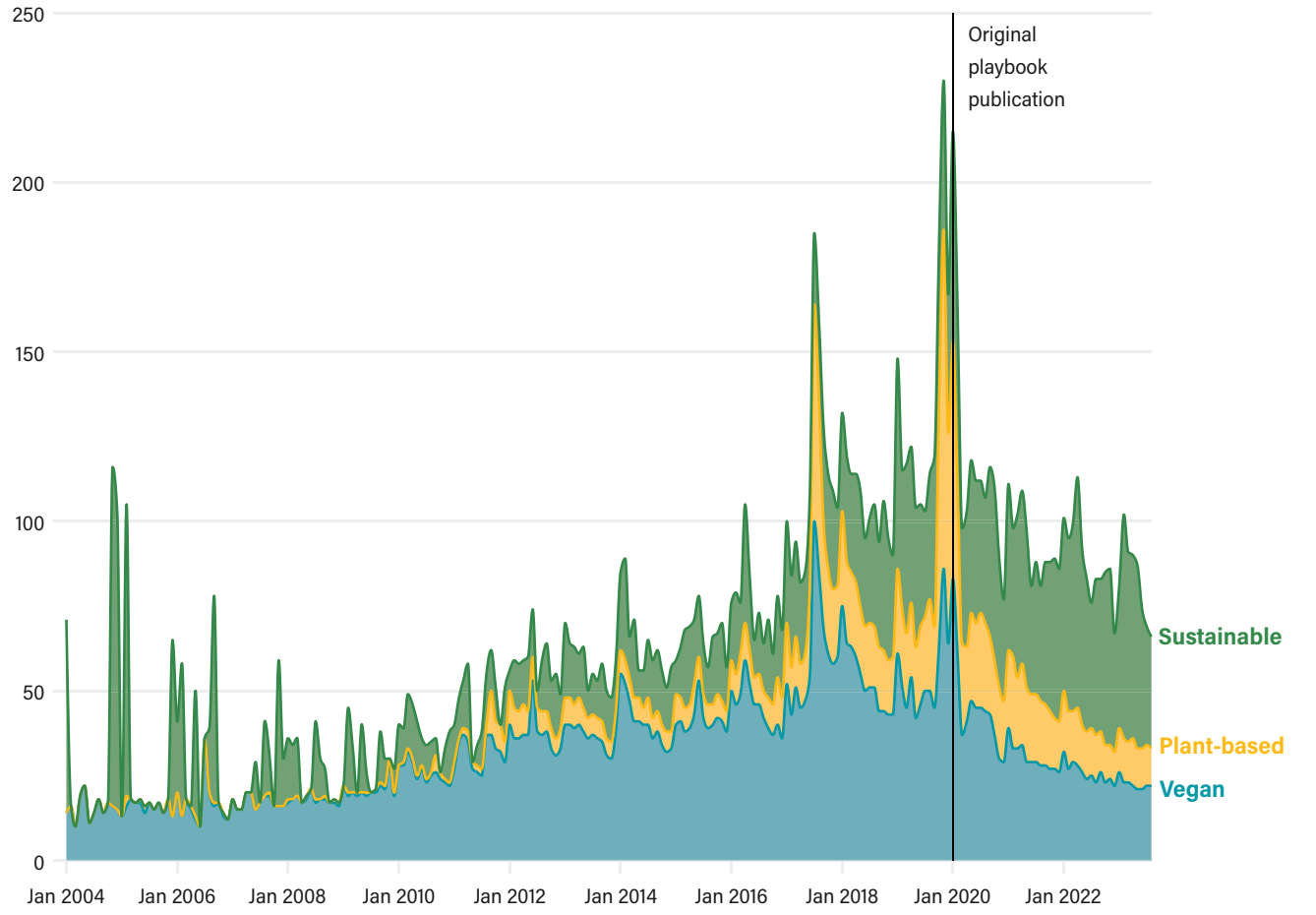
SUSTAINABLE DIETS AND THE FOOD INDUSTRY

While researchers, nutritional experts, and governments continue to work toward consensus on what constitutes the optimal sustainable diet, those in the business of preparing and serving food have responded energetically to growing public attention on this topic. This is partly in reaction to increased media and research interest in sustainable food, as shown in Figure 2. This graph tracks the evolution of Google searches for the most common terms describing plant-based diets over time (i.e., *vegan*, *plant based*, and *sustainable*).

Given the important influence that food service providers can have on population food choices, an engaged and responsive food service sector is essential to a transition to more sustainable diets at scale. For example, around 56 percent of total food expenditure in the United States was out of home in 2022 (ERS 2022), an increase of 16 percent from 2021 levels. Clearly, meals selected while dining out are substantial contributors to the healthfulness and sustainability of our diets overall. New dishes experienced in cafés, canteens, and restaurants can often inspire retail sales and in-home consumption, meaning even greater potential for spillover influences (Kerslake et al. 2022).

Viewing the plant-based movement through a commercial lens, many actors in the food system have begun to innovate strategies to meet rising consumer demand for tasty, protein-rich food in more environmentally friendly

FIGURE 2 | Worldwide Google search trends for sustainable diet terms, 2004–2023



Note: Numbers represent search interest relative to the highest point on the chart for the given region and time. A value of 100 is the peak popularity for the term. A value of 50 means that the term is half as popular. A score of 0 means there was not enough data for this term.

Source: Google Trends n.d.

ways. Market research shows that more and more consumers are now seeking better-quality and more varied plant-rich options when dining out, citing motivations that span curiosity, health, concerns about animal and human welfare, and a desire to eat more sustainably (ProVeg International 2022).

Food service businesses have taken the lead in familiarizing consumers with sustainable food by offering more high-quality plant-rich options and selectively promoting these over animal-based foods. For example, Starbucks introduced oat milk to menus nationwide in the United States, and other coffee chains now serve plant milks as the default, with no additional cost (Starostinetskaya 2023b).

Canteens in international corporations, including Google, have piloted a range of behavior change techniques to influence guests' food choices. Google worked with food management company Compass to introduce indulgent language descriptions for the plant-rich options on the menus in its staff canteens (Gavrieli et al. 2022); LinkedIn and Sodexo have partnered with Greener by Default to increase the ratio of plant-based options, implement plant-based defaults, and remove unappealing vegan dish descriptions (Cobe 2022; Starostinetskaya 2023a), and Volkswagen introduced vegetarian sausages into its canteen's iconic currywurst (*Vegconomist* 2021).

Universities, too, are innovating in this area, with notable examples including the University of Berlin's switch to a largely plant-based menu (BBC News 2021) and the University of Stirling's plan to move to 100 percent plant-based offerings by 2024 (Buxton 2022). More and more, we also find new restaurants opening around the world that are either solely or majority plant rich. In 2022, a plant-focused eatery—Geranium in Copenhagen, Denmark— even won the international award for the world's best restaurant (Buxton 2022).

At the same time, the alternative protein sector has also risen in prominence, ballooning from a few companies offering plant-rich versions of classic menu items like

burgers and sausages to a vast landscape of organizations supplying a diversity of product formats. From 2017 to 2022, the global plant-based meat and seafood market grew 118 percent, from US$2.8 billion to $6.1 billion (Gaan et al. 2021). As a whole, this sector includes plant-based, fermentation-enabled, cultivated (or cell-based), and hybrid options, many of which are now served across a wide range of geographies.

Industry launches of plant-based products, most prominently trials by Burger King (Bulbul 2023) and McDonald's (BBC News 2020) in the United States and Europe, have repeatedly proved that consumers are willing to try these novel options. However, a question mark remains as to their true potential for impact at scale: can these "alt meats" displace animal-based foods from our diets in the long term, or are they just a distracting sales gimmick or gateway to reach untapped consumer segments (O'Connor 2019)?

THE 2020 PLAYBOOK

In 2020, World Resources Institute (WRI) published the *Playbook for Guiding Diners toward Plant-Rich Dishes in Food Service*. This guide for food service summarized a range of behavior change techniques to encourage diners to shift toward more sustainable plant-rich options when dining out (Attwood et al. 2020).

Fifty-seven evidence-based techniques were presented in the first edition of the playbook, organized into a "5P" framework representing five major target categories for change: "Product" (the food being served), "Placement" (food displays and the food service environment), "Presentation" (language, imagery, and layout of food menus, signs, and labels), "Promotion" (communication, marketing, advertising, and consumer campaigns), and "People" (food service employees).

The goal of the 2020 playbook was to provide stakeholders working in food service (i.e., restaurants, cafés, university dining services, and corporate cafeterias) with effective behavior-change techniques to encourage more diners to choose healthy, sustainable, plant-rich options, including guidance on how to introduce behavioral science "nudges" into dining environments.

Since the original publication, food providers serving billions of meals each year have used insights from the 2020 playbook to make operational changes (see Box 2) (Coolfood 2022). As of 2023, Coolfood Pledge members—who committed to reduce absolute food-related emissions by 25

BOX 2 | What is Coolfood?

Coolfood, the World Resources Institute (WRI) initiative for curbing diet-related emissions, provides the food service industry with the tools and expertise to reduce emissions by 25 percent by 2030, in line with the goals of the Paris Agreement. as of May 2024, food providers serving 8 billion meals annually rely on Coolfood to step up their climate action and thereby help build a food system that benefits people and the planet.

Coolfood uniquely combines deep environmental research with expertise in behavioral science and consumer marketing techniques, all in a one-stop shop that allows the food service industry to turn its ambition into action.

Many restaurants, cafeterias, and other dining environments also use Coolfood's low-carbon certification mark to spotlight menu items that have been certified by WRI as being low carbon, meaning their emissions are at least 38 percent lower than the average meal. This label helps diners quickly identify options that are better for the planet. More than 4,000 meals across the United States and Canada now carry the Coolfood certification mark.

For further information, please visit coolfood.org

percent by 2030—achieved an average 10 percent per-plate reduction in the GHG emissions of the food they serve by adopting the behavior change techniques listed in the 2020 playbook. Some sectors—including health care, higher education, and cities—are even ahead of the pace needed to meet Coolfood's science-based target. This target aligns with the goal of keeping global temperature increases to under 1.5°C and was developed using the Science Based Targets initiative's target-setting methods (https://sciencebasedtargets.org/). It will be important for members to continue to accelerate progress in 2024 and beyond (Cho and Waite 2023).

The 2020 playbook has so far been independently downloaded over 4,000 times, providing food service providers, research organizations, and policymakers beyond Coolfood members with access to a compendium of the behavior change techniques that have potential to shift our collective food choices in a more sustainable direction.

PLAYBOOK 2.0: WHAT'S NEW?

Growing interest in climate-friendly food choices has led to an entirely new landscape of insights and resources for the food service sector to draw on as it works toward reducing the environmental footprint of the food served. In producing this update of the 2020 playbook (hereafter, referred to as the "playbook 2.0"), our intention has been to identify, summarize, and incorporate this new research into a single, evidence-based, and up-to-date guide that food service providers can continue to use as the basis for action.

Where possible within the playbook 2.0, we have endeavored to improve the original publication by addressing feedback received from end users and making changes to our methods and presentation as a result. In the following pages, you will find updates that include a summary of new academic research on promoting healthier, more sustainable choices in food service, published between 2018 and 2023. Additionally, we present a new compendium of behavior change techniques structured into a "6P" framework.

Lastly, we have also added an original analysis of the research evidence. This has helped us to identify "priority" behavior change techniques for rapid adoption by the food service sector. Our prioritization is now based on a combination of expert stakeholder ratings and scores that reflect the relative number of times that each technique led to a significant shift in food-related intentions or choices versus no significant change. This approach strengthens the conclusions of the 2020 playbook by explicitly accounting for the quantity of supportive research evidence rather than solely relying on expert ratings to identify priority techniques.

Building the playbook 2.0

In this section, we summarize the methods used to develop the new "complete" list of 90 behavior change techniques in the playbook 2.0. We identify a shortlist of 18 priority techniques for rapid adoption by the food service sector, based on the available research and endorsement from 49 expert stakeholders.

HOW WE BUILT THE PLAYBOOK 2.0

For full details of how we designed and built the playbook 2.0, please see our complete methods section in Appendix A. In brief, we began by reissuing our search of the academic literature available in English. Our search terms returned over 18,000 titles of peer-reviewed research papers published between 2018 and 2023. To this, we added 49 relevant publications identified from the gray literature or otherwise already known to us.

We reviewed the titles of all papers to identify trials testing behavior change interventions to encourage diners to select and/or consume plant-rich options. Following a subsequent review of abstracts, we retained trials that specifically focused on plant-rich food choices, as well as broader research that tested interventions for different, but relevant, purposes (for full inclusion criteria, please see Appendix A). Although our primary interest was trials conducted in food service settings (e.g., restaurants, cafés, and university and corporate cafeterias), we included research from food retail where we deemed this as applicable to self-service dining. Publications identified from ad hoc sources and from the gray literature helped us to identify potentially new behavior change techniques, but they were not formally included in our analysis (see subsequent sections).

After a full-text review of 386 peer-reviewed publications that met the above criteria, we finally retained 261 qualifying papers for the playbook 2.0 (of these, 187 were from the updated search, and 74 were from the 2020 playbook). Detailed reasons for excluding other publications are provided in Appendix A. In brief, this included studies that were not conducted in food service, did not focus on promoting plant-rich dishes or foods, were conducted in ineligible populations (children, hospital inpatients), or did not involve trialing an intervention. As some papers present findings from multiple trials within a single publication, our final sample of 261 papers yielded data from a total of 346 individual trials in total.

IDENTIFYING BEHAVIOR CHANGE TECHNIQUES

Next, we extracted information on the individual behavior change techniques that were tested in the 346 included trials and added these to the list of techniques in the 2020 playbook. For all new trials, we determined whether they featured techniques that matched those already in the original 5P framework or whether they qualified as totally new and were not possible to cluster into the existing scheme. Subsequently, we conducted an internal group workshop to review and refine the newly identified techniques into smaller groups that were integrated or appended to the original list of 57. This was a qualitative, framework-free exercise where techniques deemed similar by all team members were clustered together and assigned a new single descriptor to reflect the core change technique.

After finalizing the complete list of old and new techniques, the resulting 90 behavior change techniques were reorganized into a user-friendly framework similar to the 2020 playbook. To develop this framework, we started with the original 5P classification, agreeing by consensus on how to classify each new technique under the five "P" categories. This was followed by an internal survey of five WRI Food Team staff members who independently assigned each technique to a P category. Where group assignments disagreed, a wider team discussion ensued, with final classification based on consensus.

In completing this exercise, a new P category, "Price," emerged. This includes all techniques that involve modifying the consumer-facing cost of plant-rich dishes or that otherwise involve financially incentivizing plant-rich choices or disincentivizing meat dishes. This was created by reclassifying some techniques from the Promotion category as well as adding newly identified techniques from the updated literature. The remaining 5P categories were retained to create an updated 6P framework that consists of a complete list of 90 behavior change techniques, as follows:

- **Product:** techniques that involve modifying the food being served.
- **Presentation:** techniques that involve modifying the language, imagery, and layout of menus, signs, and labels.
- **People:** techniques that target food service employees.
- **Promotion:** techniques that include communication, marketing, advertising, and campaign approaches.
- **Price:** techniques that involve modifying the cost of food or otherwise incentivizing or disincentivizing specific choices.
- **Placement:** techniques that involve modifying food displays and the physical food service environment.

PRIORITIZING BEHAVIOR CHANGE TECHNIQUES

To simplify and clarify our recommendations, we next identified a shortlist of priority behavior change techniques for immediate implementation by food service providers. To do this, we assessed the feasibility and potential impact of all 90 techniques according to two separate scoring systems.

The first system was based on expert evaluation. We asked a sample of 49 experts identified via WRI's Coolfood member network to each review a random subset of techniques and rate them according to two criteria: impact and feasibility. Further details of our sample are provided in Appendix A. In brief, these stakeholders were based in seven countries (61 percent were based in the United States) and represented seven sectors (51 percent were from industry, including food service, retail, and food service management; the remainder were from academia, government and municipalities, nongovernmental organizations, and think tanks).

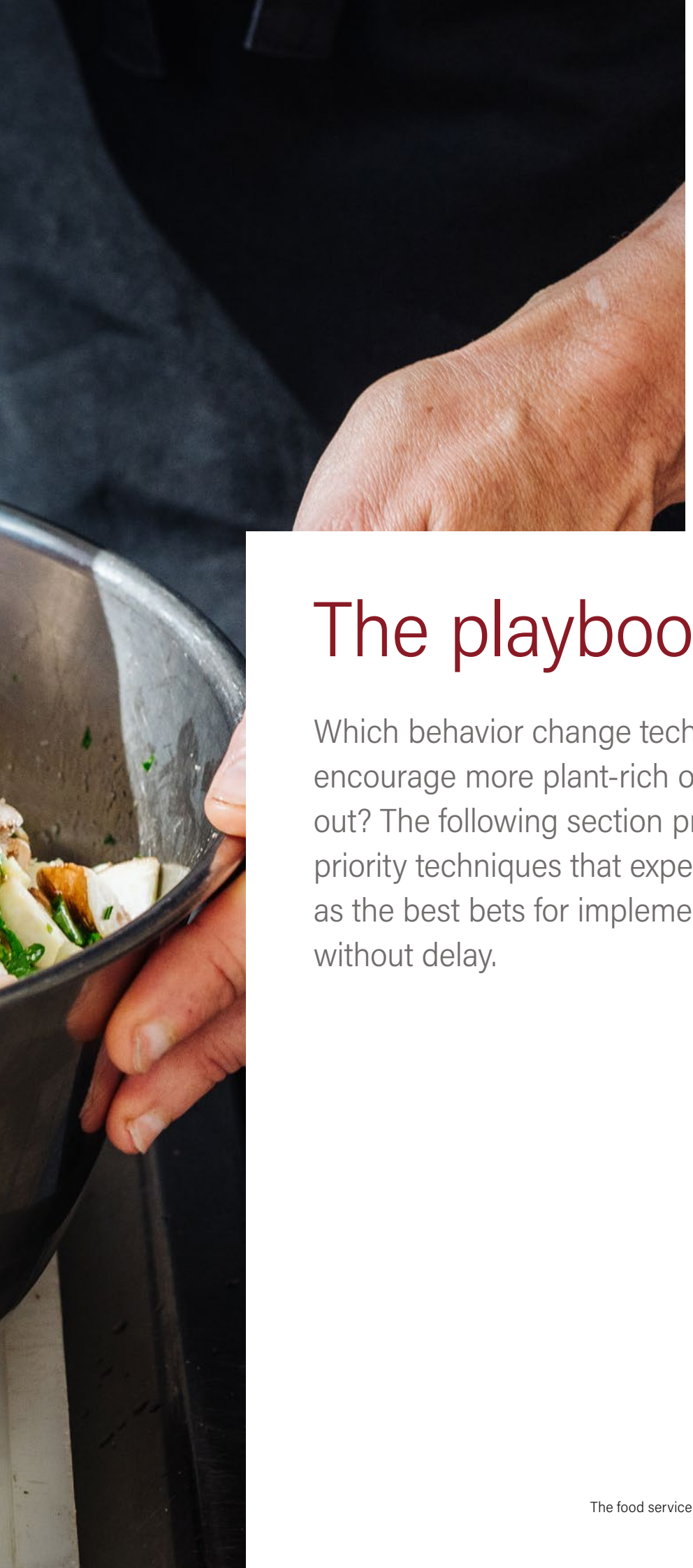
To assess the impact of each technique, we asked experts to indicate whether they believed each technique would work well in food service to influence consumer choices on a 7-point scale. To assess feasibility, we asked whether each technique would be easy to implement, scored on the same scale. Appendix A contains further details on our survey and expert sample. To identify priority techniques, we summed the impact and feasibility scores for each technique and highlighted those that scored within the highest third (i.e., over the top tertile value of 10.43) on a 14-point scale.

The second system involved evaluating the relative number of trials that found evidence for each behavior change technique. We assigned each technique to one of two categories: effective or ineffective. Judgments on effectiveness were made according to criteria determining whether the technique was tested in a trial that led to a statistically significant change in plant-rich food selection, consumption, or intentions. Because this guide is intended to provide a pragmatic overview of priority behavior change techniques for the food service sector, we did not expand our methodology to incorporate further parameters to determine effectiveness. This could include measures of effect size and ratings of trial methodological quality. We explore opportunities to strengthen the conclusions of our research in the later "Key findings" and "Recommendations for stakeholders" sections and direct the reader to Appendix A for a detailed overview of our methodology.

Based on our effectiveness assignments, we next computed a promise ratio. This involved calculating the number of times that each of our 90 techniques appeared in an effective versus an ineffective trial. We prioritize behavior change techniques based on this promise ratio, using cut-off criteria from the external literature as follows: techniques with a promise ratio greater than 2.00 (i.e., cited in double the number of effective as ineffective trials) were considered "promising," whereas techniques with a promise ratio less than 2.00 were judged "nonpromising" (Gardner et al. 2016; Martin et al. 2013). In cases where zero ineffective trials were present, we calculated the ratio simply as the number of trials for the given technique. For techniques identified via the gray literature or through ad hoc searches, no promise ratio has been assigned to reflect the fact that these techniques have not yet been trialed in the peer-reviewed literature.

Finally, to produce our final priority shortlist, we cross-referenced both scoring systems. We identified all behavior change techniques that scored in the top third on joint feasibility and impact rankings from our expert sample *and* those deemed promising according to the research evidence. The benefit of combining both scoring systems is that it allows us to identify techniques that are both supported by the majority of research trials as well as those considered feasible to implement in practice by the people who are in a position to do so. Without incorporating expert stakeholder ratings into the prioritization process, we risk shortlisting techniques that are highly evidence-based but are impractical to introduce into food service operations. Conversely, if we solely rely on expert ratings to prioritize techniques (as we did in the 2020 playbook) we may inadvertently promote techniques that are broadly presumed to work but may not actually be backed by research evidence.

In total, 18 techniques met these two criteria and compose the final priority shortlist in the playbook 2.0.



The playbook

Which behavior change techniques work best to encourage more plant-rich options when dining out? The following section presents a shortlist of priority techniques that experts *and* research support as the best bets for implementing in food service without delay.

STRUCTURE AND USE

The playbook 2.0 outlines 18 priority behavior change techniques for food service providers to implement in their operations without hesitation. These are highlighted by bold text in Table 1, which also displays the complete list of 90 techniques. The expert rating score (ranging from 0 to 14), the promise ratio, and the number of trials testing each technique are also shown here. Each of the 90 techniques in Table 1 has also been assigned a reference code ("Figure 3 code," e.g., PRD1, PLC1, PPL1, etc.) that cross-references to Figure 3. Technique codes in Table 1 are presented in alphabetical order within each P category and are not listed in rank order.

Figure 3 plots the joint scores for each technique on our two scoring systems. Techniques that fall into the top right quadrant of this figure comprise our priority shortlist. All data points in Figure 3 are color coded according to their 6P category classification, and bubble sizes indicate the relative number of trials that featured each technique (larger bubbles indicate more research), ranging from 0 (marked by an *X*) to a maximum of 80 trials. The median number of times that each technique was trialed in the research literature was 5.

The 18 priority techniques are also summarized in more detail in Figure 4. The remainder of this playbook 2.0 outlines the research exploring these priority techniques and offers ideas on how food service can use them in practice. A short case study is given for each to illustrate how other organizations have implemented each priority technique in their operations. These examples are intended to inspire and inform changemakers in food service who may wish to adapt any of the techniques presented to their own context. Where available, we also refer to additional research on each technique to allow interested readers to learn more.

We do not recommend that the remaining complete list of 90 techniques be disregarded, however. Many of these techniques are also well researched and may work well alone or in conjunction with the priority list of techniques to change diners' behavior. Instead, we present the 18 priority techniques in more detail to provide a manageable shortlist to drive action on this agenda.

TABLE 1 | The complete list of 90 behavior change techniques to shift diners toward more plant-rich dishes in food service

TECHNIQUE	FIGURE 3 CODE	SHORT NAME	EXPERT[a] RATING (RANGE 1–14)	PROMISE RATIO[b]	NUMBER OF RESEARCH TRIALS
PRODUCT					
Arrange plant-rich dishes so that more appealing ingredients are most visible (e.g., via layering, stacking, toppings, or other arrangement)	**PRD1**	**Visible arrangements**	**10.75**	**3.00**	**3**
Blend plant-based ingredients into ground or minced meat-based dishes to reduce the meat content	**PRD2**	**Blending**	**10.79**	**2.00**	**2**
Create meat-based dishes in smaller portions that take longer to eat to promote satiation (e.g., chewy, larger chunks)	PRD3	Satiating formats	7.25	0.00	2
Develop new or improve existing accompaniments (e.g., sauces, dips, wine pairings) to plant-rich dishes	PRD4	Improve sides	10.57	0.00	1
Improve the appearance of plant-rich dishes (e.g., arrangements, color, garnishes, balance)	**PRD5**	**Improve appearance**	**11.32**	**3.00**	**4**

TABLE 1 | The complete list of 90 behavior change techniques to shift diners toward more plant-rich dishes in food service (cont.)

TECHNIQUE	FIGURE 3 CODE	SHORT NAME	EXPERT[a] RATING (RANGE 1-14)	PROMISE RATIO[b]	NUMBER OF RESEARCH TRIALS
PRODUCT					
Improve the flavor and texture of plant-rich dishes	**PRD6**	**Improve flavor**	**11.11**	**3.00**	**3**
Increase the ratio of plant-rich to meat-based dishes available	**PRD7**	**Increase ratio**	**11.25**	**2.25**	**13**
Increase the variety of plant-rich dishes on offer	**PRD8**	**Increase variety**	**11.50**	**3.00**	**12**
Introduce direct plant-rich alternatives (i.e., "alt proteins") to popular meat-based dishes	PRD9	Alt proteins	10.50	1.66	8
Make all side dishes and extras on the menu plant-rich only	PRD10	Plant-rich extras	8.04	1.00	1
Reduce the amount of meat in a dish while increasing the amount of plant-based ingredients	PRD11	Meat portion size	10.38	6.00	7
Reduce the overall portion sizes of all dishes served	PRD12	Meal portion size	8.19	0.75	7
Serve plant-rich dishes on larger plates than meat-based dishes so portions appear bigger	PRD13	Plate size	6.57	2.00	3
TECHNIQUE	**FIGURE 3 CODE**	**SHORT NAME**	**EXPERT[a] RATING (RANGE 1-14)**	**PROMISE RATIO[b]**	**NUMBER OF RESEARCH TRIALS**
PRESENTATION					
Add a plant-rich "decoy" dish to menus to encourage favorable comparisons with a target plant-rich dish	PRS1	Decoy dishes	6.86	0.00	2
Add appetizing images of plant-based dishes and/or remove appetizing images of meat dishes from menus	PRS2	Appetizing images	10.13	4.00	10
Add cartoon characters to menus to highlight plant-rich dishes	PRS3	Cartoon characters	5.89	2.00	12
Add environmental footprint labels to menus	**PRS4**	**Environmental labels**	**10.44**	**2.00**	**27**
Add nature images (e.g., landscapes, rainforests) to menus	PRS5	Natural images	8.22	1.00	4
Add symbols or icons to menus to highlight healthy plant-rich options (e.g., heart healthy logo, high fiber symbol, low salt icon)	PRS6	Healthy icons	9.97	1.80	28
Color code dishes on menus (e.g., a traffic-light label) to help diners recognize that plant-rich dishes are more sustainable options	PRS7	Traffic-light labels	8.81	5.30	19
Communicate a behavioral equivalent of switching from a meat to a plant-rich dish on the menu (e.g., annual car rides saved, annual bathtubs of water saved)	PRS8	Behavioral equivalents	8.92	3.00	3

TABLE 1 | The complete list of 90 behavior change techniques to shift diners toward more plant-rich dishes in food service (cont.)

TECHNIQUE	FIGURE 3 CODE	SHORT NAME	EXPERT[a] RATING (RANGE 1–14)	PROMISE RATIO[b]	NUMBER OF RESEARCH TRIALS
PRESENTATION					
Communicate the aggregate environmental impact (e.g., greenhouse gas [GHG] emissions) of all diners collectively switching from meat to plant-rich dishes on the menu	PRS9	Aggregate impact	8.25	4.00	5
Communicate the individual environmental impact (e.g., GHG emissions) of a diner switching from a meat to a plant-rich dish on the menu	PRS10	Individual impact	8.04	2.00	3
List plant-rich dishes first on menus	PRS11	Listed first	10.17	4.00	15
List plant-rich dishes in the main body of a menu, not in a separate "vegetarian" box or "specials" section	PRS12	Listed main	12.38	1.00	1
Offer default plant-rich menus, with meat-based dishes available on a separate menu or via request from a server	PRS13	Default menus	7.38	16.00	17
Remove unappealing language describing plant-rich dishes from menus (e.g., meat-free, vegetarian)	**PRS14**	**Unappealing language**	**11.50**	**2.25**	**13**
Use indulgent language on menus to describe plant-rich dishes	**PRS15**	**Indulgent language**	**12.17**	**2.60**	**18**
Use language on menus to selectively recommend plant-rich dishes (e.g., chef's special, dish of the day)	**PRS16**	**Recommend dishes**	**11.26**	**3.00**	**8**
Use smiley face emoticons on menus to highlight plant-rich dishes	PRS17	Emoticons	8.29	3.00	4
TECHNIQUE	**FIGURE 3 CODE**	**SHORT NAME**	**EXPERT[a] RATING (RANGE 1–14)**	**PROMISE RATIO[b]**	**NUMBER OF RESEARCH TRIALS**
PEOPLE					
Create a social media peer network for chefs to share plant-rich dish recipes and to receive support and feedback from colleagues	PPL1	Peer networks	9.96	N/A	0
Educate chefs and food preparation staff on the health and environmental benefits of plant-rich dishes	PPL2	Chef education	10.34	1.00	2
Encourage front-of-house staff to try plant-rich dishes themselves	PPL3	Staff samples	10.61	0.00	1
Give chefs and food preparation staff access to the tools, equipment, and ingredients to prepare appealing plant-rich dishes	PPL4	Tools and equipment	12.44	N/A	0
Offer front-of-house staff financial, material, or social (i.e., praise and recognition) incentives to sell more plant-rich dishes	PPL5	Sales incentives	6.59	N/A	0
Provide front-of-house staff with talking points to upsell or promote plant-rich dishes to diners	PPL6	Upselling	8.83	4.00	5

TABLE 1 | The complete list of 90 behavior change techniques to shift diners toward more plant-rich dishes in food service (cont.)

TECHNIQUE	FIGURE 3 CODE	SHORT NAME	EXPERT[a] RATING (RANGE 1–14)	PROMISE RATIO[b]	NUMBER OF RESEARCH TRIALS
PEOPLE					
Reward chefs and food preparation staff who innovate to create popular plant-rich dishes	PPL7	Innovation incentives	9.04	N/A	0
Train chefs and food preparation staff how to cook and prepare appealing plant-rich dishes	**PPL8**	**Chef training**	**10.71**	**2.00**	**2**
Train front-of-house staff to praise and encourage diners who choose plant-rich dishes	PPL9	Praise customers	7.74	N/A	0
TECHNIQUE	**FIGURE 3 CODE**	**SHORT NAME**	**EXPERT[a] RATING (RANGE 1–14)**	**PROMISE RATIO[b]**	**NUMBER OF RESEARCH TRIALS**
PROMOTION					
Add empathy-inducing cute animal images to marketing materials (e.g., posters, leaflets, websites, social media, or television screens)	PRM1	Empathic images	6.23	4.00	10
Coordinate plant-rich promotions to correspond with national campaigns (e.g., sporting events, Earth Day, national holidays)	PRM2	National campaigns	11.41	1.00	1
Create social media or other group forums where diners can share ideas, recommendations, and reviews of plant-rich dishes	**PRM3**	**Social media forums**	**10.86**	**4.00**	**5**
Encourage diners to demonstrate (i.e., role model) choosing plant-rich dishes in front of colleagues, friends, or family	PRM4	Role modeling	7.70	1.33	7
Encourage diners to sign up for a plant-rich eating pledge, commitment, or challenge	PRM5	Pledges and commitments	10.32	0.50	3
Gamify learning about plant-rich dishes through quizzes, puzzles, or games	PRM6	Gamification	8.72	2.00	2
Help diners to set plant-rich diet goals and monitor their progress over time using a diet diary, food photos, or a diet app	PRM7	Diet goals	7.88	1.66	8
Inform diners of the growing popularity of plant-rich dishes (i.e., the dynamic norm) using marketing materials (e.g., posters, social media, leaflets, table tents, or television screens)	PRM8	Dynamic norms	11.24	1.38	19
Inform diners that plant-rich dishes are popular choices (i.e., the descriptive norm) using marketing materials (e.g., posters, social media, leaflets, table tents, or television screens)	PRM9	Descriptive norms	10.79	1.15	28
Introduce one day per week, or one meal session per day, when all dishes are plant-rich only (e.g., Mondays, breakfast)	PRM10	Meat-free days	8.10	5.00	5

TABLE 1 | The complete list of 90 behavior change techniques to shift diners toward more plant-rich dishes in food service (cont.)

TECHNIQUE	FIGURE 3 CODE	SHORT NAME	EXPERT[a] RATING (RANGE 1–14)	PROMISE RATIO[b]	NUMBER OF RESEARCH TRIALS
PROMOTION					
Introduce scarcity messaging (e.g., selling fast, limited edition) to boost perceived demand for plant-rich dishes	PRM11	Scarcity messages	8.11	2.00	3
Offer diners free samples or taste testing for plant-rich dishes	PRM12	Free samples	11.94	1.00	8
Offer rewards or free gifts to diners who purchase plant-rich dishes (e.g., toys or merchandise)	PRM13	Free gifts	6.21	3.00	3
Prompt diners to identify with, or align their choices to, a positive proenvironmental identity	PRM14	Positive identity	7.96	2.25	13
Provide diners with prompts to choose plant-rich dishes at the point of choice via an app alert, text message, or QR code	PRM15	Point-of-choice prompts	7.25	2.22	29
Provide diners with shopping lists and recipe cards to help them prepare plant-rich dishes at home	PRM16	Recipe cards	7.96	1.50	15
Provide diners with specific guidance on how to swap meat dishes for plant-rich dishes using marketing materials (e.g., posters, leaflets, social media)	PRM17	Recommended swaps	10.75	1.00	12
Provide interactive plant-rich cooking demonstrations or food preparation classes or workshops for diners	PRM18	Cooking demos	9.46	1.00	4
Publicize the animal welfare benefits of plant-rich dishes using marketing materials (e.g., posters, social media, leaflets, table tents, or television screens)	PRM19	Animal welfare messages	8.71	2.40	17
Publicize the environmental benefits of plant-rich dishes using marketing materials (e.g., posters, social media, leaflets, table tents, or television screens)	**PRM20**	**Environmental messages**	**10.79**	**2.85**	**50**
Publicize the health benefits of plant-rich dishes using marketing materials (e.g., posters, social media, leaflets, table tents, or television screens)	PRM21	Health messages	9.67	1.50	80
Publicize the human welfare benefits associated with plant-rich dishes using marketing materials (e.g., posters, social media, leaflets, table tents, or television screens)	PRM22	Human welfare messages	9.83	2.00	3
Publicize the local benefits of plant-rich dishes using marketing materials (e.g., posters, social media, leaflets, table tents, or television screens)	**PRM23**	**Local benefit messages**	**10.43**	**5.00**	**6**

TABLE 1 | The complete list of 90 behavior change techniques to shift diners toward more plant-rich dishes in food service (cont.)

TECHNIQUE	FIGURE 3 CODE	SHORT NAME	EXPERT[a] RATING (RANGE 1–14)	PROMISE RATIO[b]	NUMBER OF RESEARCH TRIALS
PROMOTION					
Publicize the negative emotions avoided (e.g., reduced guilt, disgust, disapproval) by choosing plant-rich dishes using marketing materials (e.g., posters, social media, leaflets, table tents, or television screens)	PRM24	Negative emotional messages	5.98	4.00	10
Publicize the positive emotional benefits gained from choosing plant-rich dishes (e.g., hope, vitality, pride) using marketing materials (e.g., posters, social media, leaflets, table tents, or television screens)	PRM25	Positive emotional messages	9.88	2.67	11
Publicize the taste and flavor benefits of plant-rich dishes using marketing materials (e.g., posters, social media, leaflets, table tents, or television screens)	**PRM26**	**Taste-focused messages**	**10.69**	**6.50**	**15**
Use attractive role models (e.g., celebrities and influencers) to publicize plant-rich dishes using marketing materials (e.g., posters, social media, leaflets, table tents, or television screens)	PRM27	Influencers	9.93	1.00	4
TECHNIQUE	**FIGURE 3 CODE**	**SHORT NAME**	**EXPERT[a] RATING (RANGE 1–14)**	**PROMISE RATIO[b]**	**NUMBER OF RESEARCH TRIALS**
PRICE					
Add a flat tax or additional cost to all meat-based dishes on offer	PRC1	Fixed added cost	6.48	4.00	4
Add a graded tax or additional cost to all meat-based dishes according to their emissions footprint (i.e., lowest cost for white meat, highest cost for ruminant meat)	PRC2	Graded added cost	5.84	3.00	4
Charge diners an additional cost to add meat to a plant-rich dish (i.e., a meat surcharge)	PRC3	Meat charge	7.57	1.00	1
Encourage consumers to purchase a plant-rich dish subscription service	PRC4	Subscription services	6.81	1.00	1
Offer plant-rich dishes for free to diners	PRC5	Free dishes	5.70	4.00	5
Reward diners with financial coupons, cash back, or loyalty card points to redeem on plant-rich dishes (e.g., 10 cents earned per dollar spent)	PRC6	Loyalty points	7.42	18.00	19
Run cross-product promotions (e.g., meal deals, set menus) on plant-rich dishes and selected drinks, side dishes, or desserts	**PRC7**	**Cross-product promotions**	**10.83**	**2.00**	**6**
Run multibuy or buy-one-get-one-free offers on plant-rich dishes	PRC8	Multibuy offers	9.10	4.00	4
Sell plant-rich dishes at a lower, or subsidized, price compared to meat dishes	PRC9	Lower prices	9.60	17.00	18

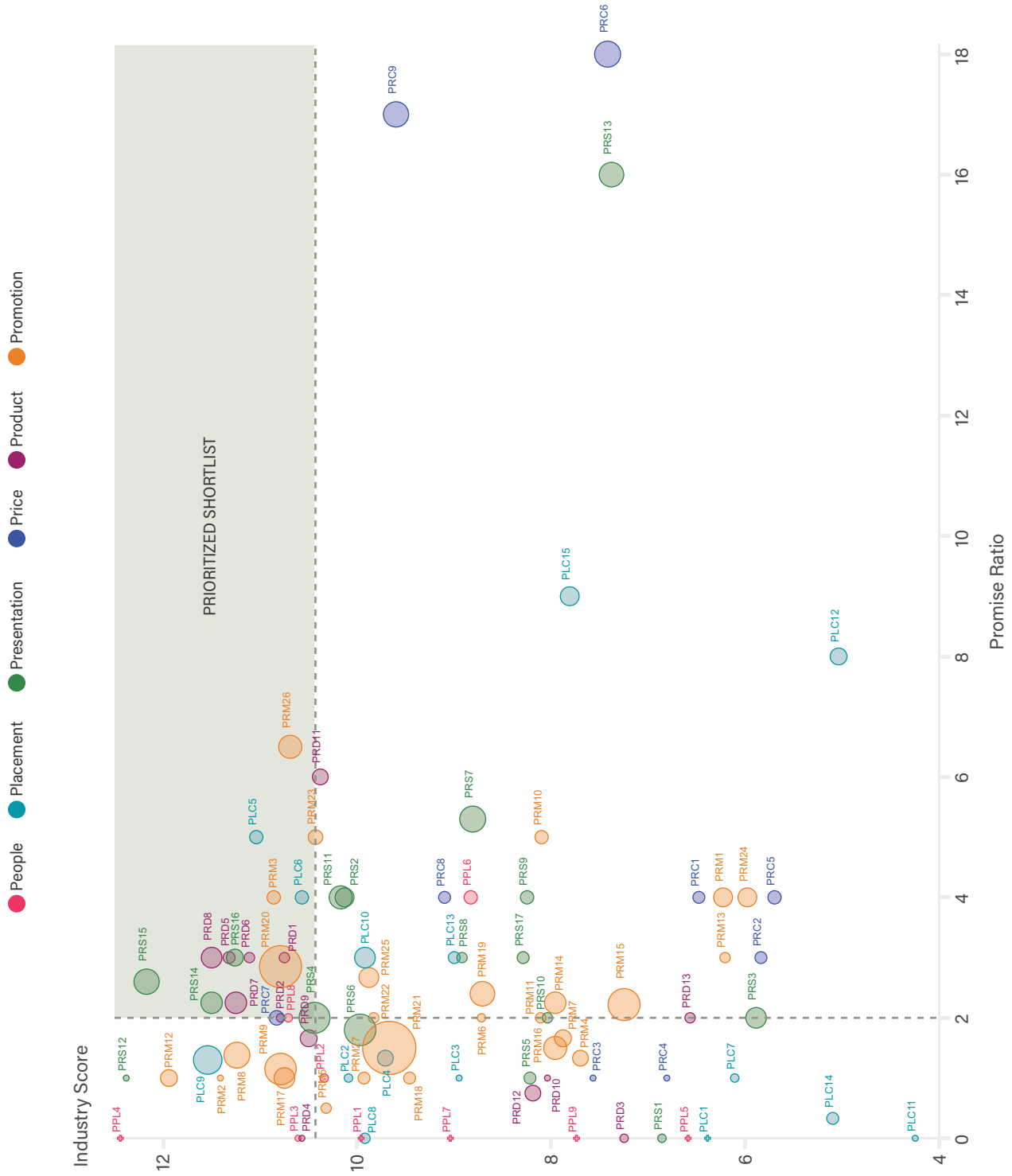
TABLE 1 | The complete list of 90 behavior change techniques to shift diners toward more plant-rich dishes in food service (cont.)

TECHNIQUE	FIGURE 3 CODE	SHORT NAME	EXPERT[a] RATING (RANGE 1–14)	PROMISE RATIO[b]	NUMBER OF RESEARCH TRIALS
PLACEMENT					
Add decorations to plant-rich dishes (e.g., flags, sparklers, flowers) to signal to other diners when these are being served	PLC1	Decorations	6.39	N/A	0
Add green leafy plants or fresh fruit and vegetable displays to the dining site	PLC2	Plants and greenery	10.09	1.00	2
Add guide markers (e.g., floor stickers, arrows, walkways) pointing diners in the direction of plant-rich dishes in a display (e.g., buffets, shelves, food carts, or stations)	PLC3	Guide markers	8.95	1.00	1
Increase the amount of self-service display space (e.g., buffets, shelves, food carts, or stations) dedicated to plant-rich dishes	PLC4	Increase display	9.71	1.33	7
Integrate plant-based meat alternatives into meat sections in a display (e.g., buffets, shelves, food carts, or stations)	**PLC5**	**Integrate alternatives**	**11.04**	**5.00**	**5**
Introduce a dedicated plant-rich food section (e.g., buffet section, shelf section, food carts, or stations)	**PLC6**	**Dedicated section**	**10.57**	**4.00**	**5**
Introduce novel utensils or packaging to make plant-rich dishes more appealing to eat (e.g., dissolvable or edible utensils, stackable packaging)	PLC7	Utensils and packaging	6.11	1.00	2
Make plant-rich displays (e.g., buffets, shelves, food carts, or stations) more engaging	PLC8	Engaging displays	9.92	0.00	3
Place plant-rich dishes in a more visible position in a display (e.g., first in order, closest, at eye level, in the most popular section)	PLC9	Visible position	11.54	1.30	23
Place plant-rich promotional materials or produce displays at the entrance to the dining site	PLC10	Entrance promotions	9.92	3.00	12
Play natural sounds (e.g., bird song, waves) in the dining environment	PLC11	Natural sounds	4.25	N/A	1
Play relaxing music in the dining site (e.g., low volume, low tempo)	PLC12	Relaxing music	5.04	8.00	8
Preplate or prepackage plant-rich dishes to make them more convenient for self-service	PLC13	Preplated dishes	9.00	3.00	4
Provide food plates or trays with a demarcated section for plant-rich options	PLC14	Demarcated plates	5.10	0.33	4
Use aroma and scents in the dining environment to enhance diners' appetites for plant-rich dishes and/or reduce appetites for meat-based dishes	PLC15	Aromas and scents	7.81	9.00	10

Notes: a. Experts included food industry representatives and academic experts in the fields of behavioral science, food systems, and nutrition, recruited via World Resources Institute (WRI) social media assets and through the networks of the WRI Food Program's industry partners; b. For techniques with no associated research trials, it was not possible to compute a promise ratio. N/A is assigned in this case.

Source: Authors.

FIGURE 3 | Ninety behavior change techniques to shift diners to plant-rich choices in food service, jointly ranked by expert ratings and promise ratio scores



Notes: Codes (e.g., PRD1, PLC1, PPL1, etc.) refer to the 90 techniques listed in Table 1. The x-axis crosses the chart at 10.43, the cut-off value for the top tertile (or third) of scores based on expert stakeholder ratings. The y-axis crosses the chart at 2, the cut-off value indicating "promising" techniques (techniques that appear in over double the number of effective versus ineffective trials). The size of the bubble represents the number of trials contributing to the promise ratio, also detailed in Table 1. We set a maximum bubble size (value: 600), corresponding with the technique associated with the greatest number of trials, and remaining bubbles were scaled proportionately based on area. Where an X is present instead of a bubble, we identified zero trials testing this technique in the research literature (N/A in Table 1). We set a minimum size for each X (value size: 5) so that techniques with zero trials would still appear visible. Interventions in the top right quadrant are those rated above the cut-off values on both scoring systems (18 in total). This prioritized shortlist is presented in full in Figure 4.

Source: Authors.

FIGURE 4 | Eighteen priority behavior change techniques for implementation without delay in the food service sector

PRESENTATION

PRS4:
Add environmental footprint labels to menus

PRS14:
Remove unappealing language describing plant-rich dishes from menus (e.g. meat free, vegetarian)

PRS15:
Use indulgent language on menus to describe plant-rich dishes

PRS16:
Use language on menus to selectively recommend plant-rich dishes (e.g. chef's special, dish of the day)

PLACEMENT

PLC5:
Integrate plant-based meat alternatives into meat sections in a display (e.g. buffets, shelves, food carts, or stations)

PLC6:
Introduce a dedicated plant-rich food section (e.g. buffet section, shelf section, food carts, or stations)

PRODUCT

PRD1:
Arrange plant-rich dishes so that more appealing ingredients are most visible (e.g. via layering, stacking, toppings, or other arrangements)

PRD2:
Blend plant-based ingredients into ground or minced meat–based dishes to reduce the meat content

PRD5:
Improve the appearance of plant-rich dishes (e.g. arrangements, color, garnishes, balance)

PRD6:
Improve the flavor and texture of plant-rich dishes

PRD7:
Increase the ratio of plant-rich to meat-based dishes available

PRD8:
Increase the variety of plant-rich dishes on offer

PEOPLE

PPL8:
Train chefs and food preparation staff how to cook and prepare appealing plant-rich dishes

PROMOTION

PRM3:
Create social media or other group forums where diners can share ideas, recommendations, and reviews of plant-rich dishes

PRM23:
Publicize the local benefits of plant-rich dishes using marketing materials (e.g. posters, social media, leaflets, table tents, or TV screens)

PRM20:
Publicize the environmental benefits of plant-rich dishes using marketing materials (e.g. posters, social media, leaflets, table tents, or TV screens)

PRM26:
Publicize the taste and flavor benefits of plant-rich dishes using marketing materials (e.g. posters, social media, leaflets, table tents, or TV screens)

PRICE

PRC7:
Run cross-product promotions (e.g. meal deals, set menus) on plant-rich dishes and selected drinks, side dishes, or desserts

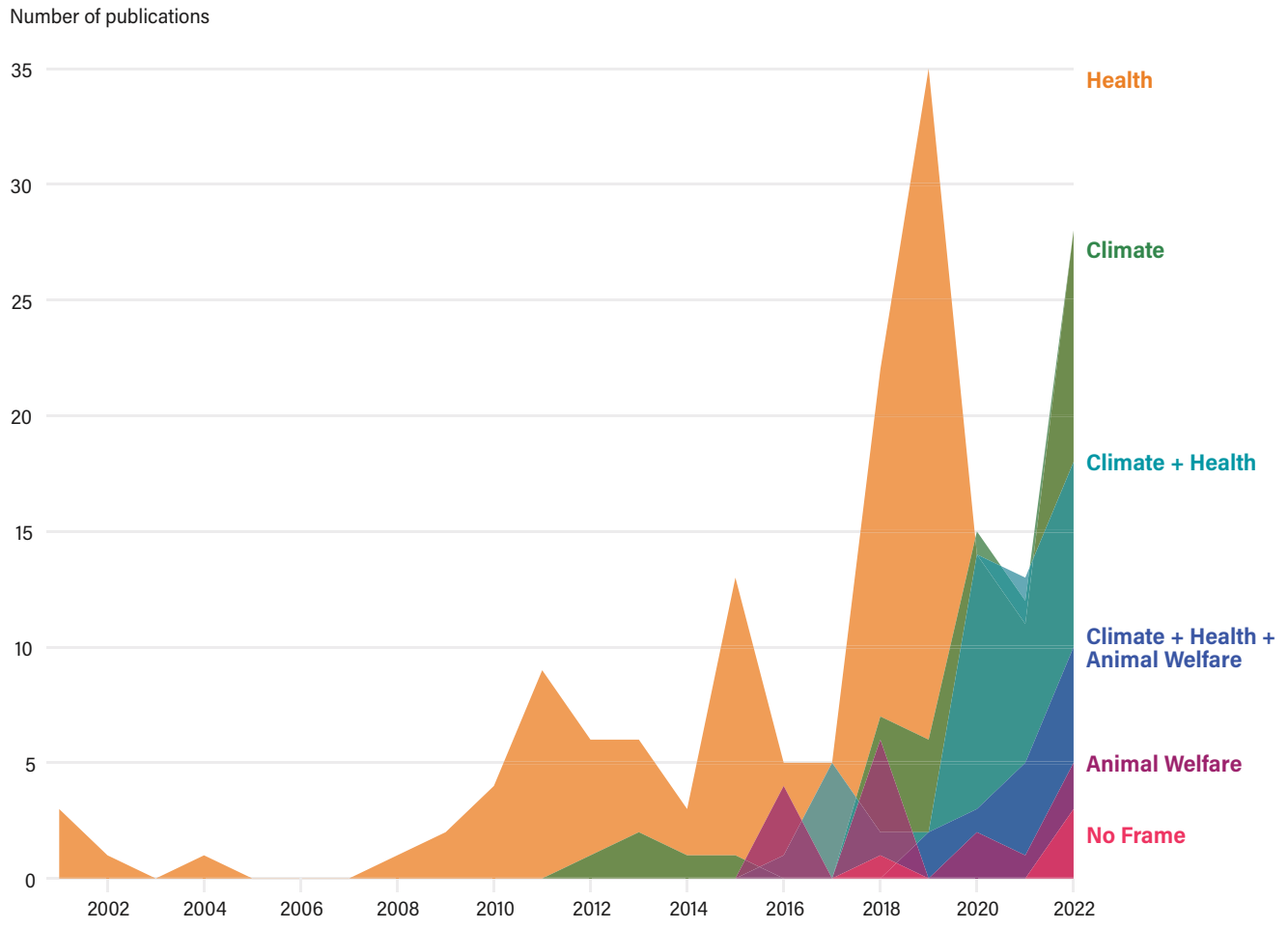
Source: Authors.

A SUMMARY OF INCLUDED RESEARCH

Seventy-eight of the 346 trials (23 percent) included in this playbook 2.0 explicitly and exclusively focus on promoting plant-rich options for environmental sustainability purposes, and a further 77 (22 percent) focus on promoting proenvironmental food choices in combination with other reasons (e.g., health, animal welfare). Combined, 45 percent of trials in the playbook 2.0 test interventions promote proenvironmental food choices (alone or in combination with other reasons), indicating rising research interest in this agenda. This percentage has increased from just 17 percent of trials in the 2020 playbook (i.e., 15 of 89 trials). At the same time, the number of studies testing strategies to promote plant-rich diets solely for animal welfare reasons also grew. There are now 32 papers (9 percent) in the playbook 2.0 compared to just 2 (2 percent) in the original publication.

Together, these findings indicate a diversification in research focus over time, moving away from studies testing behavioral science techniques to promote healthier choices. Indeed, while the number of health-focused studies has also risen since 2018 (now at 169 trials), the relative proportion of the total has declined (from 71 percent of all papers in the 2020 playbook to 49 percent in the update). These evolving trends in the research focus are displayed in Figure 5.

FIGURE 5 | Evolution in the research focus of included literature



Source: Authors.

The complete list of 90 techniques in the new playbook 2.0 represents an overall increase by 33 techniques (57 percent uplift) from the original publication. Figure 6 summarizes how the number of techniques classified under each P category has evolved over time. This includes new techniques added to each category as well as reclassifications of existing techniques.

The P category of Promotion dominated the complete list in the 2020 playbook (18 techniques, 32 percent), and it remains the largest category in this update, now containing 27 techniques overall (30 percent). New additions include techniques that support consumers in changing their food choices by providing tools like recipe cards as well as techniques that motivate a shift away from meat via gamification, aligning choices to a desired self-identity, and inducing positive emotions toward plant-rich options (or negative emotions toward meat).

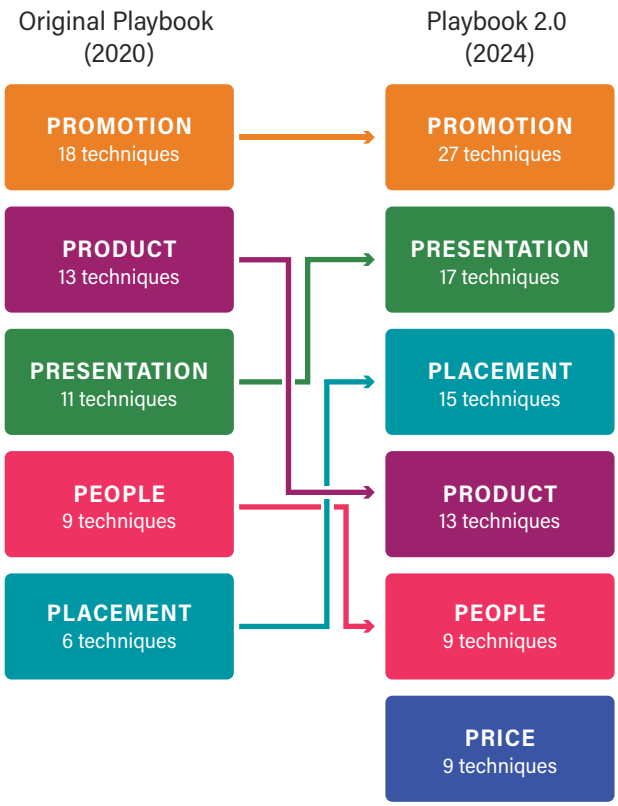
For the second-largest P category, Presentation, the number of techniques has also increased from 11 (19 percent) to 17 (19 percent) in the playbook 2.0. Major changes include an increase in the number of techniques focusing on menu imagery (i.e., menu symbols, labels, colors, and pictures), in addition to new research into the optimal use of language to describe food and novel approaches to messaging on the environmental impact of plant-rich options.

For the third-largest P category, Placement, the total number of techniques in the new complete list nearly tripled, from 6 (12 percent) techniques in the original publication to 15 techniques (17 percent) in this playbook 2.0. Major new additions include the use of guidance tools (e.g., floor stickers, demarcated plates) and sensory marketing approaches (e.g., aroma, sound, visual primes).

In terms of how the other P categories have evolved since the original publication, we found the following trends: for Product and People, the total number of techniques has remained the same (at 13 techniques [14 percent] and 9 techniques [10 percent], respectively), with only minor refinements made to technique lists since the original publication. This implies that few new behavior change techniques have been developed and tested in these areas since 2020, and more academic research is required here.

The new P category, Price, contains 9 techniques (10 percent) that focus on two broad areas: techniques to reduce the overall price of plant-rich options or increase the price of meat dishes and techniques to incentivize sales of plant-rich dishes using other means—such as loyalty points, rewards, or subscription services—or disincentivize sales of meat dishes via graded or fixed price taxes.

FIGURE 6 | Change in the technique classifications from the 2020 playbook to the playbook 2.0 update



Source: Authors.

KEY FINDINGS

Priority shortlist techniques

Techniques that fall into the top right quadrant in Figure 3 (also summarized in Figure 4) compose our shortlist of 18 priority techniques—those that our sample of expert stakeholders rated as feasible and impactful *and* that were found effective in the majority of trials in which they were tested. These 18 techniques cover all six P categories: 6 are Product techniques (33 percent of the shortlist), 4 (22 percent) are Promotion techniques, 4 (22 percent) are Presentation techniques, 2 are Placement techniques (11 percent), and 1 each (5 percent) are People and Price techniques.

The technique in the priority shortlist that ranks highest on both scoring systems simultaneously is from the Promotion category: **PRM26: Taste-focused messages** (expert rating of 10.69, promise ratio of 6.50, 15 trials). This is also the priority technique with the highest associ-

ated promise ratio of all 18 shortlisted techniques. Alternatively, the technique ranked highest by our sample of expert stakeholders (i.e., y-axis value) is from the Presentation category: **PRS15: Indulgent language** (expert rating of 12.17, promise ratio of 2.60, 18 trials).

Overall, one shortlisted Promotion technique, **PRM20: Environmental messages**, is the most thoroughly researched (expert rating of 10.79, promise ratio of 2.85, 50 trials), followed by the Presentation technique **PRS4: Environmental labels** (expert ratio of 10.44, promise ratio of 2.00, 27 trials).

The fact that the same techniques do not consistently appear at the top of both scoring systems suggests some misalignment between academic research and expertise based on real-world experiences. This means that some of the techniques most frequently studied in academic trials are not necessarily the ones that food service is most inclined to implement, for a variety of reasons that we explore below.

Moreover, some of the techniques tested most frequently in academic research are not always those considered most impactful by expert stakeholders (for example, **PRM21: Health messages**, 80 studies; **PRM9: Descriptive norms**, 28 studies; **PRM15: Point-of-choice prompts**, 29 studies). This underscores the value of academic research to explicitly determine what works—rather than relying on intuition—and highlights important priority areas for future academic study (for example, **PPL3: Staff samples**, **PPL4: Tools and equipment**, **PRS12: Listed main**, **PRM2: National campaigns**, and **PRD4: Improve sides**). Further academic trials are warranted to explore techniques ranked highly by our sample of experts.

At the same time, the techniques that our experts judged favorably are not always those with the most supportive evidence. This suggests that insights from the evidence base may not be reaching the intended target audience in food service. More translation efforts and better communication and knowledge translation between academia and food service stakeholders are, therefore, indicated.

Complete list techniques

Figure 3 also displays the complete list of all 90 behavior change techniques identified in this update. While we emphasize rapid implementation of the 18 priority techniques, we also encourage changemakers in food service to consider which of the remaining 72 approaches may also be appropriate to adopt in their own context.

When combining expert ratings and promise ratio scores together, the technique that ranks highest overall is from the Price category: **PRC9: Lower prices** (expert rating of 9.60; promise ratio of 17.00, 18 trials). Despite the high promise ratio associated with this technique, it did not reach our threshold for priority shortlisting based on a low rating from our expert sample. This may be due to concerns regarding the impact of PRC9 on overall business profitability or to a fear that offering items at lower prices may signal poor quality to diners.

We attempted to understand this matter in more detail by breaking down the expert ranking score into its two subcomponent indices—feasibility and impact—and considering these separately. In doing this, we found that PRC9 ranks in the top third on impact but in the middle third on feasibility, implying that this technique did not reach our shortlist because it is seen as unrealistic to implement rather than ineffective. As such, to promote widespread utilization of PRC9, we must work to understand how to implement this technique in a cost-neutral way. Examples might include selling plant-rich dishes that are inherently cheaper to produce than meat-based options or offsetting cheaper plant-rich dishes by raising prices elsewhere to compensate (for example, pairing this with techniques **PRC1: Fixed added cost** or **PRC2: Graded added cost**).

When we examine our promise ratio and expert rating scoring systems separately, the technique that our sample of 49 experts rate the highest is a People category technique: **PPL4: Tools and equipment** (expert rating of 12.44). This technique has no associated promise ratio because we found zero trials that had tested it in the included literature, indicating that further research would be valuable.

The technique with the highest promise ratio from the complete list is, again, a Price category technique: **PRC6: Loyalty points** (promise ratio of 18.00 from 19 trials). However, this technique is associated with an expert rating score that falls below the threshold for prioritization (expert rating of 7.42) and, hence, does not feature on our priority shortlist.

The low expert rating for PRC6 may again reflect the concerns of food service stakeholders that this approach will dent profits, and so it is considered unfeasible to introduce. This assumption is supported when we decompose the expert rating scores. Here, we find that PRC6 scores in the middle third on impact but in the lowest third according to feasibility, suggesting that industry representatives may be unaware that this technique works and also consider it too difficult to introduce in their operations.

It was not possible to calculate the promise ratio for 6 of the 90 techniques in the complete list because they were not tested in any trials. More research is therefore required to understand the effectiveness of these techniques. Five of these are from the People category (**PPL1: Peer networks**, **PPL4: Tools and equipment**, **PPL5: Sales incentives**, **PPL7: Innovation incentives**, and **PPL9: Praise customers**), suggesting that this category requires more research attention in particular.

Overall, promise ratio values varied from a minimum of 0 to a maximum of 18. The most frequently tested technique from the research literature was from the Promotion category: **PRM21: Health messages** (80 studies). Despite such extensive testing, PRM21 did not meet our shortlisting criteria on either the expert rating (9.67) or the promise ratio (1.50).

Promising techniques

As noted above, our prioritization has identified clear areas of disconnect between research and practice. To support more sustainable plant-rich choices in food service, we highlight here some of the most pertinent mismatched techniques to consider. These are the techniques associated with higher promise ratios, but expert stakeholders did not judge them favorably; they are located in the bottom right quadrant in Figure 3.

Thirty-three techniques are classified here, including the technique with the highest overall promise ratio, **PRC6: Loyalty points** (expert rating of 7.42, promise ratio of 18.00, 19 trials), and the technique with the second-highest overall promise ratio, **PRC9: Lower prices** (expert rating of 9.60, promise ratio of 17.00, 18 trials). Other techniques with high promise ratios include **PRS13: Default menus** (expert rating of 7.38, promise ratio of 16.00, 17 trials), **PLC12: Relaxing music** (expert rat-

ing of 5.04, promise ratio of 8.00, 8 trials), and **PLC15: Aromas and scents** (expert rating of 7.81, promise ratio of 9.00, 10 trials).

The fact that these techniques do not appear in the priority shortlist based on expert ratings suggests further research is needed to understand, and subsequently overcome, barriers to their acceptance by food service providers. This could include focus groups and/or interviews with a broader group of industry representatives. Possible reasons for low expert scores may include a lack of familiarity with the techniques, low awareness of the evidence (particularly for more novel techniques), perceptions of low consumer acceptability, or low perceived feasibility to implement these techniques in practice, possibly due to cost, technical, or infrastructural constraints.

Once again, we attempted to arrive at further insights on these points by analyzing the two subcomponent indices of the expert scores: impact and feasibility. Here, we see a total of five techniques with mismatched scores on these two rating systems. For example, **PRM19: Animal welfare messages**, **PRM21: Health messages**, and **PRM22: Human welfare messages** all scored in the top third for feasibility but fell in the lowest third for impact. Hence, the low total score is due to the perception that these techniques are ineffective at creating change rather than because they are considered too difficult to implement. This perception is largely backed by the evidence for PRM19 and PRM21 (tested in a combined total of 97 trials with associated promise ratios less than 2.00), but more research is needed for PRM22, which has so far only been tested in 3 trials to date.

Conversely, for **PPL6: Upselling** and **PPL7: Innovation incentives**, our expert sample scored these techniques within the top third in terms of impact but in the lowest third for feasibility. This implies these techniques are both considered highly effective but more difficult to implement in the real world. This intuition regarding effectiveness is again backed by the evidence for PPL6 (featured in five trials, with a promise ratio less than 2.00), although PPL7 has yet to be tested extensively. In both cases, further work is needed to understand why feasibility judgments are particularly low and what can be done to support adoption in practice.

FURTHER INSIGHTS

In addition to quadrants highlighting priority and promising techniques, further useful insights can be drawn from Figure 3. For example, the top left quadrant in Figure 3 highlights all techniques that our sample of 49 experts ranked within the top third of scores for feasibility and impact but with relatively low associated promise ratios (< 2.00). As such, these techniques would benefit from further academic research to determine effectiveness or further industry consultation to understand why industry perceptions of effectiveness are inaccurate.

In particular, this quadrant contains the highest-scoring technique based on our expert ratings: **PPL4: Tools and equipment** (expert rating of 12.44). Yet, as noted above, this technique featured in zero trials in our playbook 2.0. Other "zero-trial" techniques (meaning we could not compute a promise ratio) include **PPL3: Staff samples**, **PPL5: Sales incentives**, and **PLC1: Decorations**. We recommend further research specifically directed at these approaches given that they are good candidates for adoption in food service.

The bottom left quadrant in Figure 3 presents all techniques that score below our prioritization thresholds on both scoring systems. Various potentially useful techniques are listed within this quadrant, yet many of these are under- or unresearched at present. One notable exception is the Promotion technique **PRM21: Health messages**, which is the most studied technique on the complete list, featured in 80 trials. This extensive testing has so far yielded a promise ratio of 1.50, which is below our cut-off value of 2.00 for shortlisting, and this approach also fell under the expert rating threshold at 9.67.

Product techniques

We outline five priority Product techniques that involve modifying the food on offer to promote uptake of plant-rich dishes in food service.

PRD1 Arrange plant-rich dishes so that more appealing ingredients are most visible (e.g., via layering, stacking, toppings, or other arrangement)

In more detail:

For wholly plant-based dishes, attention can be drawn to prized ingredients (e.g., avocado, portobello mushrooms) by giving them "prime real estate" within a dish. For plant-rich dishes that contain small amounts of meat and dairy, these animal-based ingredients can also be showcased by placing them more visibly, such as in toppings or as highly colored or chunky elements in sauces or other mixtures. Research shows that diners often find it hard to judge the true size of a product or portion across multiple dimensions at the same time (i.e., height, width, and depth), meaning they are not sensitive to shrinking portions in one dimension (e.g., depth) if another dimension remains consistent (e.g., length). Packaging transparency also helps consumers to accurately distinguish portion sizes, implying that more appealing ingredients should be showcased in see-through containers and less appealing elements concealed in opaque packaging (Ordabayeva and Chandon 2016).

What food service can do:

Identify the ingredients in dishes that consumers value highly (or add some!). These may include rare or more expensive elements (e.g., truffle oil, saffron, pistachio nuts), items with distinct or unusual taste profiles (e.g., wasabi, seaweed, caramelized onions) or textures (e.g., avocado), or small amounts of meat and dairy. These elements should be the main focal aspect of the dish and presented prominently. If possible, find ways to spread these ingredients over larger areas to give the perception of abundance, and combine this with ideas from **PRD5: Improve appearance** to further increase visual appeal.

Case study:

In a research trial carried out in six company canteens in the Netherlands, the recipes of six luxury sandwiches were adapted to contain less meat or fish and more vegetables (Reinders et al. 2020). Chefs made sure that the sandwiches looked attractive, included a diverse range of vegetables, and that the meat or fish contents were visibly showcased as toppings. Luxury ingredients were also added (e.g., capers), and chefs distributed smaller pieces of meat or fish equally over the sandwich for a full taste with every bite. Depending on the type of sandwich, portions of meat/fish were reduced by 20–50 percent, with an average reduction of 34 percent (i.e., from 75 to 50 grams). Vegetable content more than tripled (+237 percent; i.e., increased from 18 to 60 grams). Following these changes, no statistically significant reductions in overall meal satisfaction were found between the control and intervention period: before the changes, 70 percent of diners indicated they would buy the sandwich again; after the changes, 75 percent indicated this.

Note: The photo shows the different presentation of the sandwich with salmon in intervention period (left) versus control period (right). The sandwich on the left contained less fish compared to the one on the right, yet ingredients were arranged differently so that the overall perception of the sandwich was as attractive as possible for the customers.

FURTHER READING

Ordabayeva, N., and P. Chandon. 2016. "In the Eye of the Beholder: Visual Biases in Package and Portion Size Perceptions." *Appetite* 103 (August): 450–57. https://doi.org/10.1016/j.appet.2015.10.014.

Reinders, M.J., L. van Lieshout, G.K. Pot, N. Neufingerl, E. van den Broek, M. Battjes-Fries, and J. Heijnen. 2020. "Portioning Meat and Vegetables in Four Different Out of Home Settings: A Win-Win for Guests, Chefs and the Planet." *Appetite* 147 (April): 104539. https://doi.org/10.1016/j.appet.2019.104539.

PRD1: **Visible arrangements** | Expert rating: **10.75** | Promise ratio: **3.00** | Number of research trials: **3**

PRD2 Blend plant-based ingredients into ground or minced meat–based dishes to reduce the meat content

In more detail:

Blending plant-based ingredients, such as mushrooms or lentils, is a promising way to cut the GHG emissions footprint of meat dishes. For meat eaters, making a small change like eating beef-mushroom (versus all-beef) burgers is arguably a more attainable goal than switching to a completely vegetarian option. Indeed, recent research shows that combining hybrid products with educational approaches increases consumer willingness to order beef-mushroom burgers regardless of diners' political ideologies or attitudes toward meat (Prusaczyk et al. 2021). A further large experiment in the dining service of a U.S. university has also proved that highlighting the sustainability attributes of mushrooms in a hybrid burger had positive effects on acceptability and intentions to purchase beef-mushroom options (Sogari et al. 2022).

What food service can do:

Identify plant-based ingredients suitable for blended burgers or other hybrid recipes. One common option is to replace a portion of the beef content with mushrooms, with the ratio of 70 percent meat to 30 percent mushrooms already trialed with success in food service. Meat will remain the main focal taste of the dish, and diners will likely not notice the difference, all while a significant reduction in GHG emissions can be achieved. Providing further information concerning the environmental benefits of these products, or highlighting their taste and flavor improvements (e.g., using **PRM20: Environmental messages** and **PRM26: Taste-focused messages**) may also increase purchasing intentions and eating behaviors.

Case study:

In 2020, ISS Guckenheimer launched a Better Burger that has since been served in over 200 locations. The burger was created by Guckenheimer's Food Lab, made from a 60 percent beef and 40 percent mushroom mix, and replaced 35 percent of burgers produced. The popularity of the hybrid burger convinced the company to relaunch the program in subsequent years. The recipe was developed by culinary teams from each campus during a March 2019 workshop. Overall, students across all five campuses reduced their beef consumption by about 30 percent following introduction of the hybrid burger. Student receptivity to the new burgers was very positive, with more than half who tried the blended option preferring it to the all-beef burger.

FURTHER READING

Prusaczyk, E., M. Earle, and G. Hodson. 2021. "A Brief Nudge or Education Intervention Delivered Online Can Increase Willingness to Order a Beef-Mushroom Burger." *Food Quality and Preference* 87 (January): 104045. https://doi.org/10.1016/j.foodqual.2020.104045.

Sogari, G., J. Li, Q. Wang, M. Lefebvre, S. Huang, C. Mora, and M.I. Gómez. 2022. "Toward a Reduced Meat Diet: University North American Students' Acceptance of a Blended Meat-Mushroom Burger." *Meat Science* 187 (May): 108745. https://doi.org/10.1016/j.meatsci.2022.108745.

PRD2: **Blending** | Expert rating: **10.79** | Promise ratio: **2.00** | Number of research trials: **2**

PRD5 Improve the appearance of plant-rich dishes (e.g., arrangements, color, garnishes, balance)

In more detail:

How a dish looks will have a strong influence on whether diners choose it. In food service, and particularly in self-service, diners make food choices very quickly. For this reason, it is important that a dish is visually appealing and can win attention away from competing options. Appearance should always suggest the item is high quality, with luminance indicating ingredient freshness (dull food is associated with degradation) (Arce-Lopera et al. 2012). Color is also key to overall appeal and is one of the main features that diners use to predict how flavorsome a dish will be, and high color contrast also boosts perceived favorability. Indeed, one recent study succeeded in boosting plant-rich dish choices by placing meat-heavy options on low-contrast red tables rather than on high-contrast green ones, thus decreasing the attractiveness of meat dishes (Wan et al. 2021).

What food service can do:

To increase plant-rich dish selection, consider ways to showcase the vibrant natural colors and unique forms of fruits and vegetables. You may consider creating appealing arrangements of plant ingredients and adding bright, colorful, or novel garnishes (e.g., an edible flower) that will catch a diner's eye. Include a full spectrum of bright colors, placing contrasting hues next to one another, or offsetting produce displays with tableware in opposite tones. Because luminance is important for perceived freshness, high-luster items should be showcased, and you may wish to use lighting to spotlight these options further. Balanced presentations are also preferred (Zellner et al. 2010), so consider ways to arrange, or spread out, ingredients to make them appear more ordered and harmonious rather than haphazardly placed.

Case study:

The Culinary team at UC San Diego Health, a California hospital serving about 1.4 million meals per year, worked to improve the appearance of their plant-rich dishes as part of their overall net zero goals. Not only did the team increase the variety of options available—adding vegetarian wraps and sandwiches, new plant-rich main dishes, and optional vegan proteins to their grain bowl offering—but they also crafted beautiful self-service displays and intricate presentations to showcase these options to diners. This included stacked dishes, integrating brightly colored ingredients and adding attractive garnishes. These changes, together with other actions by the culinary team and supported by the organization Health Care Without Harm, are helping to contribute to the hospital's goal of achieving a 38 percent reduction in the carbon dioxide (CO_2) emissions of food served by 2030.

Source: UC San Diego Health, roasted vegetable napoleon.

FURTHER READING

Kokaji, N., and M. Nakatani. 2021. "With a Hint of Sudachi: Food Plating Can Facilitate the Fondness of Food." *Frontiers in Psychology* 12 (October): 699218. https://doi.org/10.3389/fpsyg.2021.699218.

Wan, X., L. Qiu, and C. Wang. 2021. "A Virtual Reality-Based Study of Color Contrast to Encourage More Sustainable Food Choices." *Health and Well-Being* 14 (2): 591–605. https://doi.org/10.1111/aphw.12321.

PRD5: **Improve appearance** | Expert rating: **11.32** | Promise ratio: **3.00** | Number of research trials: **4**

PRD6 Improve the flavor and texture of plant-rich dishes

In more detail:

Texture and flavor are two of the most important features of a dish and dictate whether a trial will turn into habitual dietary choice. Improving these two attributes and communicating these improvements to diners is a valuable way to shift preferences toward plant-rich dishes. In general, plant-rich dishes are associated with more negative taste expectation compared to meat, with consumers considering them bland, heavy, dry, or lacking in crispiness or crunch (Elzerman et al. 2013). This is particularly true for novel alternative proteins, which suffer from the perception that they are tasteless and bland—and even disgusting to some consumers (Garaus and Garaus 2023). Overcoming these barriers is important for successful market adoption of meat alternatives at scale.

What food service can do:

Improve the taste and texture of the plant-rich dishes on your menu or develop new and exciting dishes that are likely to sell well. Consider using more flavor-boosting ingredients, such as herbs, spices, garlic, citrus juices, oils, vinegars, or sauces, or offer these ingredients for customers to modify the taste of a dish to their own specifications. Focus on quality ingredients prepared using specially crafted or artisanal techniques or that tap into traditions surrounding a dish or its area of origin. These approaches can enhance perceptions of quality and taste (Schösler and de Boer 2018).

Given that smell and taste are so intricately linked, the flavor of food may be successfully augmented by adding the same pleasant odor to the dining environment that is dominant in a meal (i.e., fresh herbs, citrus scents) (see **PLC15: Aromas and scents**). We also know from research that certain tastes produce greater satiation than others, especially high-intensity flavors. Hence, lower quantities of animal products may be consumed if diners are exposed to higher taste-intensity variants (e.g., pickled products) (Forde and de Graaf 2022). Similarly, softer, more liquid textures are more palatable to diners, leading to greater amounts of food being eaten, again implying that harder, chunkier, and more viscous meat and dairy dishes would lead consumers to eat less overall (Forde and de Graaf 2022) (see **PRD3: Satiating formats**). Lastly, consider optimizing food pairings to enhance flavor. You may wish to combine foods from the same geographical region, produced via the same processes (e.g., fermentation), or consider how flavors interact to produce harmonious taste. This can include pairing dishes as well as considering how drinks (e.g., wine, beer) can enhance a meal (Spence 2023) (see also **PRC7: Cross-product promotions for more)**.

Case study:

Every year around 700 million customers experience IKEA's food offerings, including a range of tasty plant-based options. For example, IKEA's hot dog has been an iconic part of the shopping experience for over 40 years. Now, IKEA has developed a new plant-based hot dog as the latest innovative addition to the family of plant-based products that they offer. Developing a plant-based hot dog to match the classic IKEA hot dog texture was a challenge. They aimed for a sensory experience similar to animal protein-based hot dogs. IKEA wants to inspire even more customers to choose plant–based products. As of October 1, 2023, IKEA offers plant-based food at the same or a lower price than the animal protein-based alternatives in more than 30 markets. This includes veggie balls, plant balls, veggie hot dogs, and plant-based soft ice.

Source: IKEA.

FURTHER READING

Forde, C.G., and K. de Graaf. 2022. "Influence of Sensory Properties in Moderating Eating Behaviors and Food Intake." *Frontiers in Nutrition* 9 (February). https://doi.org/10.3389/fnut.2022.841444.

Spence, C. 2023. "Why Pair Food and Drink." *Nature Food* 4 (February): 192–93. https://doi.org/10.1038/s43016-023-00691-3.

PRD6: **Improve flavor** | Expert rating: **11.11** | Promise ratio: **3.00** | Number of research trials: **3**

PRD7 Increase the ratio of plant-rich to meat-based dishes available

In more detail:

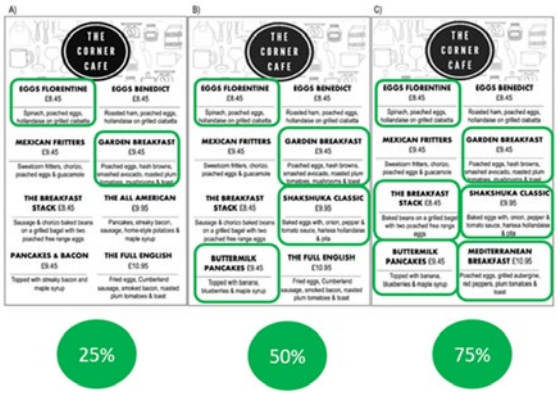
Increasing the number of plant-rich dishes compared to meat dishes can shift diners' preferences for many reasons. Firstly, it increases the likelihood that they will notice the plant-rich options on the menu. Secondly, by increasing the relative number of plant-rich options, diners have greater choice, meaning a higher chance they will find something they like. Lastly, greater availability also conveys that a dish is the typical or normal choice, with diners assuming that more plant-rich options on offer reflect greater popularity or demand. This may subconsciously lead to conformity because people want to fit in or act in the "right" way, so they will shift their choices to approximate what they believe everyone else is selecting (Pechey et al. 2021)

What food service can do:

Offer your customers a wider range of tasty, visually appealing, and satisfying plant-rich dishes (Garnett et al. 2019). It is not enough to include one or two plant-rich options on your menu—the majority (i.e., over 75 percent) should ideally be plant-rich choices (Parkin and Attwood 2022). This ratio could also be achieved by offering plant-rich base dishes to which diners can add small amounts of meat as an optional extra (see **PRC3: Meat charge**). This technique works well in increasing plant-rich meal sales while allowing diners to feel they have retained freedom of choice (de Vaan et al. 2019).

Case study:

In an online menu study of 430 participants in the United Kingdom, a series of different food menus were displayed in which either 75 percent, 50 percent, or 25 percent of items listed on the menu were vegetarian compared to meat-based dishes. Participants were asked to select their meal of choice. Results showed that vegetarian meals were chosen with significantly greater frequency from the 75 percent meat-free menu (chosen around 50 percent of the time) but not when 50 percent or 25 percent of dishes were vegetarian (chosen 29 percent and 25 percent of the time, respectively). Overall, although participants generally preferred meat dishes, this study demonstrates that preferences can be successfully influenced by modifying the sales mix. Researchers concluded that to promote more proenvironmental food choices, the availability of plant-rich dishes should exceed that of meat dishes by a large margin (Parkin and Attwood 2022). This finding has since been replicated in a further trial, which also found that increasing meat-free options from 50 percent to 75 percent of the menu almost doubled the likelihood that diners would select these options instead of meat (Pechey et al. 2022).



Note: The 75% vegetarian menu led to significantly more plant-rich dish choices.

FURTHER READING

Parkin, B.L., and S. Attwood. 2022. "Menu Design Approaches to Promote Sustainable Vegetarian Food Choices When Dining Out." *Journal of Environmental Psychology* 79 (February): 101721. https://doi.org/10.1016/j.jenvp.2021.101721.

Pechey, R., P. Bateman, B. Cook, and S.A. Jebb. 2022. "Impact of Increasing the Relative Availability of Meat-Free Options on Food Selection: Two Natural Field Experiments and an Online Randomised Trial." *International Journal of Behavioral Nutrition and Physical Activity* 19 (January): 9. https://doi.org/10.1186/s12966-021-01239-z.

PRD7: **Increase ratio** | Expert rating: **11.25** | Promise ratio: **2.25** | Number of research trials: **13**

PRD8 Increase the variety of plant-rich dishes on offer

In more detail:

More choice within a given food category increases the likelihood that diners will find something they really want to eat. However, care should be taken not to overwhelm diners with *too* many options, thus clouding their ability to make a clear decision. This can happen because weighing lots of options takes mental effort. When "decision fatigue" sets in, diners are more likely to rely on easy and attention-grabbing features to make their decisions so they can minimize the effort load (like brand names and colorful packaging), which can lead them to less than healthy choices (Smith and Krajbich 2018). Very long menus (some research suggests between 8 and 10 options is optimal) (Onuma and Sakai 2019) can also leave diners feeling less satisfied with the selection they finally make (Dar-Nimrod et al. 2009).

What food service can do:

Increase the variety of plant-rich dishes served in your establishment. Consider serving various styles of dishes (e.g., a plant-rich salad, burger, soup, and a pasta dish) rather than variations of the same type of dish (e.g., four types of pasta only). You may wish to draw influences from global cuisines that serve a diversity of innately plant-rich dishes, such as Middle Eastern, Southeast Asian, or South Asian. Another option is offering smaller portions of multiple dishes so diners can sample a range of options without needing to choose between them. When considering how to increase variety, provide dishes that vary across sensory characteristics: taste, texture, and appearance. Research suggests that providing food with a wider range of sensory characteristics can encourage diners to consume more and therefore boosts sales (Raynor and Vadiveloo 2018). To avoid overwhelming diners with too much choice, consider gradually phasing in a wider variety of plant-rich dishes, ensure your menu design is clear and structured, give diners clear guidance on what to choose in the form of a "recommended" dish of the day (i.e., **PRS16: Recommend dishes**), or offer a preorder or subscription service (**PRC4: Subscription services**) to allow diners to make food choices in their own time.

Case study:

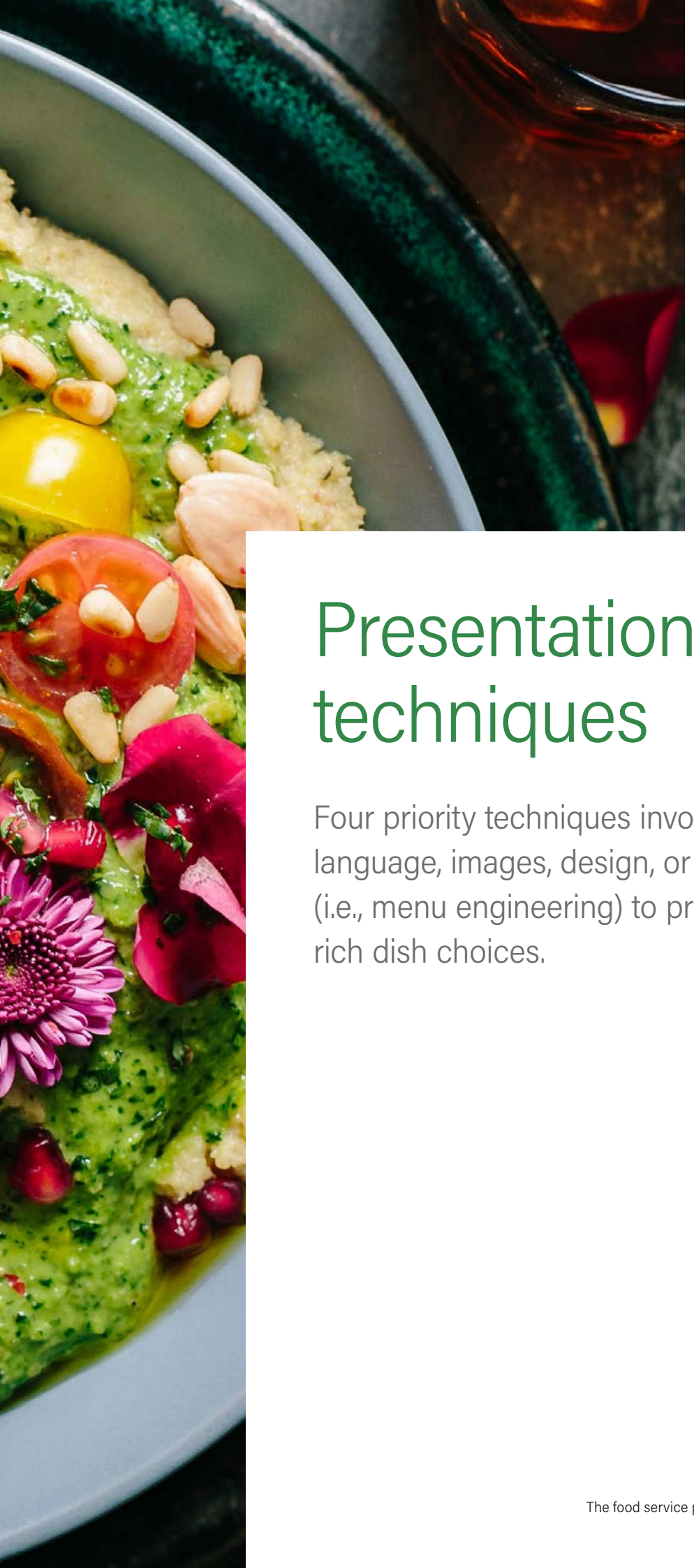
During 2023 Earth Week, New York University (NYU) Eats led a series of food-based initiatives that formed part of a university-wide effort to envision NYU in its climate neutral goal year, 2040. Across NYU's dining halls, staff organized a zero-waste teaching kitchen, a weigh-your-food-waste challenge, a farmers market, and plant-rich dining takeovers. This included introducing a whole new range of dishes, from vegan meatball subs to Latin-inspired bowls featuring beyond chorizo, grilled tofu, and plantains. NYU tracked the carbon emissions savings of these plant-based takeovers, finding a 90 percent reduction in CO_2e between regular meals on offer in their dining halls and those proposed as part of the 2040 initiative. The takeovers received overwhelmingly positive feedback from students and, in addition to the tangible reduction in CO_2e emissions from food, have ensured that NYU Eats remains committed to further enhancing the variety of its plant-based offerings on a daily basis.

FURTHER READING

Garnett, E.E., A. Balmford, C. Sandbrook, M.A. Pilling, and T.M. Marteau. 2019. "Impact of Increasing Vegetarian Availability on Meal Selection and Sales in Cafeterias." *Proceedings of the National Academy of Sciences of the United States of America* 116 (42): 20923–29. https://doi.org/10.1073/pnas.1907207116.

Raynor, H.A., and M. Vadiveloo. 2018. "Understanding the Relationship between Food Variety, Food Intake, and Energy Balance." *Current Obesity Reports* 7 (February): 68–75. https://doi.org/10.1007/s13679-018-0298-7.

PRD1: **Increase variety** | Expert rating: **11.50** | Promise ratio: **3.00** | Number of research trials: **12**



Presentation techniques

Four priority techniques involve modifying the language, images, design, or layout of food menus (i.e., menu engineering) to promote more plant-rich dish choices.

PRS4 Add environmental footprint labels to menus

Why this works:

Many diners would like to eat more sustainably, but they need guidance. Adding environmental footprint labels to menus is one way that restaurants can support customers to make this shift. Labels work by providing diners with the information they need to make informed choices and by motivating them to choose meals that feel good, or create a "warm glow," from doing the "right thing" (Lohmann et al. 2022). Research suggests that adding environmental labels to menus can lead to longer-lasting behavior change over time and across contexts compared to interventions such as "nudges." Because labels help people to understand which options are most beneficial for the environment, this new knowledge has transferability to different settings (Lohmann et al. 2022). One other potential benefit of introducing environmental labels to meals is to ensure that food service providers remain accountable to consumers. By labeling the climate impact of their dishes, food service outlets may be incentivized to maximize "green" menu offerings and serve fewer "red" alternatives.

What food service can do:

Consider the value added by introducing environmental labels to your menus. This can range from a full-specification labeling scheme, delivered by a third-party provider such as Coolfood, to just highlighting meals with lower carbon footprints on menus. Key considerations when adding environmental labels to menus include ensuring that the labels will be understood by diners, communicate relevant information, and do not misrepresent the true impact of different foods across multiple environmental outcomes (e.g., biodiversity, GHG emissions, land use, water use, etc.). At present, there is no frontrunner in terms of optimal label design, although certain characteristics, such as the color green, are received positively by customers (Arrazat et al. 2023). In all cases, if your organization is not yet ready to introduce a science-backed labeling scheme, do consider trialing other approaches that signpost diners to more environmentally friendly choices on menus, such as adding cartoon characters (**PRS3: Cartoon characters**), natural images (**PRS5: Nature images**), or smiley faces (**PRS17: Emoticons**).

Case study:

In 2022, the Coolfood marketing team conducted detailed consumer research to understand how to best update the Coolfood label to ensure it was as compelling as possible to diners. Findings showed that 65 percent of customers thought green was the best color for a climate-friendly badge, and only 2.4 percent knew how to correctly order foods based on their climate impact, despite many more being aware of, and interested in, the link between food and the environment. Following this insight, the Coolfood team redesigned and relaunched the new certification label, which was improved to ensure clarity for diners, emphasize the credibility of the Coolfood scheme, and adhere to all evolving legislation to protect consumers from greenwashing claims. Coolfood's low carbon certification is now appearing on meals served by Panera in the United States, Aramark in the United States and Canada, and ISS in the United Kingdom. More details about the Coolfood initiative can be found at coolfood.org (Waite and Blondin 2022).

FURTHER READING

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Lohmann, P.M., E. Gsottbauer, A. Doherty, and A. Kontoleon. 2022. "Do Carbon Footprint Labels Promote Climatarian Diets? Evidence from a Large-Scale Field Experiment." *Journal of Environmental Economics and Management* 114 (July): 102693. https://doi.org/10.1016/j.jeem.2022.102693.

PRS4: **Environmental lables** | Expert rating: **10.44** | Promise ratio: **2.00** | Number of research trials: **27**

PRS14 Remove unappealing language describing plant-rich dishes from menus (e.g., meat-free, vegetarian)

Why this works:

The language that we use to describe food can have a powerful influence on how we subsequently experience it. Research shows that certain language works particularly well to evoke mental simulations (or "mental images") of what a dish will be like to eat. If these simulations are positive, they can tempt diners to change their choices by creating desire for plant-rich options (Papies 2013). Despite these findings, however, terms commonly used to describe plant-rich dishes on menus—like *healthy, light,* or *low-calorie*—do not generally motivate diners to choose these options (Turnwald and Crum 2019). Similarly, language that highlights the absence of meat—*vegetarian*, *vegan*, or *meat-free*—tends to inhibit meat eaters from making a switch (Vennard et al. 2018). Interestingly, in a recent study analyzing Instagram posts about food, researchers found that plant-rich options were commonly described using far fewer indulgent language hashtags than meat posts, suggesting the plant-rich food is still considered inherently less appealing than meat by many, as reflected in how it is talked about online (Davis and Papies 2022). This finding has also been replicated by a study exploring descriptions of 240 ready meals from four UK supermarkets, where plant-based options were more likely to be described referencing ingredients, categories, or health, rather than taste (Papies et al. 2020).

What food service can do:

When describing plant-rich options on menus, signs, or food labels, remove language that emphasizes the lack of meat. Words like *vegetarian*, *vegan*, and *meat-free* tend to be unpopular among those who do not typically exclude meat from their diets. Instead, consider describing plant-rich dishes using more appealing, indulgent language (see **PRS15: Indulgent language** for further ideas on how to do this) while continuing to indicate that these items are meat-free using unobtrusive vegetarian symbols (i.e., a small green *V*). Alternative, more attractive language includes words that evoke the eating context (i.e., *celebratory*, *family feast*) or terms that refer to the social aspects of a meal (i.e., *for a relaxing conversation*) (Krpan and Houtsma 2020; Papies et al. 2020). If you do wish to use the terms *vegetarian* or *vegan*, we recommend not including these in main dish titles but rather as descriptions for diners who are motivated to seek out further information in smaller print.

Case study:

In an online study from researchers at the University of Westminster, United Kingdom, 424 participants were randomized to three groups that saw a series of food menus with either vegetarian symbols (a small *V* icon in a circle) placed to the left and in front of dish names (i.e., a more obvious position), to the right and after names (i.e., a less obvious placement), or who saw menus with no labels whatsoever. Compared to participants who saw the control menu with no labels, researchers found no significant difference in meal choices between those viewing the menus with highly visible or less visible *V* labels for vegetarian dishes. This nonsignificant finding suggests that *V* symbols are unlikely to influence diners' choices, so they can be freely included on menus without the risk of deterring consumers from choosing nonmeat options (Parkin and Attwood 2022). As such, *V* symbols offer an alternative to describing vegetarian dishes using unappealing language while still ensuring that consumers have the information that they need to identify these options.

FURTHER READING

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Krpan, D., and N. Houtsma. 2020. "To Veg or Not to Veg? The Impact of Framing on Vegetarian Food Choice." *Journal of Environmental Psychology* 67 (February): 101391. https://doi.org/10.1016/j.jenvp.2020.101391.

PRS14: **Increase variety** | Expert rating: **11.50** | Promise ratio: **2.25** | Number of research trials: **13**

PRS15 Use indulgent language on menus to describe plant-rich dishes

Why this works

Words that emphasize the delicious taste of a dish have proved effective at boosting appetite (Crum et al. 2011) and have even been found to make our mouths water in anticipation of eating (Keesman et al. 2016). In particular, studies show that emphasizing the presence of umami notes (meaning "pleasant savory" in Japanese) in plant-rich dishes may be an important strategy to boost appeal; this is a preferred flavor sought by many meat eaters and is generally present far less frequently in plant-rich meals (van Bussel et al. 2019). Interestingly, more recent research has found that it is not just taste-focused, indulgent wording that works, but enjoyable, figurative language (i.e., use of word play, idioms, rhymes, or metaphor) can also have a similar, positive effect (Kronrod et al. 2021).

What food service can do:

Rename the plant-rich dishes you offer using taste-focused, evocative language. Consider involving your culinary team in generating new and interesting names, particularly chefs who work with ingredients daily and have intimate knowledge of the look, feel, taste, and preparation techniques involved in creating plant-rich dishes. Wording that selectively highlights umami aspects (i.e., meaty, savory, pungent, delicious) may work particularly well to boost the appeal of plant-rich options to diners who would ordinarily prefer meat. At the same time, be sure to remove references to unappealing terms that could suppress sales of plant-rich options (as suggested in **PRS14: Unappealing language**). Lastly, experiment with rhyming phrases, metaphors, and alliteration (i.e., "Fuel up with fiber!," "Big, bad bandit beans!," "Sunset sautéed squash," "No doubts! Roasted brussels sprouts"). This wording can boost the aesthetic appeal of dishes and enhance consumers' experience of meals as they consider the enjoyable word play (Kronrod et al. 2021).

Case study:

A study by Compass, the food management company for Google's canteens, in collaboration with WRI and others, found that adding appealing dish names to plant-rich options in workplace canteens led to a significant increase in selection of these items. New, taste-focused names for vegetarian main dishes, side dishes, composed salads, and/or soups were trialed in four of Google's restaurants in Chicago, São Paulo, Singapore, and Sydney. Compared to days when more basic names were present, the appealing labels led to a 43.9 percent increase in the amount of plant-rich food taken per plate. Interestingly, the effects were found to be country specific, with the labels most effective in English-speaking countries (i.e., Australia and the United States), suggesting that language is a powerful tool to influence food choices toward more plant-rich options; however, naming conventions must be modified to ensure they are appropriate for different cultural contexts (Gavrieli et al. 2022).

	Dish type	Basic name	Appealing name
Chicago	Main	Eggplant and Chickpea Stew	Nonna's Garden Ragout
	Main	Seitan Stew	Wine Simmered French Vegetable Medley
	Soup	Tomato Soup	Provençal Slow-Roasted Herbal Tomato Soup
Singapore	Main	Steamed Lentils & Couscous wtih Cauliflower	Soft-Baked Cauliflower Tossed with Moraccan Grains
	Side	Steamed Mixed Vegetables	Tricolored Summer Vegetables
	Soup	Cauliflower Soup	French Smoked Cauliflower Soup

FURTHER READING

Gavrieli, A., S. Attwood, J. Wise, E. Putnam-Farr, P. Stillman, S. Giambastiani, J. Upritchard, C. Hanson, and M. Bakker. 2022. "Appealing Dish Names to Nudge Diners to More Sustainable Food Choices: A Quasi-experimental Study." *BMC Public Health* 22: 2229. https://doi.org/10.1186/s12889-022-14683-8.

Kronrod, A., M.E. Hammar, J.S. Lee, H.K. Thind, and K.M. Mangano. 2021. "Linguistic Delight Promotes Eating Right: Figurative Language Increases Perceived Enjoyment and Encourages Healthier Food Choices." *Health Communication* 36 (14): 1898–1908. https://doi.org/10.1080/10410236.2020.1805231.

PRS15: **Indulgent language** | Expert rating: **12.17** | Promise ratio: **2.60** | Number of research trials: **18**

PRS16 Use language on menus to selectively recommend plant-rich dishes (e.g., chef's special, dish of the day)

Why this works

Highlighting a plant-rich dish as the recommended option on a menu is a good way to attract attention to that meal. Recommendations give diners a decision-making shortcut, providing a quick and easy way to identify the best choices on the menu (Saulais et al. 2019). If this recommendation is from an expert source (e.g., chef's special) it may further emphasize the idea that that diner made a "good" pick that is supported by the opinion of another (well-informed) person. Research exploring this technique suggests that menu recommendations work best when combined with other behavior change techniques, such as offering default plant-rich menus (see, **PRS13: Default menus**) or when diners are particularly hungry, and so are more likely to rely on decision-making shortcuts (Zhou et al. 2019).

What food service can do:

Highlight select plant-rich dishes as "dish of the day," "chef's recommendation," "house specialty," "daily recommendation," or "owner's choice." Make this recommendation clearly visible to diners at the time they are making their choice. You could also choose to emphasize the option using bold or colored font or framed text or by placing the recommended option at the top of the menu list (Perez-Cueto 2021). At the same time, make sure that these highlighted dishes are integrated into regular menus rather than listed on a separate specials board, where they could easily be overlooked by customers. You may also wish to boost this technique by encouraging service staff to recommend the selected dish to diners directly (i.e., **PPL6: Upselling**).

Case study:

Research conducted in France in 2019 showed that featuring a plant-rich dish as the highlighted "dish of the day" (DoD) on menus significantly increased selection. Around 300 restaurant customers participated in a trial that involved choosing food from a buffet. Dishes were shown on a clearly visible menu board that was presented to the diners at the point of choice. When approaching the buffet, a server also told all customers, "Today our dish of the day is [. . .], with other alternatives available on the menu board," and then displayed the menu board clearly. Selection of the vegetarian DoD increased by 26 percent (from 34 percent to 60 percent of all food choices) when presented as the highlighted option, compared to when the same dish was presented in a more neutral way. Interestingly, menu size appeared to influence this DoD effect, with the increase in vegetarian dish choices even greater when three meal options were available, rising by 30 percent (23 percent to 53 percent) (Saulais et al. 2019).

FURTHER READING

Saulais, L., C. Massey, F.J.A. Perez-Cueto, K.M. Appleton, C. Dinnella, E. Monteleone, L. Depezay, H. Hartwell, and A. Giboreau. 2019. "When Are 'Dish of the Day' Nudges Most Effective to Increase Vegetable Selection?" *Food Policy* 85 (May): 15–27. https://doi.org/10.1016/j.foodpol.2019.04.003.

Zhou, X., F.J.A. Perez-Cueto, Q. Dos Santos, W.L.P. Bredie, M.B. Molla-Bauza, V.M. Rodrigues, V.M., T. Buch-Andersen, et al. 2019. "Promotion of Novel Plant-Based Dishes among Older Consumers Using the 'Dish of the Day' as a Nudging Strategy in 4 EU Countries." *Food Quality and Preference* 75 (July): 260–72. https://doi.org/10.1016/j.foodqual.2018.12.003.

PRS16: **Recommend dishes** | Expert rating: **11.26** | Promise ratio: **3.00** | Number of research trials: **8**

People techniques

One priority technique involves targeting food service employees (i.e., chefs, service staff, hosts, managers) as agents of change to promote plant-rich dishes.

PRL8 Train chefs and food preparation staff how to cook and prepare appealing plant-rich dishes

In more detail:

Given how important taste is to boost demand for plant-rich food, it is essential that chefs and other food preparation personnel are skilled in creating healthy, sustainable meals that are also delicious. Yet despite many chefs holding positive attitudes toward both health and the environment, many have not received the training required to create delicious and nutritious plant-rich meals (Bertoldo et al. 2022). Compared to meat, plant-rich options may contain more and varied ingredients that require different and unfamiliar cooking techniques, and certain plant-based ingredients can be a challenge to procure from existing suppliers. Responding to this fact, many culinary schools are now beginning to incorporate nutrition and sustainability training into their curricula. Research shows that budding chefs are interested in this offering, with 67 percent of trainees surveyed expressing the belief that they can play a key role in addressing climate change through their menu and purchasing decisions (Bertoldo et al. 2022), and over 80 percent saying they plan to promote environmentally sustainable food systems through their work as chefs when they qualify (Bertoldo et al. 2022).

What food service can do:

Make sure your back-of-house staff have access to up-to-date training on how to prepare and cook better plant-rich dishes, including access to a range of newly created plant-rich food training programs from major culinary organizations. If you have a dedicated training budget, consider inviting an expert to run a plant-rich training session for your whole team. You may also consider using a "train-the-trainer" model, in which you strengthen one staff member's skills—perhaps by sending a member of staff on an external training course—and then ask that individual to run training sessions with the rest of your culinary team. Alternatively, look to source free and easily accessible online tutorial videos. You may wish to showcase the work of well-known celebrity chefs who advocate for plant-rich cookery and have a good reputation for producing delicious meals.

Case study:

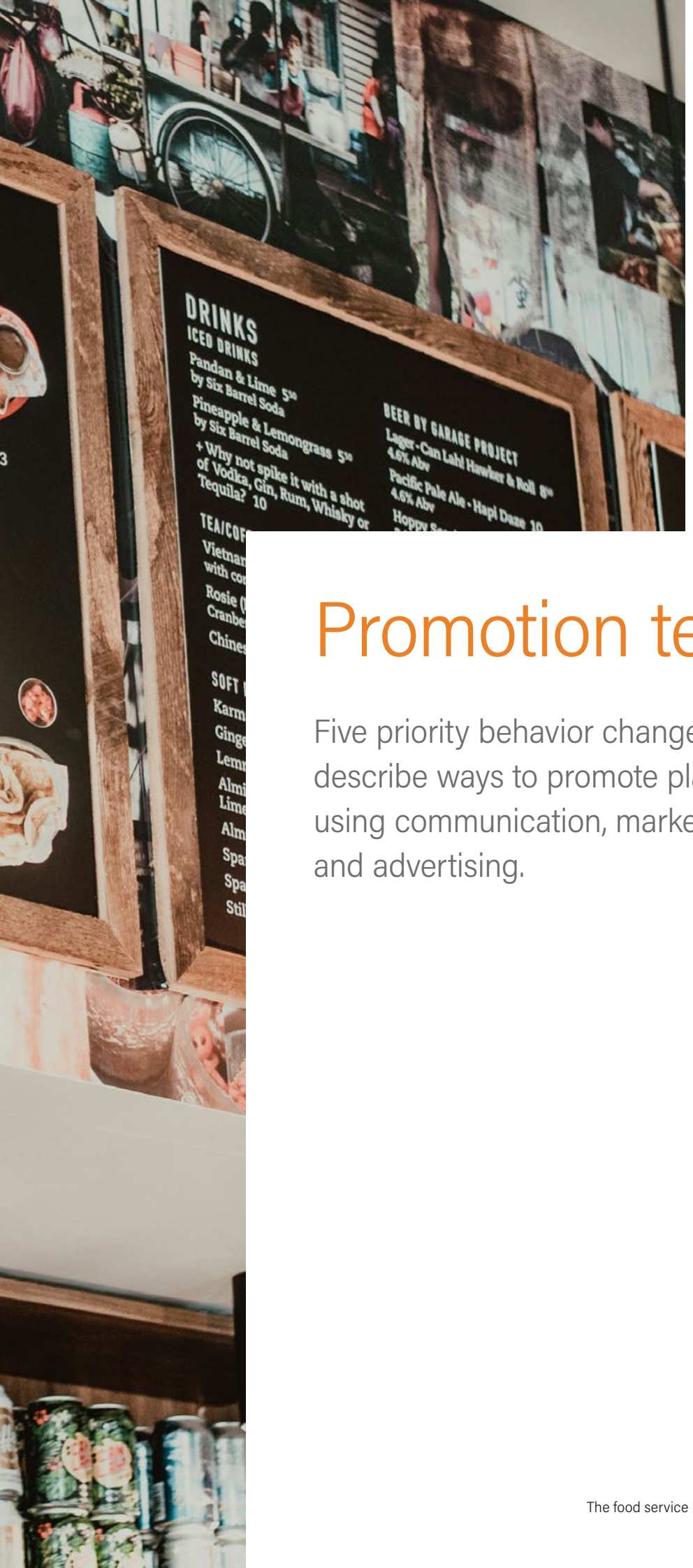
To reach its Sodexo campus target of offering 50 percent plant-based planned resident dining menus by 2025, the catering company Sodexo teamed up with the Humane Society of the United States (HSUS) to launch plant-based trainings across a number of its campus sites. Structured as a three-session course, the trainings involve familiarizing chefs with a range of techniques to prepare plant-based ingredients and sources of protein as well as how to effectively cook global plant-forward cuisines. Chefs are subsequently asked to implement what they learned during a plant-based takeover event, based in campus dining halls, and followed by a roundtable to review feedback and lessons learned. More than 144 trainings have already been completed by the HSUS, including 55 from the 2022–23 academic year. Sodexo and the Humane Society International have since expanded their reach by launching a master class called "Vegetalizing Our Meals and Offers: The Start of the Cultural Shift" in continental Europe in 2023 (Sodexo 2022).

FURTHER READING

Bertoldo, J., R. Hsu, T. Reid, A. Righter, and J. Wolfson. 2022. "Attitudes and Beliefs about How Chefs Can Promote Nutrition and Sustainable Food Systems among Students at a US Culinary School." *Public Health Nutrition* 25 (2): 498–510. https://doi.org/10.1017/S1368980021003578

PRL8: **Chef training** | Expert rating: **10.71** | Promise ratio: **2.00** | Number of research trials: **2**


SALADS
Malaysian Slaw 10
Crispy noodles, shredded cabbage, carrots, cucumber, toasted peanuts, Vietnamese mint, coriander & lime dressing
OR
Singapore Rice Noodle Salad GF 12
Aromatic rice noodles, toasted peanuts, chillies, Vietnamese mint, turmeric dressing
ADD:
Szechuan Prawns GF +6
Five Spice Roast Duck GF +6
Malaysian Chicken GF +4
NASI LEMAK
The National Dish of Malaysia
- Coconut Rice & Condiments, it's all about the texture
Coconut rice, sambal, dried anchovy, egg, toasted peanuts GF 10
ADD:
Spiced Chicken Wings +6
Beef Rendang GF +6
Chickpea Masala GF +4
SPICE IT UP
Sriracha GF 1.50
Fresh Chillies GF
Sambal GF 1.50
SIDES
Roti Canai with Nonya sauce 5
Steamed Rice 3
SWEET
Portuguese Custard Tart
Sweet Spiced Doughnuts with Coconut Caramel 6
KIDS
For 12 and under
Kids Hawker Roll 9
Bowl served
Steamed Rice 9



Promotion techniques

Five priority behavior change techniques describe ways to promote plant-riches dishes using communication, marketing, social media, and advertising.

PRM3 Create social media or other group forums where diners can share ideas, recommendations, and reviews of plant-rich dishes

In more detail:

Social media offers restaurants, cafés, and caterers a valuable tool to engage potential customers before they even set foot on-site. Positive online reviews can have a significant influence on an establishment's profit and client counts (Bai et al. 2023). In addition to being a medium for marketing and advertising, social media platforms can also be used to establish group forums where diners can come together, receive feedback (through "likes," "shares," and "follows"), gather information, and exchange ideas. In the context of proenvironmental food choices, social media group forums can be leveraged to help consumers overcome barriers they may hold to trying new plant-rich recipes or novel ingredients, such as alternative proteins (Legendre and Baker 2021). Seeing a friend, family member, or colleague enjoying these options and talking about them online may influence diners to follow suit, and recommendations from known and trusted people may overcome food neophobia and provide reassurance that an unfamiliar meal tastes good and is worth trying (Simeone and Scarpato 2020).

What food service can do:

If you work for an organization that serves the same diners over time (e.g., workplace canteens or other institutional dining settings), consider launching an online forum where your customers can leave feedback, communicate, and interact together and with staff. This can be a valuable engagement tool to promote more plant-rich diets, allowing you to post menus and promotions, solicit recommendations and requests, and establish moderated chat forums where team members can prompt directed conversations on chosen topics (Nigg et al. 2021). These can be used to communicate the benefits of plant-rich dishes, provide tools and tips to support diners to make a switch, or elicit customer concerns or barriers to trying these options, which can then be promptly addressed.

Case study:

The Fork Ranger app is designed to help diners adopt plant-rich diets. The app is set up so that users can learn more about sustainable food, collect infographics with relevant facts, and receive new plant-rich recipe ideas every day. Users regularly share information with one another and swap recipes that they have tried. The app has a specific feature that allows people to mark which dishes they have made themselves and leave reviews about them. In addition, content from the Fork Ranger app is regularly promoted on social media, where people can comment and share ideas, recommendations, and reviews. Consequently, "through friends" and "social media" make up the majority (79 percent) of routes through which users find and download the app.

Source: Fork Ranger app.

FURTHER READING

Bai, S., X. Zheng, C. Han, and X. Bi. 2023. "Exploring User-Generated Content Related to Vegetarian Customers in Restaurants: An Analysis of Online Reviews." *Frontiers in Psychology* 13 (January): 1043844. https://doi.org/10.3389/fpsyg.2022.1043844.

Legendre, T.S., and M.A. Baker. 2021. "The Gateway Bug to Edible Insect Consumption: Interactions between Message Framing, Celebrity Endorsement and Online Social Support." *International Journal of Contemporary Hospitality Management* 33 (5): 1810–29. https://doi.org/10.1108/IJCHM-08-2020-0855.

PRM3: **Social media forums** | Expert rating: **10.86** | Promise ratio: **4.00** | Number of research trials: **5**

PRM 20 Publicize the environmental benefits of plant-rich dishes using marketing materials (e.g., posters, social media, leaflets, table tents, or television screens)

In more detail:

There are many benefits to eating more plant-rich foods, including positive impacts on health, taste, animal welfare, and the environment. Recent research exploring the best ways to talk about these benefits suggests that highlighting the environmental impacts may be one of the more effective messaging strategies. For example, one recent study found that integrating environmental messages into a full-service restaurant menu led to the greatest decline in meat choices compared to other message types (i.e., health, animal welfare) (Grummon et al. 2023), with other studies showing similar outcomes (Piester et al. 2020; Shreedhar and Galizzi 2021). Environmental messages may influence choice by providing the information that diners need to make decisions that align with their personal values. In turn, choosing more environmentally friendly options allows people to feel they are a "good person." Adding environmental messages to promotional materials can motivate diners who are skeptical of other arguments (i.e., health, taste, or animal welfare) to choose plant-rich options (Shreedhar and Galizzi 2021).

What food service can do:

Include messages that highlight the environmental benefits of plant-rich options on your posters, social media, leaflets, menus, table tents, and other promotional materials. Current research evidence is still uncertain about which specific environmental message format works best (Piester et al. 2020), so prioritize information that speaks to the concerns of your own clientele, is easy to understand, and is placed in prominent positions where it will be noticed and read before diners make their choices. You may wish to message about environmental benefits in addition to highlighting the deliciousness of the plant-rich options (see, **PRM26: Taste-focused messages**); this can reassure diners that the "good" option is also the tasty option and that no trade-off in their eating experience is required if they make the more environmentally friendly choice (Visschers and Siegrist 2015).

Case study:

Aramark Canada saw significant interest among its clients in understanding the carbon footprints of dishes served across its locations and found a solution in Coolfood's low carbon certification. Aramark Canada introduced a six-month Coolfood low carbon certification pilot program in 15 universities, using lessons learned from a similar pilot conducted in the United States. It tweaked existing recipes to meet Coolfood's low carbon certification requirements, making the transition easier for Aramark Canada's operational and culinary teams. Moving forward, it will be developing new recipes meeting the Coolfood low carbon certification requirements to provide more variety to diners. To promote meals with the Coolfood low carbon certification and help diners understand the climate impact of food, Aramark Canada created a one-page flyer and other point-of-sale materials (see below) highlighting simple messaging around Coolfood's emissions target. Looking at purchasing data, Aramark Canada has seen an 11 percent reduction in ruminant meat purchasing since introducing the pilot program and an increase in the sale of plant-based meals. A survey of students and employees showed a positive response to the addition of meals with the Coolfood low carbon certification. Following the successful trial, Aramark Canada plans to roll out Coolfood's low carbon certification to additional locations and to analyze more recipes for the label. The expansion will push Aramark Canada into more challenging business areas for sustainability messaging, including corporate dining. To ensure a successful rollout, Aramark Canada is planning additional training for chefs at these locations because it set a target for 15–17 percent of all menus to be low carbon.

FURTHER READING

Blondin, S., S. Attwood, D. Vennard, and V. Mayneris. 2022. "Environmental Messages Promote Plant-Based Food Choices: An Online Restaurant Menu Study." Working Paper. Washington, DC: World Resources Institute. https://www.wri.org/research/environmental-messages-promote-plant-based-food-choices-online-restaurant-menu-study.

Grummon, A.H., A.A. Musicus, M.G. Salvia, A.N. Thorndike, and E.B. Rimm. 2023. "Impact of Health, Environmental, and Animal Welfare Messages Discouraging Red Meat Consumption: An Online Randomized Experiment." *Journal of the Academy of Nutrition and Dietetics* 123 (3): 466–76. https://doi.org/10.1016/j.jand.2022.10.007.

PRM20: **Environmental messages** | Expert rating: **10.79** | Promise ratio: **2.85** | Number of research trials: **50**

PRM 23 Publicize the local benefits of plant-rich dishes using marketing materials (e.g., posters, social media, leaflets, table tents, or television screens)

In more detail:

The idea of environmentally friendly diets can sometimes be quite abstract for diners, who are being asked to consider the impact of an immediate meal choice on outcomes that may be happening far away (e.g., deforestation in the Amazon rainforest), are uncertain and in the future (e.g., ecosystem collapse in 20 years), or they perceive as unlikely to affect their own lives (e.g., impacting populations in a faraway place). As such, highlighting the local benefits of switching to plant-rich dishes can bring the idea closer to home and emphasize advantages to the individuals themselves or to their local communities (Jäger and Weber 2020). For diners who may not be convinced by environmental arguments, highlighting local economic benefits (e.g., supporting local businesses, tourism, or agriculture) can provide a new and different set of justifications to make a change. Otherwise, local food also tends to be associated with greater freshness and higher quality, meaning the "local" label is synonymous with the idea of a better and safer option (Wang et al. 2023). Lastly, local dishes are often also linked to the idea of greater authenticity and higher craftmanship (Autio et al. 2013).

What food service can do:

Consider advertising the local origins of the plant-rich dishes that use local ingredients and highlighting benefits to neighborhood businesses (i.e., boosting the rural economy) or communities. This can include highlighting how products are sourced from nearby farms, are regional specialties, or showcase production or cooking techniques that are unique to the local culture. Highlighting local benefits may be particularly effective for food service organizations based in tourist destinations, where travelers are often seeking local, sustainable options to try (Testa et al. 2019). Care should be taken to clarify that local food is not always more environmentally friendly by default; whereas local produce may have fewer air miles and shorter supply chains, transportation-related GHG emissions typically contribute far less to the overall GHG emissions footprint of a dish than the type of ingredients it contains (e.g., meat versus plant-based food) (Cappelli et al. 2022; Tubiello et al. 2021).

Case study:

In a study of 305 Swiss consumers, researchers at ETH Zurich tested whether labeling different plant-based foods as either originating in Switzerland or abroad influenced perceptions of the environmental sustainability and social impact of each item. Findings showed that country of origin significantly swayed consumers' views, with Swiss products judged to be more environmentally friendly than those originating from other countries—particularly from very distant locations—as well as being better for social justice, fair trade, and human rights. This was despite no evidence to indicate that the nationally produced products were actually better for the planet or human welfare; it demonstrates how selectively highlighting the country of origin can help sway consumers toward locally grown plant-based options (Lazzarini et al. 2017).

FURTHER READING

Cappelli, L., F. D'Ascenzo, R. Ruggieri, and I. Gorelova. 2022. "Is Buying Local Food a Sustainable Practice? A Scoping Review of Consumers' Preference for Local Food." *Sustainability* 14 (2): 772. https://doi.org/10.3390/su14020772.

Lazzarini, G.A., V.H.M. Visschers, and M. Siegrist. 2017. "Our Own Country Is Best: Factors Influencing Consumers' Sustainability Perceptions of Plant-Based Foods." *Food Quality and Preference* 60 (September): 165–77. https://doi.org/10.1016/j.foodqual.2017.04.008.

PRM23: **Local benefit messages** | Expert rating: **10.43** | Promise ratio: **5.00** | Number of research trials: **6**

PRM 26 Publicize the taste and flavor benefits of plant-rich dishes using marketing materials (e.g., posters, social media, leaflets, table tents, or television screens)

In more detail:

Research shows that many diners automatically presume that healthy and environmentally friendly foods will not taste good (Turnwald and Crum 2019). As such, adding taste-focused language to plant-rich promotional materials is an important technique to help overcome the misperception that "healthy (and sustainable) ≠ tasty." This language can be particularly useful to encourage diners to try new plant-rich dishes, after which point the product can speak for itself. It is for this reason that many novel "alt" protein food companies are emphasizing the great taste of their products in marketing materials, describing how closely they emulate meat to appeal directly to diners' hedonic preferences and play on a sense of familiarity (Bryant and Dillard 2019). Interestingly, research also demonstrates that advertising the rich flavor of plant-rich meals can even influence the taste experience itself, with one study showing that taste-focused labels increased the deliciousness ratings of meals compared to when no labels were present (Turnwald and Crum 2019).

What food service can do:

In addition to following the recommendations laid out for technique **PRS15**, consider adding indulgent, taste-focused language to all promotional and advertising materials. If you wish to use this technique to upsell alt proteins specifically, experiment with language that emphasizes the similarity of these novel products to meat (e.g., "juiciness," "chewy," "meaty," "satisfying"). Other strategies you may wish to try include adding language that refers to an enjoyable eating context ("grilling season," "Sunday roast," "Friday night with friends," "pub lunch") or messages that refer to these products as treats or guilt-free guilty pleasures (Sexton et al. 2019).

Case study:

In 2021, Swedish restaurant chain MAX Burger experimented with adding different appealing promotional messages to menus and signs across 137 of its sites. Its goal was to understand which approach to messaging—taste focused, norm focused, or feel good—was most effective at promoting more sustainable menu items. The taste message involved adding a small green sign that simply stated, "The green option tastes good!"; it was accompanied by a smiley face emoji. The results of the study showed that the taste message was most effective, leading to a significant 10 percent increase in plant-rich food sales compared to when no message was present. If scaled across all MAX Burger outlets, researchers estimated that this minor change to wording would translate to around 140,000 extra sales of green menu options over the course of a year (Reinholdsson et al. 2023). Since this time, MAX Burger has continued to expand its range of tasty plant-rich options and ensure that these are framed as positive choices in its "Supreme Green" menu. Launched in 2023, this new menu contains dishes with appealing taste-focused labels emphasizing quality ingredients and enjoyable eating experiences, such as the "crispy supreme sandwich," "crispy supreme buffalo," or "Grilloumi original." MAX Burger is a global climate leader in its industry and continuously works toward its sales target of "every second meal free from red meat."

Notes: The message-based nudges. "Många här väljer grönt!" (descriptive norm) translates to "Many here choose green!"; "Det gröna valet smakar bra!" (hedonic) translates to "The green option tastes good!"; "Det gröna valet känns bra!" (warm glow) translates to "The green option feels good!." The taste message led to a significant 10 percent increase in plant-rich food sales compared to no message.

FURTHER READING

Reinholdsson, T., M. Hedesström, E. Ejelöv, A. Hansla, M. Bergquist, M., Å. Svenfelt, and A. Nilsson. 2023. "Nudging Green Food: The Effects of a Hedonic Cue, Menu Position, a Warm-Glow Cue, and a Descriptive Norm." *Journal of Consumer Behaviour* 22 (3): 557–68. https://doi.org/10.1002/cb.2129.

Turnwald, B.P., and A.J. Crum. 2019. "Smart Food Policy for Healthy Food Labeling: Leading with Taste, Not Healthiness, to Shift Consumption and Enjoyment of Healthy Foods." *Preventive Medicine* 119 (February): 7–13. https:/doi.org/10.1016/j.ypmed.2018.11.021.

PRM26: **Taste-focused messages** | Expert rating: **10.69** | Promise ratio: **6.50** | Number of research trials: **15**

Price techniques

One priority technique involves modifying the price to promote plant-rich dishes to diners in food service.

PRC7 Run cross-product promotions (e.g., meal deals, set menus) on plant-rich dishes and selected drinks, side dishes, or desserts

In more detail:

Promoting certain dishes alongside complementary products, such as a suitable wine, side dish, sauce, or dessert, is a well-known and well-used marketing technique. Cross-product promotions like these can boost sales of plant-rich options by making it easier for diners to choose what to eat in combination (Carroll et al. 2018), and they can encourage consumers to associate plant-rich dishes with other high-quality and well-branded products. This can lead diners to transfer positive perceptions from these products to the target plant-rich dish. The right pairings can also help to enhance the flavor of plant-rich options because the additional items may boost certain tastes, suppress undesired elements, or create a more harmonious eating experience overall (Spence 2020).

What food service can do:

If your establishment offers self-service dining, consider displaying plant-rich options alongside paired products in the same area on shelves or in buffets or add signs at the point of choice that recommend to diners which options should be paired with their selected dish. You could even consider adding arrows, floor stickers, or other guide markers that point toward the location of the recommended paired product (see **PLC3: Guide markers**). If you offer table service, you may consider advertising cross-product promotions using a plant-rich set menu or a meal deal or encouraging your service staff to upsell attractive pairings of plant-rich drinks, sides, desserts, or extras to diners. Research suggests that certain pairings are more inherently appealing to diners than others; combinations that are culturally accepted and well-known are generally perceived as tasting better (i.e., pairing beer with pizza rather than white wine) (Buodo et al. 2019), as are pairings that leading to greater complexity in flavors (Spence 2020).

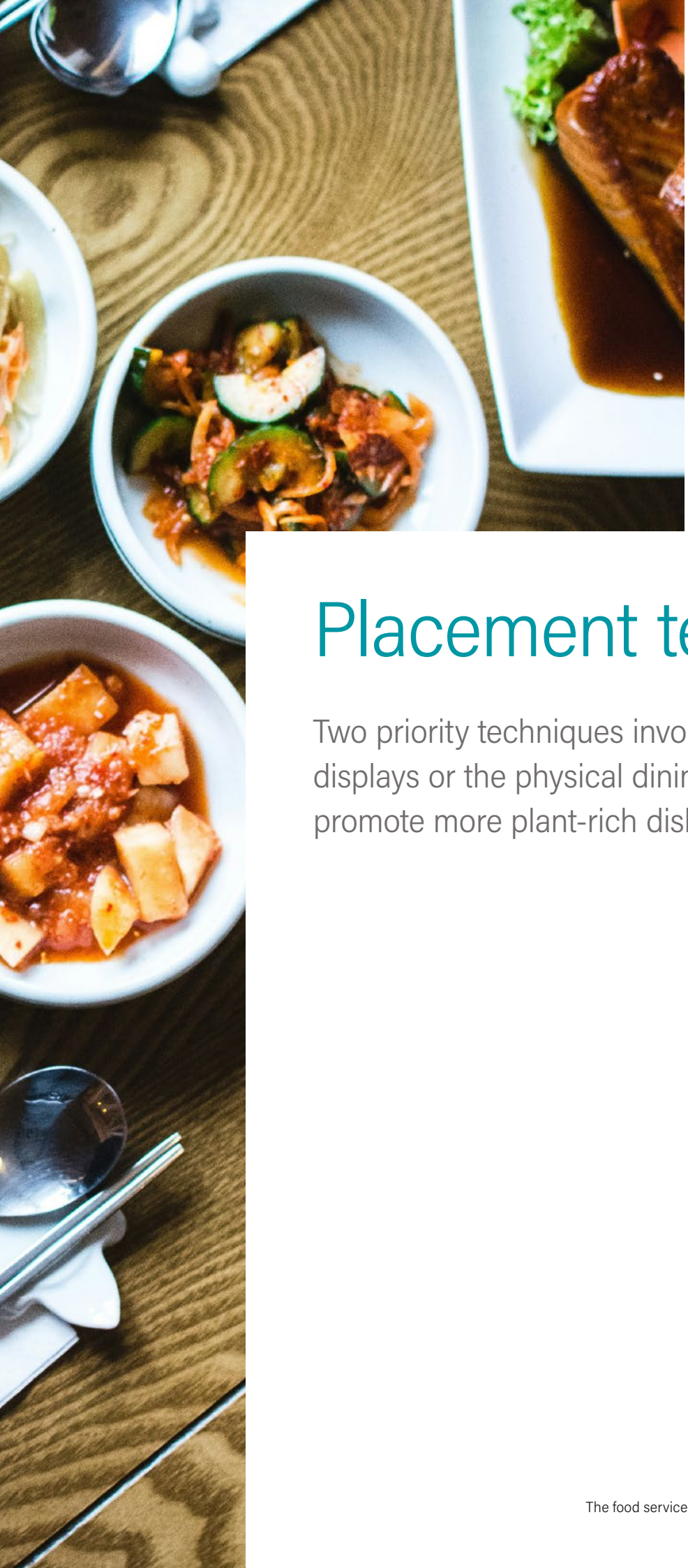
Case study:

The plant-based movement has grown in popularity in recent years, with ever more celebrations, "challenges," and seasonal promotions now available to support its expansion. "Veganuary" is perhaps the best known of these. The Veganuary challenge involves people signing up to forgo animal-based products for the month of January. In 2022, over half a million people from 228 countries participated in Veganuary. Responding to the popularity of this initiative, multiple food businesses have now begun to offer promotional meal deals on plant-rich dishes and selected drinks, side dishes, or desserts during January. For example, in 2023, the UK supermarket chain Waitrose launched its first-ever plant-based dine-in-for-two meal deal. Marketed as the "£9 Plant-Based Dine In," customers could choose two mains along with one side or a dessert from PlantLiving (Waitrose's rebranded own-label vegan brand). During the same year, another UK supermarket chain, Sainsbury's, added a new vegan sandwich to its lunchtime meal deal, allowing customers to purchase this sandwich along with a snack and a drink for a total of £3.50. In 2022, the retail giant Tesco also promoted the "Wicked Kitchen Meal Deal," serving a vegetarian main, side, and dessert for a total price of £8. Tesco has since also launched new food-to-go options in its Plant Chef range, which are available as part of the Tesco £3 meal deal.

FURTHER READING

Buodo, G., R. Rumiati, L. Lotto, and M. Sarlo. 2019. "Does Food-Drink Pairings Affect Appetitive Processing of Food Cues with Different Rewarding Properties? Evidence from Subjective, Behavioral, and Neural Measures." *Food Quality and Preference* 75 (July): 124–32. https://doi.org/10.1016/j.foodqual.2019.03.003.

PRC7: **Cross-product promotions** | Expert rating: **10.83** | Promise ratio: **2.00** | Number of research trials: **6**



Placement techniques

Two priority techniques involve modifying food displays or the physical dining environment to promote more plant-rich dishes.

PLC5 Integrate plant-based meat alternatives into meat sections in a display (e.g., buffets, shelves, food carts, or stations)

In more detail:

Meat eaters often bypass, or even actively avoid, the "vegetarian and vegan" section in self-service dining or on menus. Conversely, vegetarian and vegan diners tend to do just the opposite: they deliberately seek out this section in stores, restaurants, or menus, where they know they will find meals to suit their dietary needs (Kerslake et al. 2022). For these reasons, **PLC5: Integrate alternatives** and **PLC6: Dedicated sections** are useful Placement interventions to consider in combination. By integrating meat alternatives into displays where meat is typically available, these new options stand a far better chance of catching the attention of diners who may not otherwise consider switching their choices away from meat but might actually enjoy trying these alternative products. Where this approach has been tested in retail settings, substantial increases in sales of meat alternatives have been shown (e.g., a 171 percent increase in sales in one study), although no simultaneous reduction in meat sales have been documented; this suggests that this approach needs further testing to understand whether it leads to consumers switching their choices rather than simply buying more food overall (Vandenbroele et al. 2021).

What food service can do:

Consider adding alternative meat dishes to self-service displays or buffet sections where meat-heavy dishes are normally served. Because these sections are frequented by diners actively seeking meat, ensure that the alternative options are as similar to popular meat dishes as possible. By placing meat-free options next to meat dishes, diners' positive taste expectations of the latter may transfer over to the new meat-free dish, thus potentially helping to boost selection (Vandenbroele et al. 2021). To further promote these options, either avoid highlighting the difference between the meat and nonmeat options or actively promote the meaty, familiar taste of the nonmeat dishes to entice diners to try them. To encourage a direct switch from meat to meat alternatives, also consider placing the meat-free options in more visible positions in the display (**PLC9: Visible position**) and increasing the number and variety of these options (**PRD7: Increase ratio** and **PRD8: Increase variety**) while reducing the number of meat-based dishes on sale at the same time.

Case study:

The UK bakery chain Greggs has achieved massive success in selling meat-alternative versions of its most popular meat offerings. Greggs now offers both vegan steak bakes and sausage rolls, selling these products alongside meat products in its self-service displays. When first launched, these vegan options received an extremely positive reception, with the meat-free sausage roll now listed as one of Greggs's top ten best-selling products. Greggs's overall goal of offering alt-meat options alongside meat was not necessarily to serve the needs of the chain's vegan customers, who make up just 14 percent of its clientele, but rather to provide greater choice to the more than two-thirds of Greggs customers who are looking for ways to reduce, but not necessarily exclude, meat from their diets (Smithers 2020).

FURTHER READING

Smithers, R. 2020. "Greggs Launches Meatless Steak Bake to Beef Up Its Vegan Range." *Guardian,* January 1. https://www.theguardian.com/business/2020/jan/02/greggs-launches-meatless-steak-bake-beef-up-vegan-range.

Vandenbroele, J., H. Slabbinck, A. Van Kerckhove, and I. Vermeir. 2021. "Mock Meat in the Butchery: Nudging Consumers toward Meat Substitutes." *Organizational Behavior and Human Decision Processes* 163 (March): 105–16. https://doi.org/10.1016/j.obhdp.2019.09.004.

PLC5: **Integrate alternatives** | Expert rating: **11.04** | Promise ratio: **5.00** | Number of research trials: **5**

PLC6 Introduce a dedicated plant-rich food section (e.g., buffet section, shelf section, food carts, or stations)

In more detail:

Introducing a dedicated plant-rich food section can work alongside integration (**PLC5: Integrate alternatives**) to ensure that diners who are actively seeking plant-rich options always know where to find them and can easily locate them from the range of alternatives on offer without having to peruse the meat section. Ensuring that you have an identifiable display section dedicated to reduced-meat or no-meat options is particularly important if a large percentage of your customer base is vegetarian, vegan, or flexitarian.

What food service can do:

Dedicate a section of your food displays, buffets, shelves, and/or stations to offering plant-rich options and ensure that these sections are identifiable to diners who are explicitly seeking out these dishes. Because many vegetarians and vegans choose to avoid meat because they dislike the taste or sensory aspects, consider offering dishes here that will appeal to the preferences of this customer segment, such as legumes, grains, or nuts and seeds, rather than serving options that mimic the taste of meat (Kerslake et al. 2022; Malek and Umberger 2023). Follow recommendations in **PRS15: Indulgent language** on how best to promote the plant-rich dishes available in this section by describing them using indulgent, taste-focused language. This is likely to be the most inclusive approach because it will appeal to vegans and vegetarians while also potentially attracting more flexitarian diners than would an approach using more explicit terms such as *meat-free* or *vegetarian* (Hielkema and Lund 2022).

Case study:

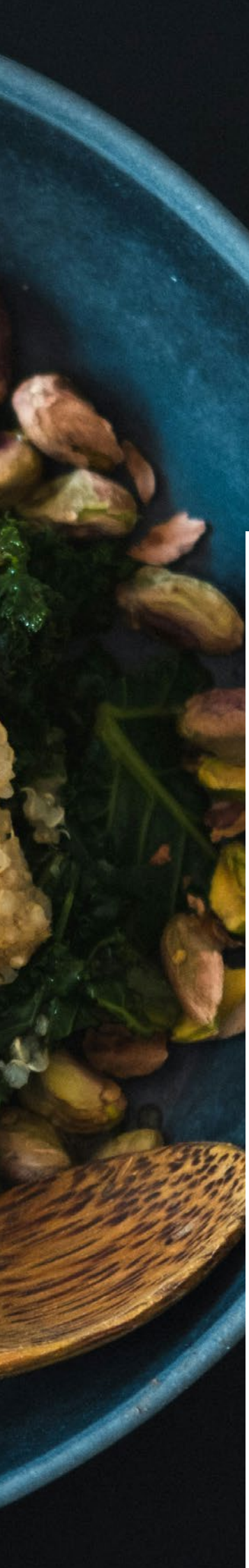
The campus dining service at the University of Michigan created a dedicated "24 Carrots" plant-rich food station that offers staff and students a wide range of appealing meat-free options that are specifically positioned in their own area in a positive, attention-grabbing way. The station presents a rotation of various vegan or vegetarian burgers, Asian-inspired dishes, stir-fries, and vegan or vegetarian sandwiches, among other others. The offering always contains nutrient-dense plates that include a source of plant-based protein, such as tofu, tempeh, seitan, beans, or lentils, as well as vegetables and a starch component. In addition to 24 Carrots, each dining hall at the university also serves a further range of vegan and vegetarian dishes integrated into other food stations (in line with the previous technique, **PLC5: Integrate alternatives**), plus a salad bar and a vegetarian soup option at each site. Together, these activities are helping the culinary team reach its overarching goal of ensuring that over 55 percent of menu items are plant rich by 2025. Staff and student response to these meat-free options has been overwhelmingly positive, with praise and feedback from many, including vegan diners who praise the dining service for ensuring their dietary needs are taken into consideration.

Source: Michigan Dining.

FURTHER READING

Kerslake, E., J.A. Kemper, and D. Conroy. 2022. "What's Your Beef with Meat Substitutes? Exploring Barriers and Facilitators for Meat Substitutes in Omnivores, Vegetarians, and Vegans." *Appetite* 170 (March): 105864. https://doi.org/10.1016/j.appet.2021.105864.

PLC6: **Dedicated section** | Expert rating: **10.57** | Promise ratio: **4.00** | Number of research trials: **5**



Summary

This playbook 2.0 outlines a shortlist of 18 priority behavior change techniques to guide and inspire food service providers to encourage diners to choose more plant-rich dishes more often. In this section, we summarize key findings and provide recommendations for stakeholders to further advance the healthy, sustainable diets agenda.

KEY FINDINGS

This updated playbook 2.0 contains 90 behavior change techniques that food service providers can use to encourage consumers to choose more plant-rich options when dining out. We identified this complete list from a review of 346 peer-reviewed research trials and have organized them into a 6P framework referring to the target of change: Product, Presentation, People, Promotion, Price, and Placement.

All 90 techniques were reviewed and ranked by a group of 49 experts. Simultaneously, they were assigned a promise ratio based on the quantity of evidence showing that each technique is effective versus ineffective at influencing food choices. Based on these two scoring systems, 18 priority techniques were identified and outlined in more detail. We recommend that food service providers introduce these high-scoring techniques into their operations without hesitation.

Of these, the priority shortlist technique with the highest joint scores from both experts and the research evidence is **PRM26: Taste-focused messages**. This is the same top technique identified in the 2020 playbook, which has retained its place at number one both as the evidence base has expanded over time and as food service providers have more experience implementing the approach. This demonstrates that taste, enjoyment, and pleasure should remain central to promoting plant-rich dishes rather than emphasizing more "virtuous" aspects of the dining experience.

The priority techniques ranked highest by our sample of 49 experts are **PRS15: Indulgent language** and **PRM20: Environmental messages**, which show the most consistent evidence of effectiveness based on the research literature. These techniques emphasize the importance of carefully considering wording on marketing materials, labeling, menus, posters, and social media. The findings of this playbook 2.0 underscore the fact that effective communication, particularly taste-focused and proenvironmental messaging, is a powerful and practical way to entice diners to try more plant-rich options when dining out.

Product techniques compose nearly one-third of the new priority shortlist. Overall, these techniques tend to be ranked highly by our expert sample, particularly **PRD5: Improve appearance**, **PRD7: Increase ratio**, and **PRD8: Increase variety**, but they would benefit from further academic research to reinforce evidence of effectiveness (for PRD5 and **PRD6: Improve flavor** especially). Similarly, we welcome further research exploring all People techniques. We located very few new studies testing these techniques, yet they tended to be ranked highly by those working in food service (particularly **PPL4: Tools and equipment**).

OUR FINDINGS IN CONTEXT

This playbook 2.0 supports the conclusions of many existing academic reviews already available on the topic of promoting plant-rich food choice (or reducing selection and consumption of meat and dairy). Although a detailed overview of the findings from all these publications is beyond the scope of this report, we summarize key similarities in their conclusions and those found in the playbook 2.0, as follows:

- Published academic reviews consistently support the use of behavior change techniques as effective tools to influence consumers' food choices, including many of the 90 techniques that we outline in the playbook 2.0. For example, a review by Harguess et al. (2020) found that 88 percent of the behavior change studies were effective at changing either actual meat consumption or intentions to eat meat. Similarly, Grundy et al. (2022) reported that 80–100 percent of the behavior change studies included in their metareview succeeded in influencing meat intake (with variability depending on the type of change technique trialed), whereas Taufik et al. (2019) reported that between 40 percent and 65 percent of the behavior change studies in their review significantly influenced food consumption (with success again dependent on the types of interventions tested).
- Other effect sizes reported in the academic review literature include the following: Chang et al. (2023) found an 82 percent average reduction in the odds of consuming meat in higher education dining settings in a meta-analysis of 31 behavior change intervention studies. Greene et al. (2023) found that improving the convenience of choosing plant-rich dishes (by introducing default plant-rich dishes or making these the recommended choice) was associated with the largest effect size of all intervention types reviewed (Cohen's d = 1.64). Mathur et al. (2021) found that interventions aimed at reducing meat intake by showing diners images of farm animals were also effective and led to a significant 22 percent increase in the likelihood of participants choosing to reduce their

consumption, purchasing, or intentions to eat meat (meta-analytic mean risk ratio [RR] = 1.22; 95 percent CI: [1.13, 1.33]).

- Some debate remains across existing reviews as to whether behavior change approaches that unconsciously "nudge" diners are more effective than interventions that modify diners' conscious knowledge, attitudes, and values pertaining to plant-rich food. Our playbook 2.0 includes techniques targeting both conscious and nonconscious drivers of choice but is dominated by the latter. Available evidence from current published reviews suggests that both approaches are valuable in influencing food choices and that introducing a range of techniques that both nudge and inform diners simultaneously may prove the most effective route to change (Chang et al. 2023).
- Existing published reviews acknowledge that far more research is needed "in the field." Our promise ratio calculations also attest to the fact that various behavior change techniques require more evidence to demonstrate effect and, particularly, evidence that they work to change dish choices for real diners in real food service settings (Kwasny et al. 2022). The current academic research evidence contains many studies conducted in online or lab-based "mock dining" environments, or that require participants to state their intentions to change, rather than observing their true choices when dining out (Harguess et al. 2020). Behavior is likely to differ in test circumstances compared to in real life, implying the effect sizes drawn from these studies may not accurately depict true estimated impact. This has been shown for trials exploring environmental footprint labels specifically, which are generally found effective in survey-style studies but demonstrate far less promise when trialed in real-life food retail and dining contexts (Greene et al. 2023).
- Across the academic reviews, a variety of priority areas have been highlighted for further research. These include research into specific behavior change techniques, population groups, and dietary choices. Published academic reviews recommend more research into behavior change techniques that target social identity, culture, religion, hedonic factors (e.g., taste), and habits (Harguess et al. 2020; Kwasny et al. 2022). The field would also benefit from a move away from studies exploring belief- and norms-based interventions (Greene et al. 2023). Our own promise ratio analysis supports these conclusions. The most-tested technique, **PRM21: Health messages**, is a belief-based approach that so far has been trialed 80 times yet has been found to be substantially less effective than many other approaches (with a promise ratio of just 1.50).
- In terms of global applicability, published reviews highlight the relative lack of research studying populations that are not from Western, educated, industrialized, rich, and democratic (WEIRD) countries; this may play a role in biasing the overall evidence base (Grundy et al. 2022). Our analysis reinforces this point, demonstrating that over 41 percent of our included studies were conducted in Canada and the United States, and 46 percent were from the European Union and the United Kingdom. Although these are higher meat-consuming areas, which justifies the research focus, consumption is rising in many other geographies. Further work is now required to understand how to target consumers in a wider range of locations. Bianchi et al. (2018) have also indicated a need for more research exploring gender differences in response to behavior change interventions in food service and retail settings, especially given the fact that gender is one of the leading drivers of meat intake across contexts (with men generally consuming more animal-based foods than women).
- Lastly, academic reviews also indicate that further research is needed to examine the role of behavior change interventions on specific aspects of the diet. The present evidence base is dominated by trials that either focus on reductions in meat intake or on the promotion of fruits and vegetables. Additional studies are now required to understand whether behavior change techniques prove similarly effective for other aspects of a healthy, sustainable diet—namely, in promoting reductions in dairy product consumption or increases in consumption of other plant-rich produce, such as whole grains, legumes, or nuts and seeds (Grundy et al. 2022; Taufik et al. 2019).

RECOMMENDATIONS FOR STAKEHOLDERS

Based on the updated findings of this playbook 2.0, the following are recommendations for key stakeholders:

For food service: The 18 priority techniques highlighted in this playbook 2.0 are the actions that food service providers can take, without hesitation, to help consumers transition to more sustainable plant-rich diets. We also invite

food service providers to consider introducing any of the additional 34 promising behavior change techniques highlighted in the bottom right quadrant of Figure 3. Here, further pilot testing is welcomed before widespread rollout, and we urge all organizations to make their findings publicly available so that the broader food service sector learns from their tests. Not only would more evaluations of promising techniques contribute important insights to the existing evidence base, but they also would help to inspire others working in food service, including senior leadership, to create positive changes in their own operations and thus contribute to building a sector-wide movement.

For governments and policymakers: The behavior change techniques covered in this guide are as relevant to dining in public institutions (e.g., hospitals, government offices, schools, prisons) as they are for private sector restaurants, cafés, and canteens. Hence, for changemakers working in public food service roles, we also encourage direct implementation of our 18 priority techniques without delay. Additionally, other stakeholders from government can play a valuable, upstream role by creating policy conditions that favor and facilitate the introduction of behavior change techniques from this playbook 2.0. For example, introducing taxes on meat and dairy while supporting subsidies on fresh produce would help food service providers adopt Price techniques, updating dietary guidelines to incorporate sustainability considerations would support Promotion and People techniques, and providing a consensus statement on environmental footprint labeling for food would inform various Presentation techniques. Here, further research and evaluation may be warranted by governments and policymakers to understand public support for behavioral nudges. We recognize that many consumers may consider these acceptable, but others may see them as paternalistic overreach. Integrating findings from research on consumer acceptability as a third shortlisting criteria could help us arrive at a final list of behavior change techniques that are jointly effective, supported by industry, and considered generally acceptable by consumers.

For academics and research organizations: We encourage academics and research organizations to conduct rigorous evaluations of the behavior change techniques identified in this playbook 2.0, especially those with very little or no associated research (we found 15 techniques tested in either zero or one study only). This should include field trials run in partnership with food service organizations to not only determine effectiveness but also the factors that influence successful implementation in practice. Five techniques were ranked in the top third by our expert sample, including three People techniques (PPL1, PPL3, PPL4), one Promotion technique (PRM2), and one Product technique (PRD4). These offer a useful starting point because they are judged as feasible to implement in practice. Most of the People techniques identified in the playbook 2.0 are currently not evidence based. Hence, we recommend that these, along with a number of the Product techniques, become the focus area of future academic research. We would additionally counsel a pivot away from more research into health and environmental messaging because these approaches already have a well-consolidated evidence base (cited in 80 and 50 studies, respectively), whereas large gaps in research coverage remain for other potentially valuable approaches.

In addition, we recognize that the limitations of our current methodology could be usefully addressed and built upon by the academic research community. Notably, we welcome improvements to our promise ratio calculations, which are intended to provide food service providers with an overview of the research evidence, yet they do not account for the effect size or the methodological quality of the research literature. We encourage academics to expand upon the analysis in this playbook 2.0 by further scoring behavior change techniques based on a combination of the volume and consistency of supportive trials with the overall size of the effect (i.e., small, medium, large) and with an indicator of research quality. This would enable us to shortlist those behavior change techniques that we can

trust to consistently produce substantial changes in food choices rather than more inconsequential effects.

For philanthropies and funders: Despite the evidence and early promising case studies presented in this playbook 2.0, behavioral science remains an under-leveraged tool to encourage dietary shifts. There is, therefore, a strong opportunity for more private funding to be directed towards encouraging uptake of the priority behavior change techniques laid out in this playbook 2.0. At the same time, philanthropic funds can also accelerate progress and expand research into behavioral techniques for dietary shifts through investment directed at other change agents, including city governments and health care providers. Finally, funders and philanthropic actors can also play an important role in creating momentum by signaling the early direction of travel for future investment. For example, philanthropic foundations can provide early catalytic funding, which can then be followed by larger-scale government investment into areas where impact has been proved through this early work.

CONCLUSIONS

Without transformation within the food service industry, a timely transition toward healthier, more sustainable diets globally will prove challenging if not impossible. Although the sector has made some commendable progress already, far more extensive and rapid changes to dining environments, staff training, and food innovations are needed to impact the climate in a meaningful and lasting way. This playbook 2.0 outlines a complete list of 90 behavior change techniques that food service stakeholders can use to promote more plant-rich dish choices among their customers, 18 of which are highlighted as priorities because they are judged as feasible to implement and effective by industry representatives and are found effective in the majority of research trials in which they have been tested. As such, we encourage food service providers to implement techniques from this priority shortlist without hesitation as they work toward reducing the environmental impact of the food they serve.

Our recommendation to academic and research organizations is to conduct careful evaluations of those behavior change techniques we identified as being associated with little or no research evidence but often judged as feasible to implement in practice by the pool of expert stakeholders we consulted. Finally, we hope the evidence offered will guide the work of policymakers active in public food service roles and also governments to incorporate behavioral strategies when developing policy frameworks that instigate concrete sustainable action.

Thanks to the guidelines presented in this playbook 2.0, shifting diners' dietary habits toward more plant-rich diets has never been easier. Simple behavioral changes can go a long way in supporting our mission to redesign food systems where both the people and the planet thrive.

Appendices

APPENDIX A: FULL METHODOLOGY

Scoping review search strategy

Scoping literature review methods

For the playbook 2.0, we reissued our original search of academic research literature on the topic of dietary behavior change. We conducted a scoping search of several academic databases via the EBSCO Discovery Service, which incorporates EBSCOhost (covering Academic Search Complete, Environment Complete, Business Source Complete, GreenFILE, OpenDissertations, and Medline [i.e., PubMed]), ScienceDirect (covering the Agricultural and Biological Sciences; Economics, Econometrics and Finance; Environmental Science; and Veterinary Science and Veterinary Medicine collections), JSTOR (covering the Life Sciences collection), Springer (covering the Biomedical Sciences, Business and Management, Earth Sciences, Economics, Environmental Sciences, and Life Sciences journal collections), and Scopus (covering the Environmental Psychology, Social Psychology, and Social Sciences journal collections), in addition to a separate search of *Nature* journal collections.

To ensure that our search only included new studies, published in the years since the 2020 playbook was first launched, we limited our database searches to locate articles released after November 2018. Search terms used to find relevant publications reflected our eligibility criteria for the review, listed in Table A-1. An example of the search string that we used for this updated review is available in Box A-1.

In addition, we also performed a brief search for systematic reviews on the topic of dietary behavior change, also published after 2018. Via forward searches of review reference sections, we identified any further potentially eligible primary studies that our database searches may have missed.

Lastly, where we were aware of additional ad hoc relevant publications that met our eligibility criteria (including gray or in-press literature sent via our expert network), we added these studies to the pool of publications for full-text consideration.

Our eligibility criteria for including research into the playbook 2.0 were the same as those used for the 2020 playbook. They allowed us to locate studies conducted in (or relevant to) real-life food service settings that included a measure of change in the selection, purchase, or consumption of at least one plant-rich food, dish, or product (or, conversely, reduction in selection, purchase, or consumption of animal-based foods).

Eligible settings included food service establishments (e.g., restaurants, cafés, workplace canteens, kiosks), food shopping establishments (e.g., grocery stores, supermarkets, online retailers), and lab-based or online studies testing interventions commonly used in "real-life" food service environments (e.g., food-labeling studies) or that could plausibly be applied to these contexts.

Eligible studies did not need to only focus on the topic of plant-rich food choices but also could have a broader focus and investigate dietary behavior change for health or animal welfare

TABLE A-1 | Eligibility criteria for accepting research into the playbook 2.0

ELIGIBILITY CRITERIA	INCLUDE IF . . .	EXCLUDE IF . . .
Study setting	The study focuses on places where food is purchased and eaten on or off the premises. This includes supermarkets, shops, or online ordering platforms. It also includes lab-based research settings, where the authors indicate techniques could be used in food service specifically (e.g., an online labeling study) or where the intervention under consideration has already been widely implemented in food service.	The study focuses on in-home food preparation and consumption or is a school-based study targeting children.
Type of intervention	The study specifically aims to shift consumers to eat more plant-rich foods, reduce meat or dairy consumption overall, or shift to less resource-intensive meats or other alternatives. This includes studies that look at increasing fruit and vegetable intakes for health as long as there is a specific measure of plant-rich food items. Studies do not have to explicitly focus on switching away from meat and dairy.	The study measures an overall dietary index or macronutrient levels (e.g., fat) and does not report on the relative increase of specific food types or items (e.g., "low-fat diets" or "high-protein diets" are excluded unless the study provides measures of the specific plant-rich items, such as fruit portions, that make up this diet).
Outcome of measure	The study includes a between- or within-group comparison of intentions or actual change in selection, purchasing, or consumption of a specific plant-rich food product. This can include measures of the specific food item or food group under focus (e.g., fruit or vegetable, tomato-based products, reduction in meat).	The study only has physiological measures (e.g., weight loss, blood pressure) and no intentions or change in food choice.
Study population	The study population consists of free-living adults, ages >18 years, including university-based studies.	The study participants are receiving substantial inpatient care (e.g., undergoing treatment), are institutionalized (e.g., severely ill patient groups who are not representative of the general population), or are part of a lab-based animal study.
Study design	The study design includes original controlled or randomized controlled trials, cross-sectional studies comparing two different cohorts, quasi-experiments, or pretest and posttest studies that compare a minimum of two groups (i.e., control and intervention, retrospective or prospective control).	The study does not include an intervention or change (natural or man-made); is a qualitative study, review, or meta-analysis; or is a protocol or methods-only paper. Only include process evaluations in addition to the main randomized controlled trial that they describe.
Date	The study was published on or after November 2018 and before March 2023.	

Source: Authors.

BOX A-1 | Example of the Scopus database search string for publications after November 2018

(canteen OR cafe OR cafeteria OR restaurant OR supermarket OR retail OR takeout OR "take away" OR shop OR store OR "food service" OR "food provider" OR meal OR menu OR online OR deliver*)

AND

(RCT OR "randomized controlled trial" OR "randomised controlled trial" OR "controlled trial" OR "quasi experiment*" OR "pre test post test" OR "retrospective controlled group" OR "prospective controlled study" OR "cohort study" OR "case controlled study" OR "cross sectional study" OR experiment OR interven* OR pilot)

AND

(behaviour OR behavior OR eat* OR consumption OR purchase OR sales OR diet OR food OR consume OR motivation OR intention OR attitude OR choice OR intake OR select* OR buy OR reduce OR choose OR order)

AND

(fruit OR vegetable OR "plant based" OR "plant forward" OR meat OR dairy OR legumes OR grains OR vegetarian OR vegan OR flexitarian OR "alt* protein" OR "alt* meat" OR beef OR "plant rich" OR "sustainable diet" OR "sustainable food")

reasons if all other criteria were also met. Only original research that compared two or more groups—either between-group (e.g., intervention versus control) or within-group (e.g., pretest versus posttest) comparisons—was included in this update.

Scoping literature review search results

Figure A-1 summarizes the results of our updated search strategy and the process by which we removed ineligible studies based on the aims of the review. In total, we located 18,217 new and potentially eligible publications, to which a further 49 were added from a forward reference search of reviews (e.g., handsearching reference lists to identify potentially eligible primary studies) and via ad hoc additions to the list. The authors, all WRI researchers, systematically screened the titles and abstracts of these publications against the eligibility criteria. After removing ineligible publications, 386 papers were considered potentially eligible and were taken forward to a full-text review (see Figure A-1).

Of this shortlist, a further 199 papers were subsequently deemed ineligible once the full texts had been considered, leaving a final total of 261 new papers that were taken forward to create the playbook 2.0. Of these new papers, 187 were from the updated search, and 74 were from the 2020 playbook. Because some of the included papers presented findings from multiple trials within a single publication, our final sample of 261 papers yielded data from a total of 346 individual trials.

Figure A-2 shows the publication year of all 346 trials included in the playbook 2.0, displaying a steep increase in the amount of relevant academic research published since the 2020 playbook was launched in early 2020 (Attwood et al. 2020).

The 346 trials included in this playbook 2.0 were set in 28 different countries (see Figure A-3). Of these, the vast majority originated from North America (41 percent, 141 trials) and Europe (52 percent, 179 trials).

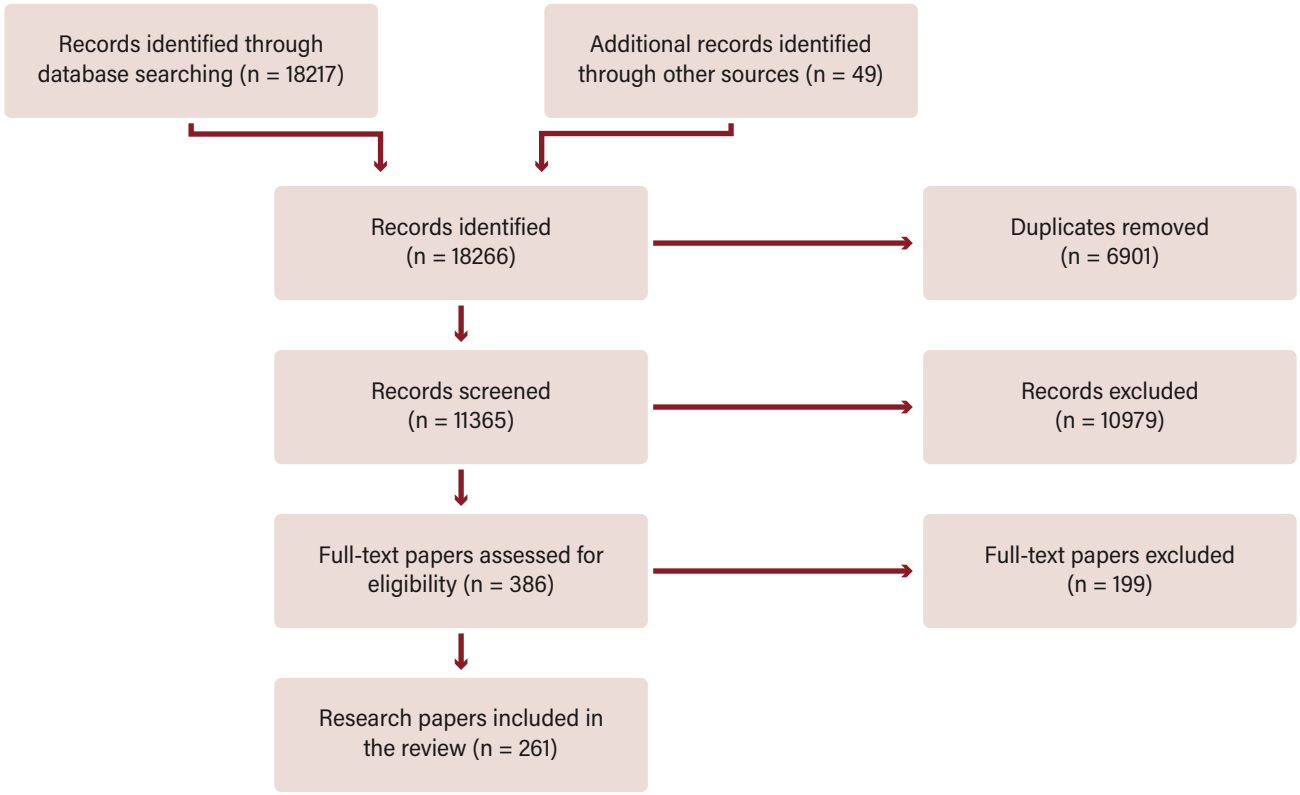
CODING AND CLUSTERING INTERVENTIONS

Data extraction and technique coding

We performed data extraction on the newly identified 346 trials. This entailed developing a coding scheme to classify each behavioral intervention described in the new literature according to our 2020 playbook list of 57 interventions (organized into a 5P framework of approaches that target Product, Placement, Presentation, Promotion, and People). Where a newly identified trial contained a behavior change technique that could not be classified under the original list, we pasted the full details of all the activities that authors reported into a new column in our data extraction file for subsequent coding and clustering.

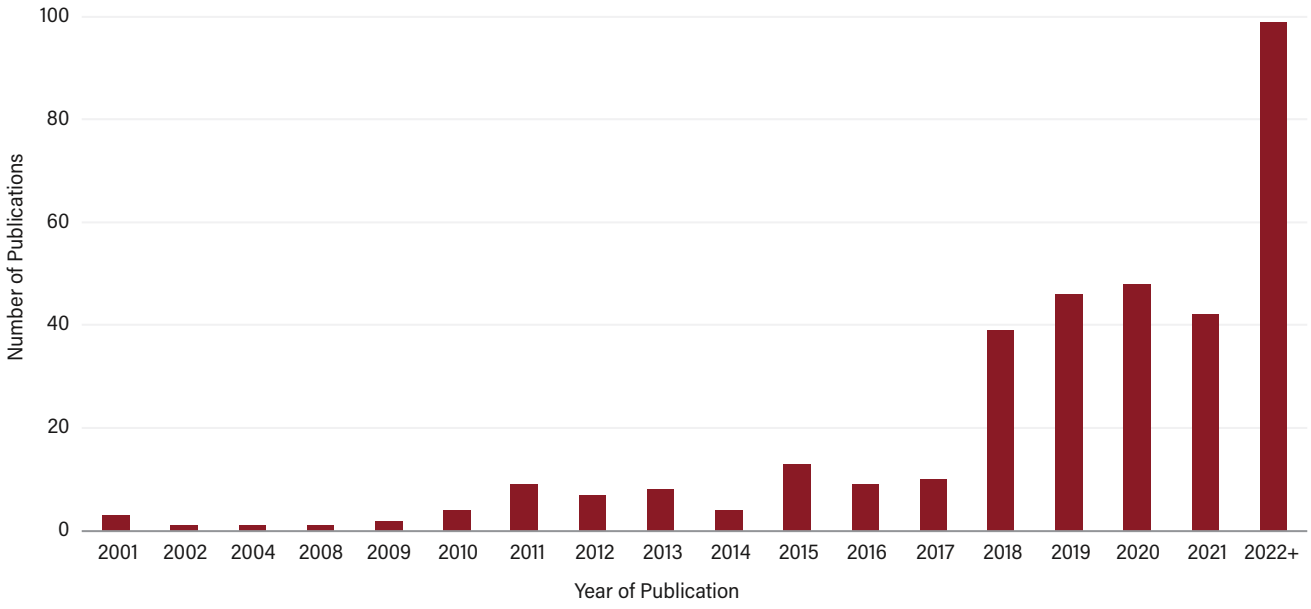
In addition to coding the presence of different behavior change techniques, we also coded information on other key elements during data extraction—such as trial location, abstract summary, study design, and sample size—to enable us to better characterize the evidence base. Data extraction was conducted by the three authors, each coding a subset of the included trials, and with 20 percent of data extractions cross-checked by two authors. Where discrepancies in coding were identified, consensus was reached with the third author via group discussion.

FIGURE A-1 | Scoping literature review search results and exclusions



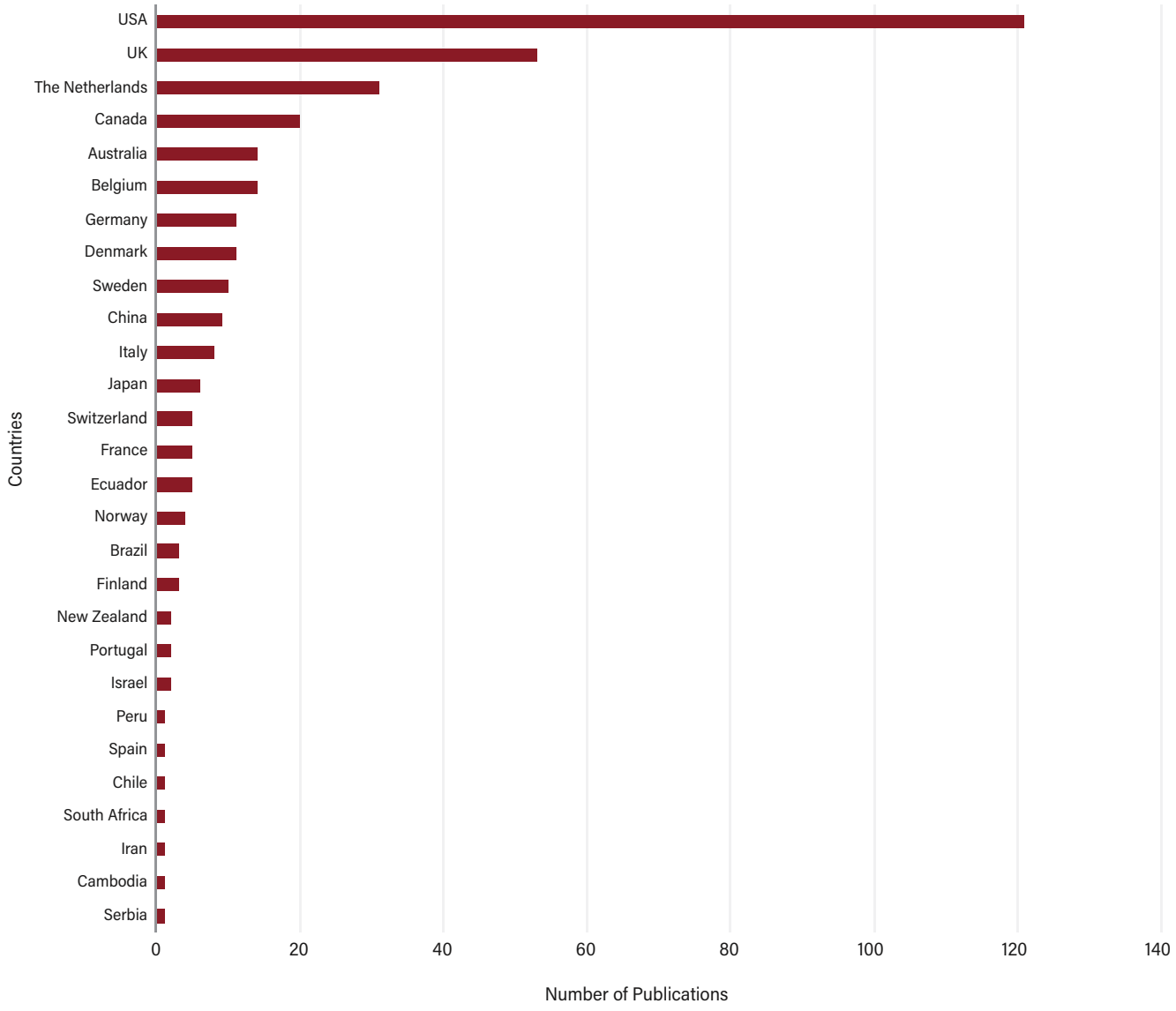
Source: Authors.

FIGURE A-2 | Year of publication of the 346 trials included in the playbook 2.0



Source: Authors.

FIGURE A-3 | Location of the 346 trials included in the playbook 2.0



Source: Authors.

Updated technique coding and new framework development

Once all eligible trials were coded, we jointly reviewed the column of pasted text that described newly identified interventions that could not be categorized in the existing framework. During a group workshop, we clustered these new techniques according to similarities in their putative mechanism of effect, assigned an overarching title to the cluster, and then jointly categorized them under the existing 5P framework.

In running this task, we realized that the Promotion category had become unwieldy in length and that a distinct subset of approaches involving price modification had emerged. Hence, we decided to split this cluster of distinct techniques into a new Price category, forming a new 6P framework (Product, Presentation, People, Promotion, Price, and Placement). We also chose to review the categorization of existing techniques under this new framework and modified the classification of a few techniques into different 6P categories where we jointly felt that this created a more intuitive structure.

Technique effectiveness coding

For each of the 346 eligible trials included in the playbook 2.0, we next embarked on an exercise to rate whether the behavior change interventions reported in each could be considered effective at promoting plant-rich food choices in food service settings.

To do this, we reviewed each intervention and coded the parent trial as either "effective +" or "ineffective –" according to the list of criteria outlined in Box A-2. Because the goal of the playbook 2.0 was to compile a "complete list" of behavior change techniques to inspire food service providers to engage in the sustainable diets movement and further explore techniques that may work for them, we chose a lenient, or inclusive, interpretation of effectiveness within these criteria, as is shown. This decision is on the presumption that food service providers will subsequently test their chosen techniques to determine actual effectiveness.

BOX A-2 | Criteria for judging the effectiveness of behavior change interventions in the eligible literature

- Does the research show a significant main effect of the intervention in reducing animal-based food choices (or proxy measures thereof) and/or increasing plant-based choices? If yes, intervention is coded as effective +.
  - (Non-)Significance of main effect is prioritized over (non-)significance of interaction effects or secondary/exploratory/subgroup analyses when both are reported.
  - If there are various and mixed significant/nonsignificant results for multiple outcomes, we prioritize change in actual behavior (e.g., sales, food selection, or consumption) over changes in social cognitive measures, such as attitudes, perceptions, and intentions.
  - We excluded studies that only report anthropometric measures in response to interventions (e.g., weight, blood pressure) because we are interested in behavior change. However, in studies that report anthropometric and behavioral/social cognitive measures, we selectively report the latter.
- If there are various and mixed significant/nonsignificant results, we prioritize judging overall effectiveness of an intervention based on relevance to the goals of our research and considering how insights from our playbook will be used in practice by food service:
  - We prioritize outcomes that relate to reducing animal-based food choices (specifically meat) and/or increasing plant-based food choices. Several studies look at multiple outcome measures (i.e., change in different elements of the diet). Here, we selectively judge change for the most relevant food type.
  - Where composite meals are reported as outcomes (e.g., pizza), we determine these as plant-based if they would be suitable for someone who adheres to a lacto-ovo vegetarian diet.
- In studies with multiple end points, a behavior change intervention is considered effective if results are significant and positive at any time (i.e., immediately postintervention or at short-, medium-, or long-term follow-up).
- If only marginally significant effects are present ($p = 0.051$ or $p = 0.06$), yet they are headed in the right direction, we deem the intervention effective.
- Where unadjusted and adjusted analyses show different outcomes, we prioritize findings from the unadjusted analyses because this better represents the true effect that would emerge in real-world environments.
- For a multicomponent study, if the authors looked at the individual impact of each component separately and found that some components led to significant change but others did not, we independently coded the effectiveness of each technique.

IDENTIFYING PRIORITY BEHAVIOR CHANGE TECHNIQUES

Industry consultation

Following data coding and creation of the updated 6P framework, we engaged in a process of prioritizing the complete list of behavior change techniques. We identified a priority shortlist of techniques to actively endorse and encourage food service stakeholders to adopt and scale these approaches within their operations.

For the playbook 2.0, we combined two data sources to identify this priority list: the first source consisted of the results from an expert consultation survey, and the second source involved the computed promise ratio for each behavior change technique, according to the research evidence. This builds on the approach we used in the 2020 playbook by incorporating evidence into expert rankings of techniques and is our response to feedback and recommendations on how to improve the playbook, which we received following the original publication.

For the expert consultation, we first created an online survey (via the platform Survey Monkey) and publicized this to a large sample of food industry representatives and academic experts in the fields of behavioral science, food systems, and nutrition via WRI's social media assets and through the networks of the WRI Food Program's industry partners.

We asked survey respondents to score the new long list of behavior change techniques that we identified in the scoping review according to two leading considerations: feasibility and impact. For each technique, participants were asked to reflect on a technique and to rate it according to whether they thought the technique would be effective at shifting the preferences of consumers away from meat and toward plant-rich options (the "impact criteria") and whether they thought the technique would be feasible to use in food service operations (the "feasibility criteria"). We did not explicitly probe the reasons for these judgments (i.e., breaking down if low feasibility scores are actually due to the perceived cost of the approach, poor consumer acceptability, staff incapabilities, etc.). Instead, we relied on the overall values to give a more global sense of how those working in food service view these techniques in the round.

The survey was distributed to Coolfood member representatives. Survey respondents were each randomized to receive a subset of 15 interventions on feasibility and 15 on impact from the complete list of 90 interventions to prevent response fatigue and dropout. Importantly, everyone ranked 15 different techniques on impact and 15 different techniques on feasibility, hence evaluating 30 unique techniques in total. Each question was answered according to a seven-point sliding scale ranging from "not at all" to "very" on feasibility and "very poorly" to "very well" on effectiveness. Forty-nine member representatives completed the survey, with each intervention ranked 7–11 times (8 times on average).

Details of survey respondents are presented in Figures A-4 and A-5. We received responses from individuals based in more than seven countries, with the majority (61 percent) based in the United States. These individuals worked in organizations spanning seven sectors, with responses most commonly received from experts working in academic settings (29 percent).

Calculating the promise ratio

To use the research evidence to create a priority shortlist of behavior change techniques, we chose to leverage an approach developed by Martin and colleagues (2013), and later revised by Gardner and colleagues (2016), known as the promise ratio. Here, we draw on our prior effectiveness scoring to code each of the behavior change techniques within our 6P framework into one of two categories: promising and nonpromising, based on the ratio of the number of times a specific behavior change technique was considered effective, divided by the number of times the same technique was coded as ineffective.

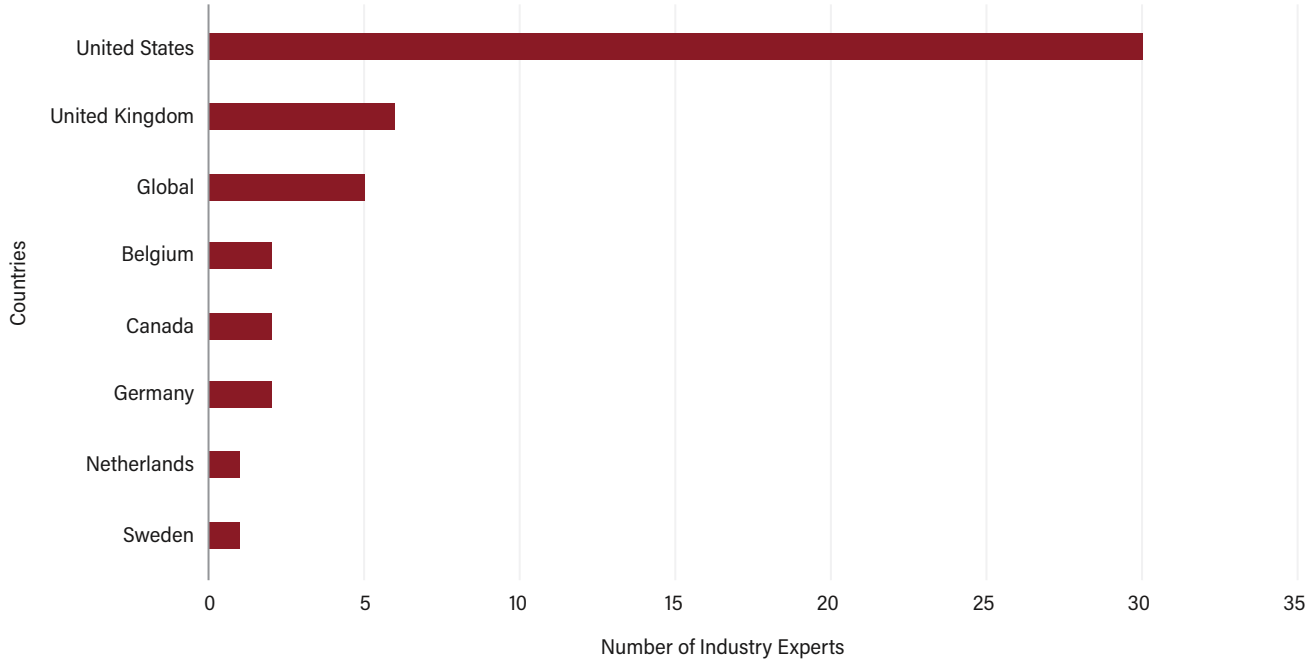
We considered a technique promising if it was classified as effective in at least twice as many promising as nonpromising interventions (i.e., promise ratio ≥ 2.00). To calculate the promise ratio, a behavior change technique had to be present in at least two studies, otherwise we chose not to compute a ratio to avoid overinterpretation of the evidence based on insufficient data. Finally, if a technique only appeared in effective interventions, the number of interventions in which it was used was reported instead of the ratio (otherwise the ratio would involve dividing the effective approaches by an ineffective value of 0, leaving a total value of 0).

Shortlisting and visualizing priority techniques

To identify our list of priority techniques, we combined data from the expert consultation and promise ratio, highlighting the behavior change techniques that ranked highly on both scoring systems simultaneously. We present this insight in Figure 3.

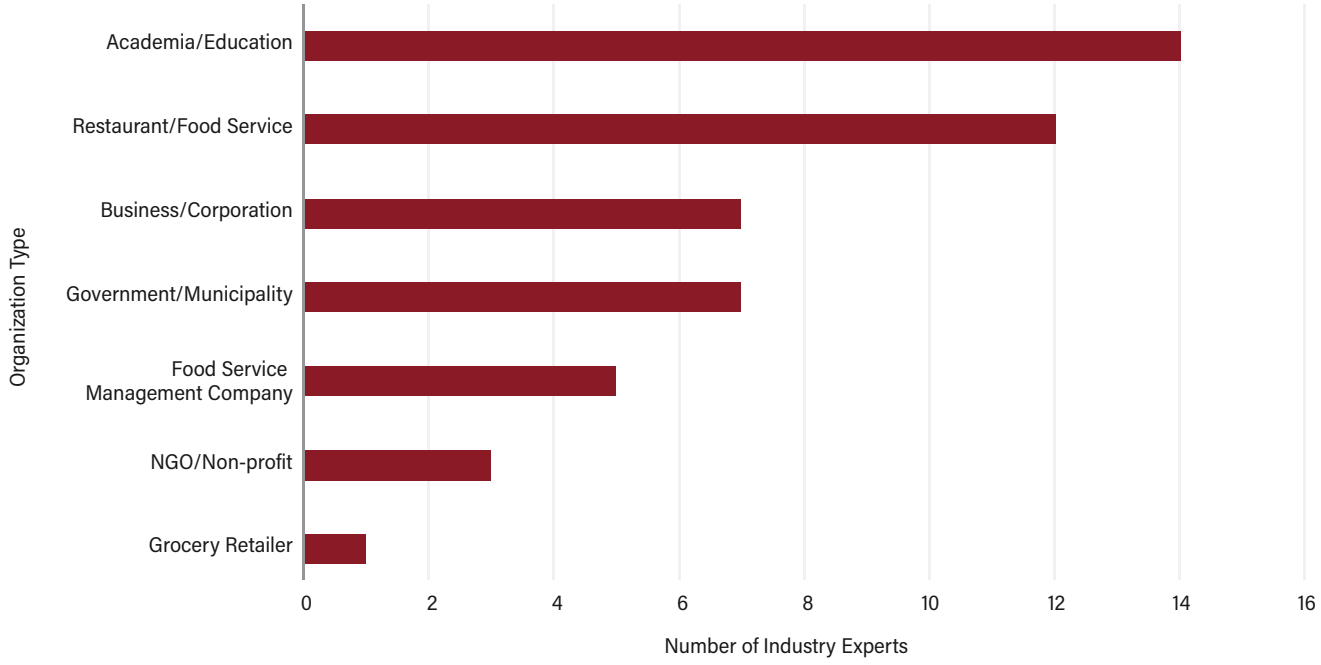
Figure 3 plots the full spectrum of behavior change techniques that we examined according to scores from both the experts and the research evidence and divides the graphic area into four quadrants. Each data point in the figure represents

FIGURE A-4 | Number of expert stakeholders consulted by country



Source: Authors.

FIGURE A-5 | Number of expert stakeholders consulted by organization type



Note: NGO = nongovernmental organization.

Source: Authors.

a behavior change technique, identifiable by its assigned reference code (e.g., PRD1, PLC1, etc.), which can be used to cross-reference to the full description of each intervention available in Table 1.

The y-axis of this figure plots each technique's combined score from the two items in the expert survey (i.e., the sum of impact and feasibility scores). The x-axis of this figure plots promise ratio scores for each technique. To create the four quadrants, we divide scattered scores by crossing the y-axis (expert consultation scores) according to the top tertile cut-off value (10.43) and by crossing the x-axis (promise ratio scores) at the value of 2.00 (the ratio value representing promising techniques).

STRENGTHS AND LIMITATIONS OF OUR METHODS

In creating the playbook 2.0, our intention was to address feedback from end users of the 2020 playbook. One of the leading comments we received from readers of the original publication was that our approach to shortlisting priority techniques was based exclusively on expert feedback and did not incorporate an objective indication of the strength of the research evidence. For this reason, we now calculate promise ratios for all techniques. To derive these ratios, we independently coded the research literature for effectiveness, with a subset cross-checked between all three authors (all doctoral-level analysts) to ensure rigor. Our new updated shortlist of 18 priority techniques therefore incorporates both an objective indication of the research evidence in support of each technique as well as a more subjective expert rating of what is feasible and effective to implement in food service settings. Combining these two approaches is a strength of this playbook 2.0 because it yields an indication of the quantity of evidence in favor of each of our identified behavior change techniques while also incorporating a more pragmatic judgment on the types of approaches that food service stakeholders are willing and able to introduce, in practice, into their operations.

However, we also recognize several limitations of our methods. Firstly, the industry sample surveyed for this update was relatively small, containing 49 individuals based in more than seven countries. However, although the views of our sample do not necessarily reflect the perspectives and experiences of all individuals working across a wide range of different types of food service outlets, we did have representation from a wide variety of food service organizations. Moreover, because we recruited through internal networks, we are confident in the quality of responses received.

Secondly, although our computed promise ratios add important information to our prioritization process, these values are themselves relatively crude and do not reflect all the nuance available in the current evidence base. For example, the promise ratios are based on simple counts of the number of times a specific technique appears in a study that was effective at changing consumer food choices (or intentions to change) versus ineffective. As such, they do not capture the size of the effect, nor do they reflect the risk of bias associated with each of our included research studies. We recommend that future research address these two areas, potentially building a new composite score that reflects not only the ratio of supportive evidence but also the magnitude of effect and the likelihood that the outcome value can be trusted, based on the quality of the evidence.

Thirdly, we additionally note that the threshold values that we used as our shortlisting criteria are somewhat arbitrary. We chose to identify our priority techniques based on the top third of expert ratings and on promise ratio values above 2.00. Although the latter is based on an externally reported standard in the literature (Martin et al. 2013), our choice to focus on the top tertile of expert ratings was purely pragmatic: it allowed us to construct a shortlist of techniques that was a manageable length to communicate with clarity to our food service audience. We do, therefore, recommend that all parties interested in implementing behavior change techniques in their operations review all details of scores listed in Table 1.

Lastly, we acknowledge that the promise ratio scores calculated in this playbook 2.0 reflect the pool of literature located via our library search using our inclusion criteria as a boundary. Although we performed a systematic search across a range of academic databases, we are aware that we may have missed some potentially eligible research, particularly non-English-language studies. We also recognize that the available literature is subject to publication bias, meaning studies without significant findings are less likely to have been published in the first place. Identification and inclusion of additional research studies has the potential to alter our promise ratio values.

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OUR CHALLENGE

Natural resources are at the foundation of economic opportunity and human well-being. But today, we are depleting Earth's resources at rates that are not sustainable, endangering economies and people's lives. People depend on clean water, fertile land, healthy forests, and a stable climate. Livable cities and clean energy are essential for a sustainable planet. We must address these urgent, global challenges this decade.

OUR VISION

We envision an equitable and prosperous planet driven by the wise management of natural resources. We aspire to create a world where the actions of government, business, and communities combine to eliminate poverty and sustain the natural environment for all people.

OUR APPROACH

Count it

We start with data. We conduct independent research and draw on the latest technology to develop new insights and recommendations. Our rigorous analysis identifies risks, unveils opportunities, and informs smart strategies. We focus our efforts on influential and emerging economies where the future of sustainability will be determined.

Change it

We use our research to influence government policies, business strategies, and civil society action. We test projects with communities, companies, and government agencies to build a strong evidence base. Then, we work with partners to deliver change on the ground that alleviates poverty and strengthens society. We hold ourselves accountable to ensure our outcomes will be bold and enduring.

Scale it

We don't think small. Once tested, we work with partners to adopt and expand our efforts regionally and globally. We engage with decision-makers to carry out our ideas and elevate our impact. We measure success through government and business actions that improve people's lives and sustain a healthy environment.

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