NECTAR | September 2024

# Future of the Industry 2024 – Plant-Rich Meat

## A Sensory Analysis of Plant + Meat Blends

> Categorical Insights > Consumer Satisfaction
> Competitive Insights > R&D Opportunities

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# Foreword – Meet Better Meat

The amount of meat we consume is increasingly impacting the future of our planet. Industrial animal agriculture poses a significant threat to public health and the environment. Many people are looking to make a change in their diet, yet finding a clear path forward has been challenging. While alternative proteins have the potential to transform the market, they are in their early days and have yet to fully win over consumers and achieve widespread adoption. Despite the ongoing innovation and growth in this field, our reliance on conventional meat requires a more urgent response.

Enter **plant-rich meats***: *products that blend conventional animal protein with a significant proportion of plant-based ingredients, delivering improved nutrition and a reduced environmental impact while preserving—or even enhancing—the taste of conventional meat.* Unlike past attempts by the conventional meat industry to cut costs with fillers and extenders, plant-rich meats use meaningful amounts of plant-based ingredients transparently to provide added nutritional, environmental, and taste benefits.

This hybrid approach could attract a broad range of consumers—those who enjoy conventional meat but are also seeking healthier and more sustainable alternatives. Similar to how hybrid cars act as a transitional technology towards fully electric vehicles, plant-rich meats offer a practical, immediate solution that delivers environmental benefits today while setting the stage for broader dietary and industrial changes tomorrow.

The potential of plant-rich meats is becoming evident. NECTAR's ***Future of the Industry 2024: Plant-Rich Meat*** report reveals that, in several key categories, plant-rich meats outperform their 100% animal counterparts on taste—a primary driver of purchasing decisions. By delivering on taste while offering strong nutritional benefits, plant-rich meats are well-positioned to gain the trust of omnivorous consumers who are hesitant about fully plant-based options.

The mainstreaming of flexitarian diets demonstrates the plant-rich category's potential, however the path to impact is not guaranteed. With careful category-level stewardship and thoughtful product and category design principles, plant-rich meats can be an incorruptible solution that meets people where they're at today while opening the door to where we need to go tomorrow.

To support this journey, the alternative protein industry needs platforms like NECTAR. Focused on taste, this report provides a detailed overview of the plant-rich meat sector, highlighting opportunities, challenges, and future directions. We hope it sparks action and innovation among industry professionals and stakeholders, contributing to the growth of a category that promises a better future for us all.

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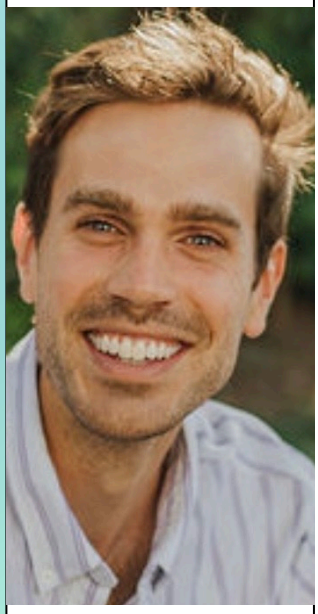

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*As with many emerging food categories, the language used to describe these products may evolve as more producers and products enter the market and more consumer feedback is gathered. Although this report uses the term "plant-rich meat," further research and industry alignment are required for nomenclature to be finalized.

# Survey Overview

## Current Context

In June 2024, NECTAR released its inaugural *Taste of the Industry* report, the largest publicly available sensory analysis of plant-based meats. This report found that a plant-rich burger outperformed the leading plant-based burger in taste, highlighting the significant potential of plant-rich products and indicating a need for further research. ***Future of the Industry: Plant-Rich Meat*** builds on this previous analysis by exploring the sensory attributes of this emerging category.

Recent data from The Good Food Institute (GFI) and the Plant-Based Food Association (PBFA) show a 19% decline in unit sales of plant-based meat and seafood in 2023.[1] As plant-based products face adoption challenges largely driven by mis- and dis-information about their healthfulness, companies worldwide—ranging from startups to major corporations—are moving beyond the binary by introducing products that blend plant-based and animal-based ingredients.

For example, Nestlé, the world's largest food company, recently launched Maggi Rindecarne in Chile, a plant-based meat product designed to be mixed with conventional beef; Quorn is blending its mycoprotein with animal meat to create new foodservice products for hospitals in the U.K.; and 50/50 Foods introduced their plant-rich 'BOTH Burger' at Disneyland in early 2024. This growing range of plant-rich products, combined with the pressing need to reduce global meat consumption, has led NECTAR to delve deeper into how these products perform with omnivore consumers.

## Our Approach

In addition to its annual *Taste of the Industry* sensory analysis of plant-based meat, NECTAR plans to release smaller, intermittent reports on emerging alternative protein sectors with high-potential for impact. These *Future of the Industry* reports are sensory deep dives into nascent alternative protein categories and technologies across the global food value chain.

*Future of the Industry: Plant-Rich Meat* is the first report in this series. NECTAR conducted blind sensory panels to get an objective view of how plant-rich meat products taste today. Using plant-based and animal-based product benchmarking, the results of this survey provide a perspective into competitive positioning and R&D opportunities for this emerging category.

If you have any questions or would like to discuss potential future research areas for NECTAR, please contact caroline@nectar.org.

1. Good Food Institute. Key plant-based category sales metrics and purchase dynamics. 2023. https://gfi.org/marketresearch/

# Nomenclature

| | |
|---|---|
| Plant-rich* meats | Plant-rich meats refer to food products created by blending animal-based meat and plant-based ingredients. |
| Plant-rich* average | The averaged overall satisfaction across all plant-rich products tested for each product category. |
| Plant-rich* leader | The plant-rich product in each category that performed the highest in overall satisfaction. |
| Plant-based benchmark | The top-performing plant-based product in each category based on prior rounds of sensory testing (e.g., *Taste of the Industry 2024*). |
| Animal benchmark | The highest retail sales volume animal product in each category. |

*As with many emerging food categories, the language used to describe these products may evolve as more producers and products enter the market and more consumer feedback is gathered. Although this report uses the term "plant-rich meat," further research and industry alignment are required for nomenclature to be finalized.

# Study Design & Methodology

**Food System Innovations partnered with Palate Insights** to conduct authentic, quantitative and qualitative blind taste tests at Palate's restaurant partners in San Francisco between May 2024–July 2024.

## Testing Environment

Participants tried products at Palate's restaurant partners in San Francisco in order to achieve an authentic and natural experience.

## Preparation

All products were prepared using proper equipment and according to manufacturer instructions. Participants were allowed to add condiments to keep the eating experience natural but were required to apply them consistently across products.

## Tasting Experience

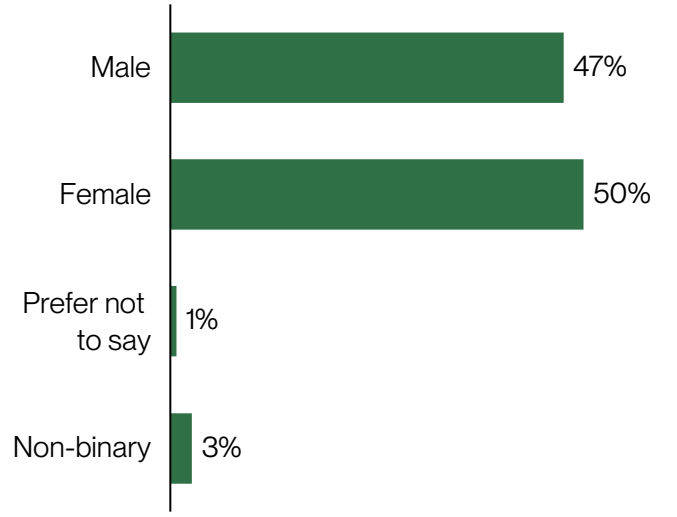
Participants were served conventional dishes based on the product. While they ate, participants filled out a mobile phone survey detailing their experience with each product in a randomized order.

# Study Population

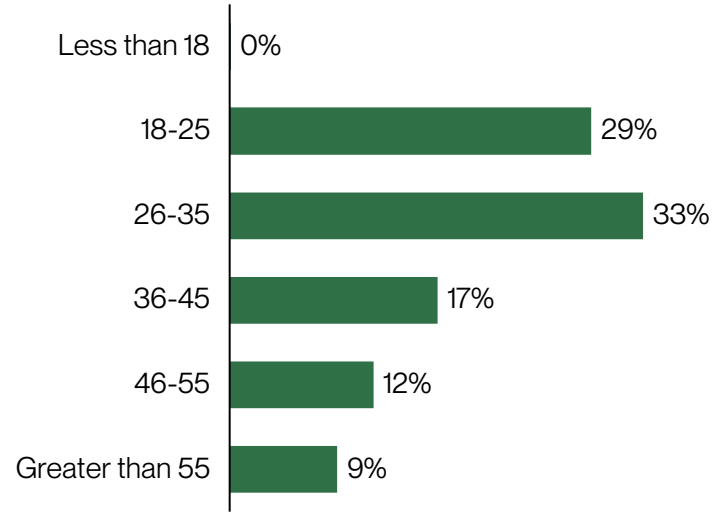
Demographic overview of a representative sample of 1,192 omnivores and flexitarians.

Participants were additionally screened to only **include those who eat the category being evaluated at least once every 1-2 months.**[1]

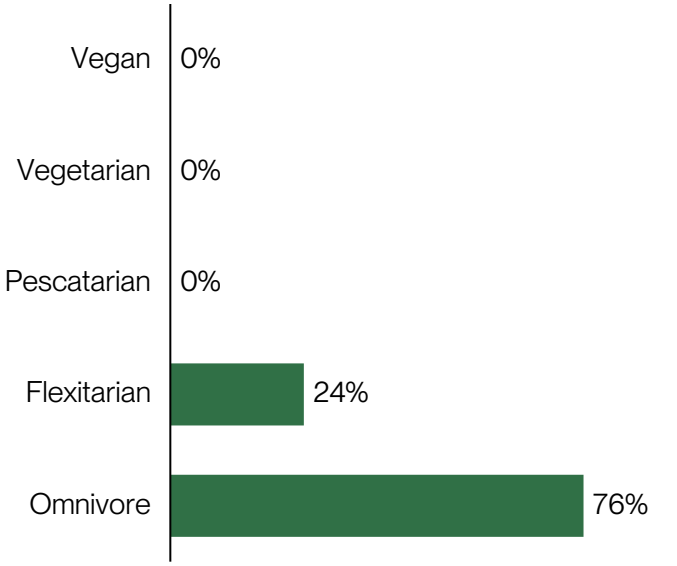
**Gender,** % of participants



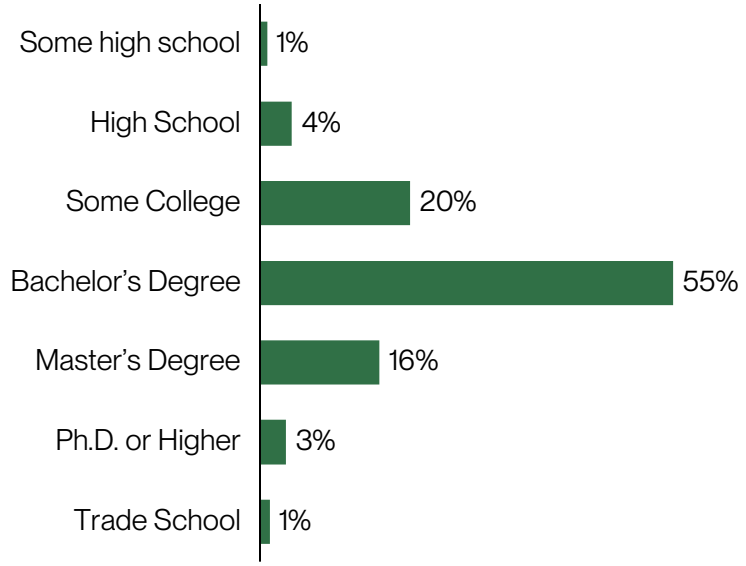

**Age,** % of participants




**Dietary preference,** % of participants




**Education,** % of participants




1. Percentages and figures based on 1,192 responses rather than unique participants to adequately represent study demographics.

# Products Tested

**Selection Criteria:**

**Animal benchmarks** were selected based on their retail volume with the goal of using brands representative of the 'typical' animal product.

**Plant-based benchmarks** were selected based on their scores on previous sensory testing with the goal of using 'leading' plant-based products.

| Category | Sample size | Animal benchmark | Plant-based benchmark | Plant-rich products tested |
|---|---|---|---|---|
| Burger | 305 | Safeway Signature SELECT 80/20 Frozen Beef | ✓ | 7 |
| Hot Dog | 97 | Ballpark 100% Beef Franks | ✓ | 1 |
| Steak | 100 | Safeway Signature SELECT | ✓ | 1 |
| Pork Sausage | 100 | Johnsonville Original Brats | ✓ | 2 |
| Beef/Pork Meatball | 199 | Cooked Perfect Italian Style Meatballs | ✓ | 3 |
| Chicken Sausage | 101 | Aidell's Chicken Apple Sausage | | 2 |
| Chicken Meatball | 98 | Amylu Italian Style Meatballs | ✓ | 2 |
| Chicken Nugget | 99 | Tyson | ✓ | 2 |
| Unbreaded Chicken Patty | 104 | Tyson | ✓ | 1 |

# Top Performing Brands

There was a **high bar** to be awarded as top-performing brand. Brands needed to achieve all of the following:

- Rating of above 'like somewhat' (at least 5pts out of 7pts)
- Rating within 0.5pts of the animal product
- Better than the average plant-rich product in its category
- Better than the plant-based benchmark

Brands are sorted alphabetically from left to right.

| | |
|---|---|
| **Burger** | BOTH™, fable, DUO, TETON WATERS RANCH |
| **Beef/Pork Meatball** | TETON WATERS RANCH |
| **Chicken Meatball** | kidfresh |
| **Chicken Nugget** | kidfresh |
| **Unbreaded Chicken Patty** | Grateful Eats |

# Key Stakeholders

## Food System Innovations

Food System Innovations (FSI) is a philanthropic impact platform that funds and creates efforts to accelerate the protein transition towards a more humane and sustainable food system.

NECTAR is a programmatic initiative of FSI on a mission to accelerate the protein transition with taste.

## Palate Insights

Palate Insights is a product feedback platform pioneering authentic, affordable, and agile tools exclusively for the sustainable food industry.

Palate helps companies get consumer feedback through pop-up events with their restaurant and grocer partners and chef feedback through their panel of 150+ Executive Chefs.

# Executive Summary

## Recommendations and Insights for Plant-Rich Meats

### Concept Perception

Plant-rich meats have a clear space in the market.

- **Plant-rich meats are conceptually more appealing than plant-based but behind animal** – higher purchase intent than plant-based but lower than animal.'
- **Plant-rich meats more likely to attract omnivores** – omnivores much more likely to purchase a plant-rich product than plant-based.
- **Greatest interest for historically blended product formats** – meatballs and sausages were the top-rated formats conceptually.
- **50:50 ratio of meat with mushrooms or savory vegetables most desired** – meat-forward ratio and familiar ingredients scored higher.

### Consumer Satisfaction

Most plant-rich products should prioritize improving liking to replicate early wins elsewhere in category.

- **Products are generally 'somewhat' liked** – mean liking between 4.5pts and 5.5pts for 8/9 categories.
- **Wide range in liking across categories** – top categories rated 'like very much' or 'like' 1.5-2x more often than bottom-performing categories.
- **Leader products emerging** – top-performing products separated themselves from the crowd in burgers, beef/pork meatballs, and chicken meatballs and were 'disliked' 2-3x less often.

### Competitive Positioning

Despite early promise, products are performing comparably to plant-based and behind animal products.

- **Early wins in burger and chicken nuggets** – these plant-rich leaders outperformed the animal while the plant-rich average was at parity ($p<.05$).
- **Most products require more R&D to surpass animal in liking** – animal products had 1.5x–2x more promoters than the plant-rich average in hot dogs, steak, pork sausages, chicken meatballs, and beef/pork meatballs.
- **Leading plant-rich products generally surpass plant-based but average products should focus on R&D** – plant-rich average only outperformed the plant-based product in 4/8 categories while the leader outperformed in 6/8 categories.

### GTM Strategy and Proofpoints

Focus on health and use food service to drive trial for initial launch while prioritizing price and taste long term.

- **Target price parity with animal meat** – just 24% willing to pay a premium.
- **Focus on overcoming taste and affordability objections** – 43-45% selected 'not tasty' or 'not affordable' as barriers while just 23-26% selected them as drivers.
- **Win over early adopters with focus on health** – it was recognized as top benefit for the category and is a key decision criteria for a meaningful set of consumers.
- **Food service can be used to drive trial** – 55% more likely to try in a restaurant.
- **Plant-rich meats can differentiate restaurants and retailers** – 90% rated as unique and 67-71% more likely to return to or recommend a restaurant/retailer.

### R&D Opportunities

Plant-rich brands should focus on R&D before investing heavily in launches.

- **Improvement is feasible** – emergence of plant-rich leaders highlights the potential for plant-rich products to surpass animal products and differentiate on liking.
- **Flavor was the top opportunity for plant-rich products** – most products should focus on mitigating 'weird aftertastes' and 'off-flavors' while boosting meat notes and fatty flavors to overcome blandness.
- **Texture is a key secondary focus** – opportunities varied by category, but the most common theme was increasing firmness and cohesiveness.

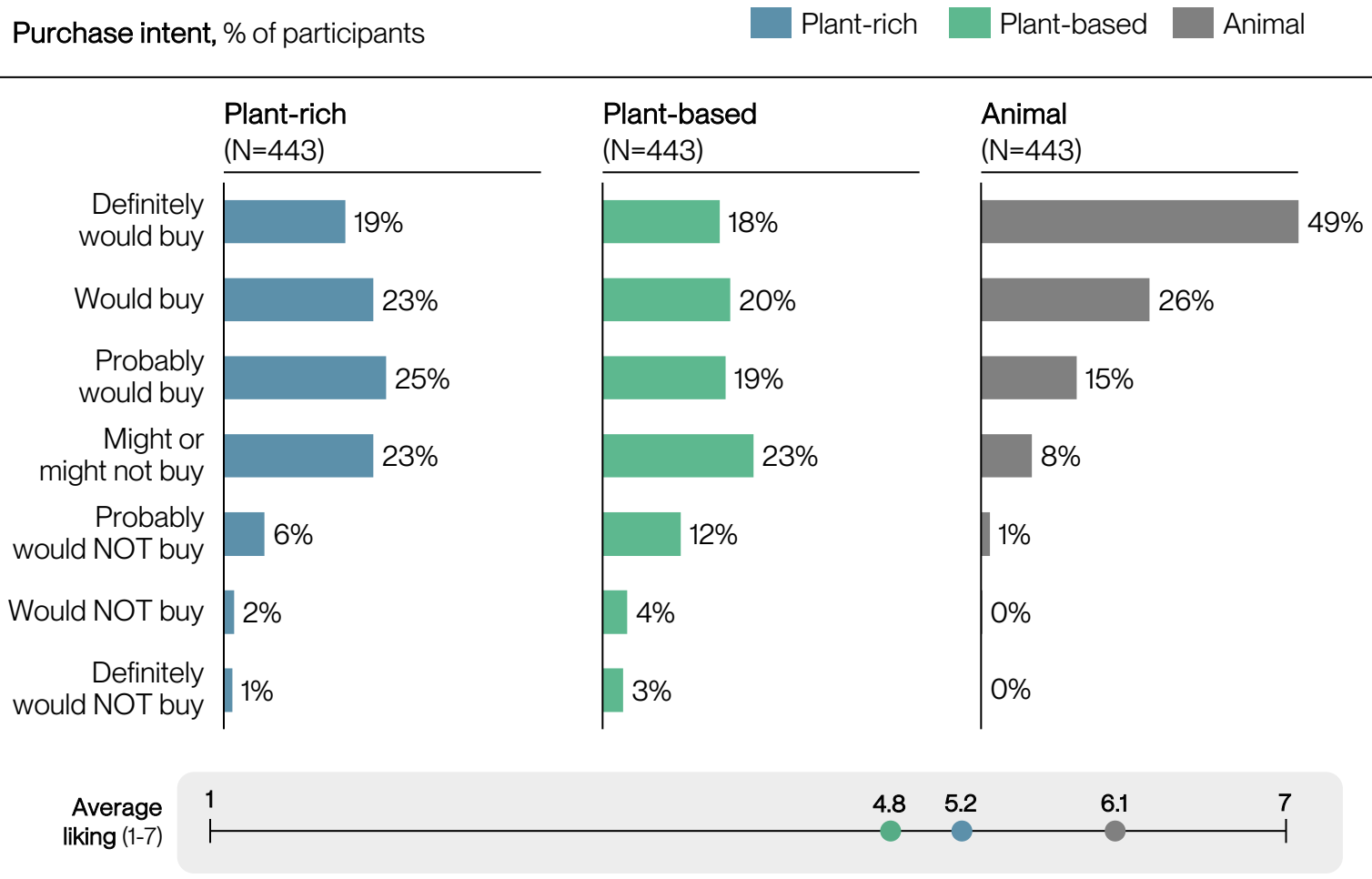
Cross Category Insights

# Concept Perception

# Purchase Intent

How likely would you be to PURCHASE a XXX product?

**Purchase intent,** % of participants




## Takeaways

### Plant-rich products have a place in the market, addressing consumer desires better than plant-based products

- Average purchase intent 5.2pts (versus 4.8pts for plant-based).

### Plant-rich products trail animal in purchase intent

- Only 42% 'would buy' or 'definitely would buy' plant-rich (versus 75% for animal).

# Target Demographics

## Broader appeal

Omnivores are significantly more likely to purchase a plant-rich product than a plant-based product. Purchase intent for plant-rich products are almost the same across omnivores and flexitarians.[1] This represents an opportunity for plant-rich products to appeal to a broader market.

**Mean purchase intent (1-7)** Lower Higher

| | Plant-based | Plant-rich |
|---|---|---|
| Omnivores | 4.7 | 5.1 |
| Flexitarians | 5.4 | 5.3 |

Lower Higher

| Mean purchase intent (1-7) | | Plant-rich | Plant-based |
|---|---|---|---|
| Age | 18-25 | 5.0 | 4.5 |
| | 26-35 | 5.3 | 4.9 |
| | 36-45 | 5.3 | 5.2 |
| | 46-55 | 5.2 | 5.2 |
| | 56+ | 4.7 | 4.8 |
| Gender | Male | 5.0 | 4.7 |
| | Female | 5.3 | 5.0 |
| Dietary Preference | Omnivore | 5.1 | 4.7 |
| | Flexitarian | 5.3 | 5.4 |
| Education | High school | 4.9 | 4.5 |
| | Some college | 5.1 | 4.7 |
| | Bachelor's | 5.2 | 4.9 |
| | Master's | 5.1 | 4.9 |
| | PH.D or higher | 5.3 | 5.2 |
| Plant-based meat consumption | 2-3 times a week or more | 5.7 | 5.8 |
| | Once a week | 5.3 | 5.4 |
| | 2-3 times a month | 5.2 | 5.2 |
| | Once every 1-2 months | 5.2 | 4.9 |
| | 4-5 times a year or less | 4.8 | 4.0 |

## Similar to plant-based consumer

The demographics with highest purchase intent for plant-rich products resemble those of plant-based products. Mainly leaning:

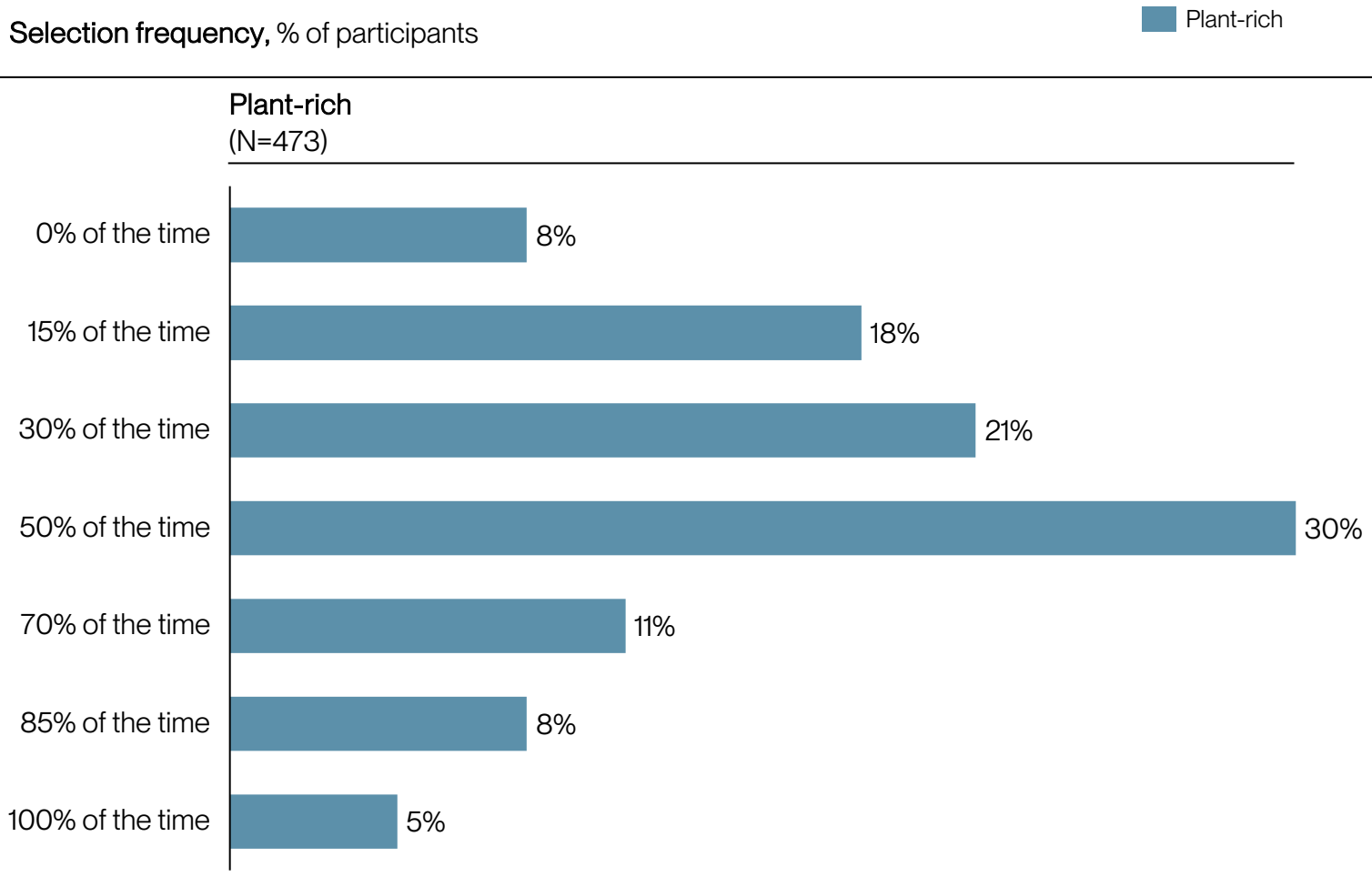
- Millennial and Gen X
- Female
- Flexitarian
- Higher education levels
- Frequent plant-based meat consumption

1. Omnivores are defined as regular meat eaters while flexitarians eat meat only occasionally.

# Selection Frequency Over Animal

How often would you choose plant-rich meat instead of a 100% animal-based product?[1]

**Selection frequency,** % of participants




## Takeaways

### Almost all consumers showed interest in incorporating plant-rich meat into their diets

- 92% consumers would choose a plant-rich meat at least 15% of the time.

### Consumers showed desire to incorporate plant-rich meat into their diets in meaningful proportions

- 54% of participants would choose plant-rich meat at least 50% of the time.

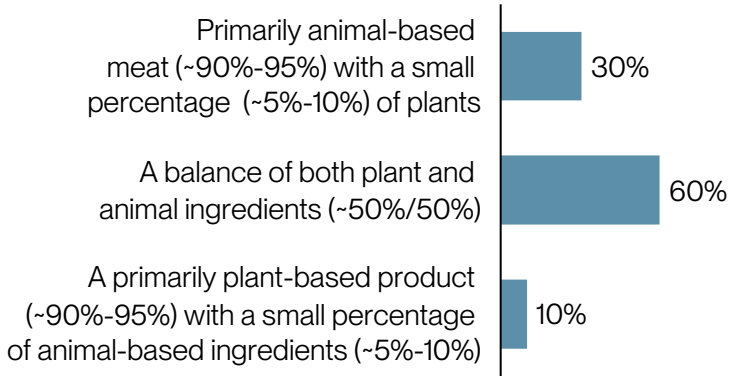
1. Original question phrasing used the term 'blended meat' instead of 'plant-rich meat.'

# Innovation

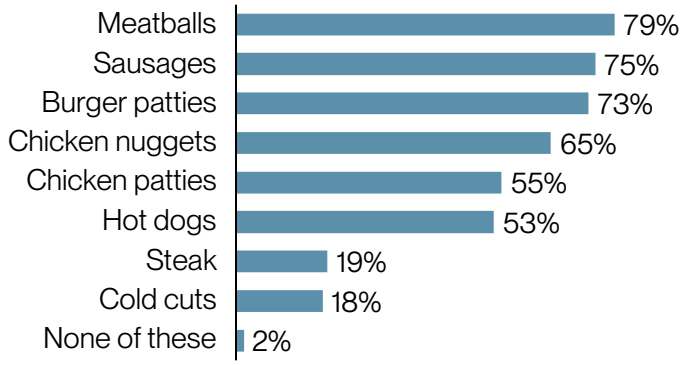
## Consumers prefer a balanced mix of plant and animal ingredients

- Most consumers said a 50/50% mix of plant and animal ingredients was most appealing.
- Just 10% wanted plant-rich products to be mostly plant-based.

What is the most appealing mix of animal-based product and plants in a plant-rich meat product?[1] (N=473)




Which of the following products would be appealing as plant-rich products?[1] (N=473)



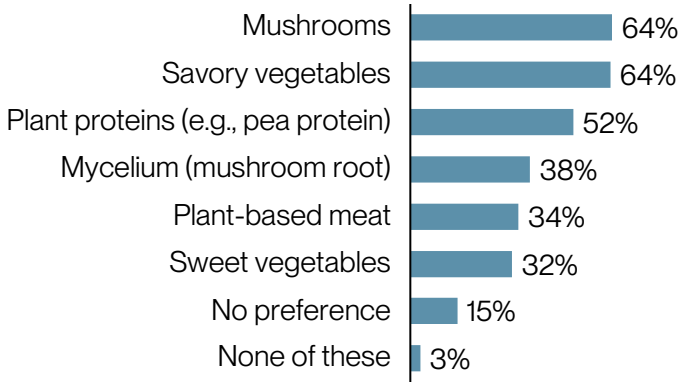

## Products which already involve mixing, shaping, or blending ingredients are more appealing as plant-rich products

- Items like meatballs, sausages, and burger patties, which are more physically processed from their original forms, are more appealing than steak and cold cuts, which are more directly cut from the animal.

## Participants want blends with familiar ingredients

- Traditional, savory ingredients like mushrooms and savory vegetables were the most appealing.
- Novel ingredients like plant-based meat and mycelium were less desirable.

What do you want the animal-based product to be blended with? (N=473)



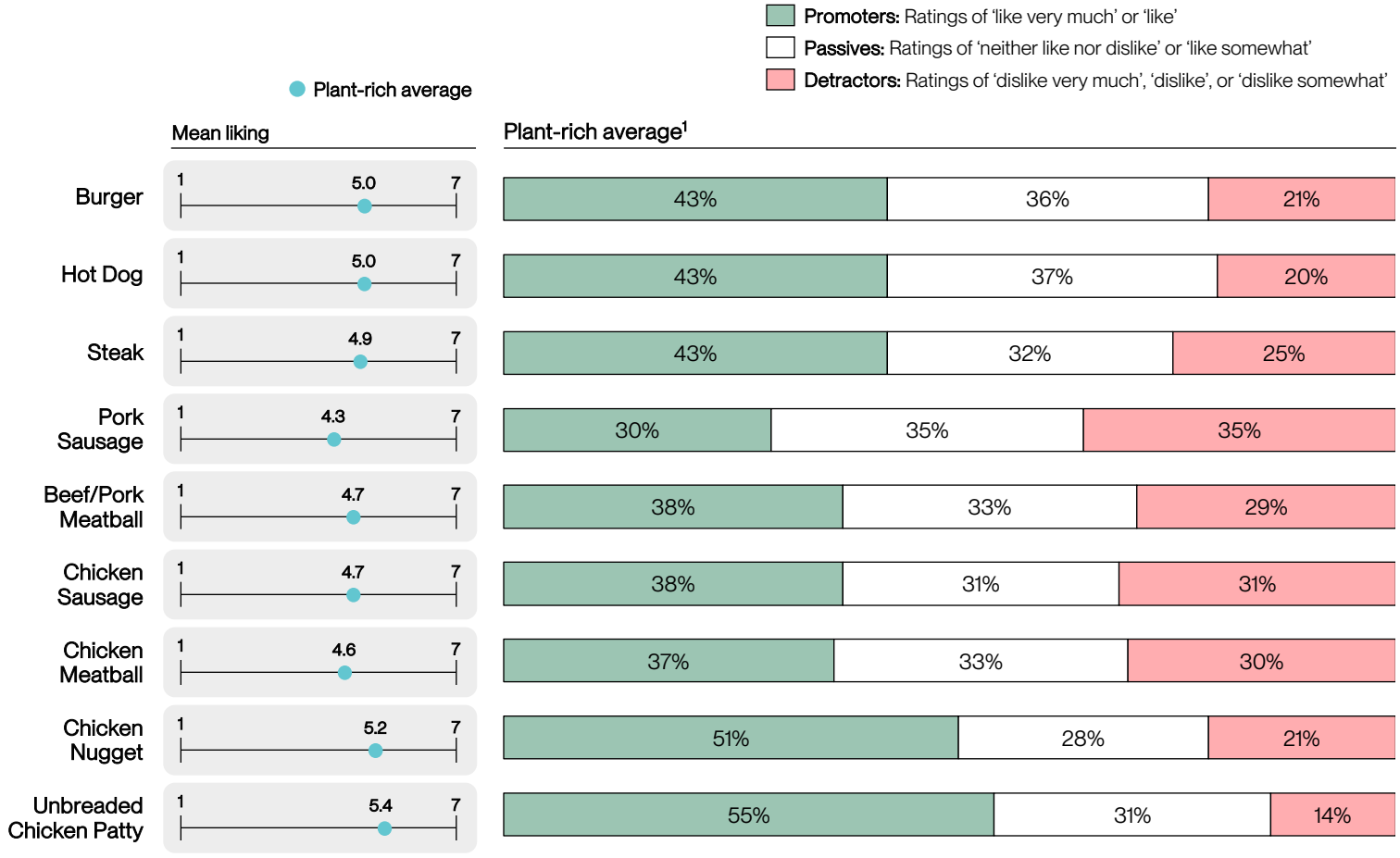

1. Original question phrasing used the term 'blended meat' instead of 'plant-rich meat.'

Cross Category Insights

# Consumer Satisfaction

# **Plant-rich average:** Overall Liking

How would you rate your OVERALL LIKING of XXX?




## Takeaways

### Opportunity to improve general liking across categories

- The plant-rich average was rated 'like somewhat' or less for all product categories.

### Unbreaded chicken patties and chicken nuggets had the highest share of promoters

- 51-55% were promoters of the plant-rich chicken nugget or unbreaded chicken patty.

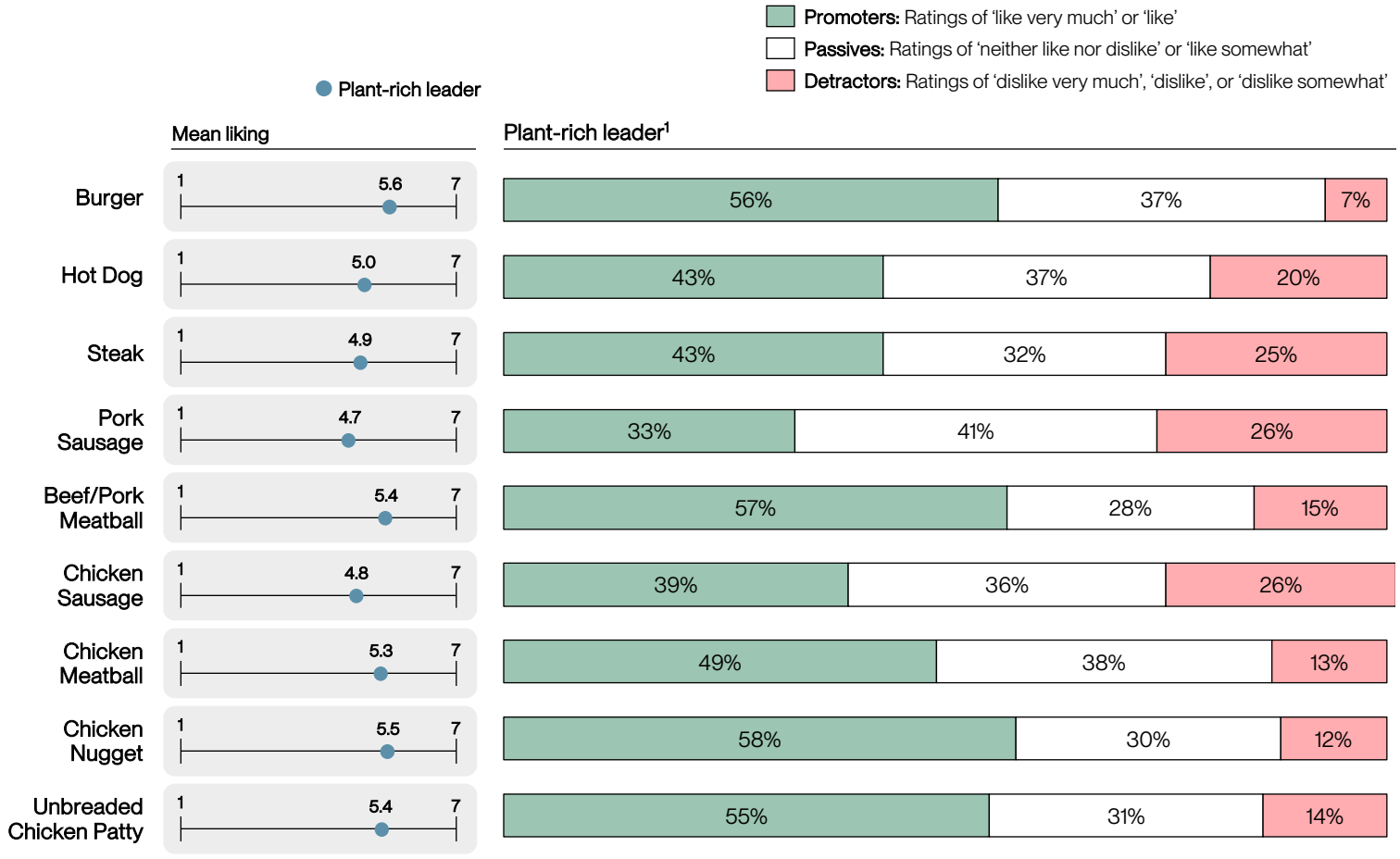
### Pork sausage struggled in overall liking

- Pork sausage had the lowest average liking at 4.3pts, and the lowest share of promoters.

1. Aggregated across all plant-rich products tested for each category. Product count by category; Burger (7), Hot Dog (1), Steak (1), Pork Sausage (2), Beef/Pork Meatball (4), Chicken Sausage (2), Chicken Meatball (2), Chicken Nugget (2), Unbreaded Chicken Patty (1).

# **Plant-rich leader:** Overall Liking

How would you rate your OVERALL LIKING of XXX?




## Takeaways

### The top plant-rich leaders were 'liked' by consumers

- The plant-rich leader in the burger and nuggets category achieved an average rating of 'like.'

### Opportunity to improve in sausages and hot dogs

- 20-26% were detractors of the leading hot dog, pork sausage, and chicken sausages.

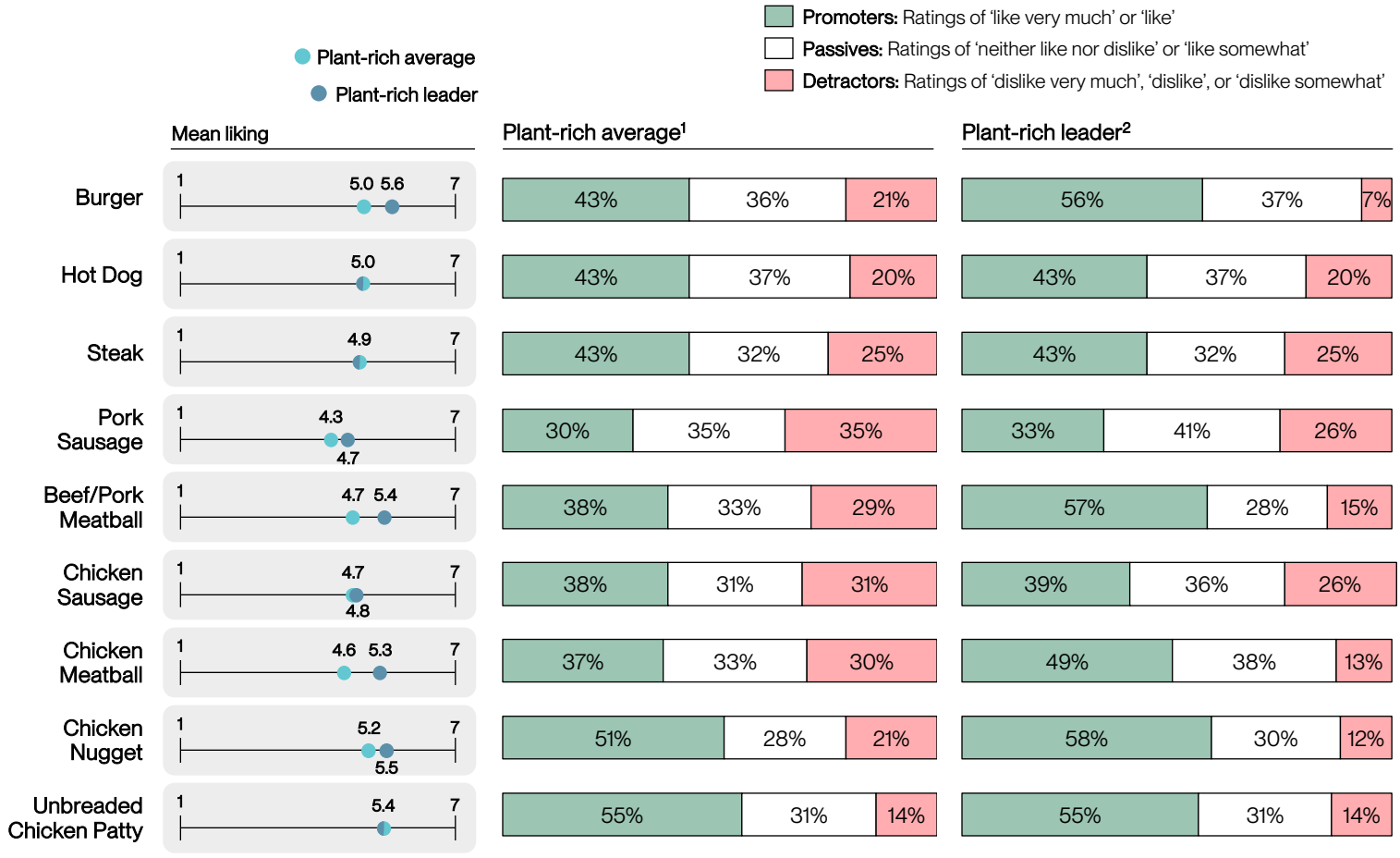
### Plant-rich chicken was the top-performing protein amongst leaders

- Plant-rich chicken products all had mean likings of 5.3-5.5pts (excl. chicken sausage).

1. The plant-rich product with the highest mean liking of those included in this test. For the following categories, only one product was tested and is referred to as the plant-rich leader: Hot Dog, Steak, Unbreaded Chicken Patty.

# **Plant-rich average vs leader:** Overall Liking

How would you rate your OVERALL LIKING of XXX?




# Takeaways

## Improving product liking is clearly feasible for most products

- Leaders achieved statistically significantly higher liking in most categories.
- 12-21% more respondents rated plant-rich leader 'like very much' or 'like' versus the plant-rich average in the beef/pork meatball, burger, and chicken meatball categories.

## Opportunity for leader products to emerge in the sausage and nuggets categories

- Average overall liking of plant-rich leader was only slightly higher than the plant-rich average in these categories.

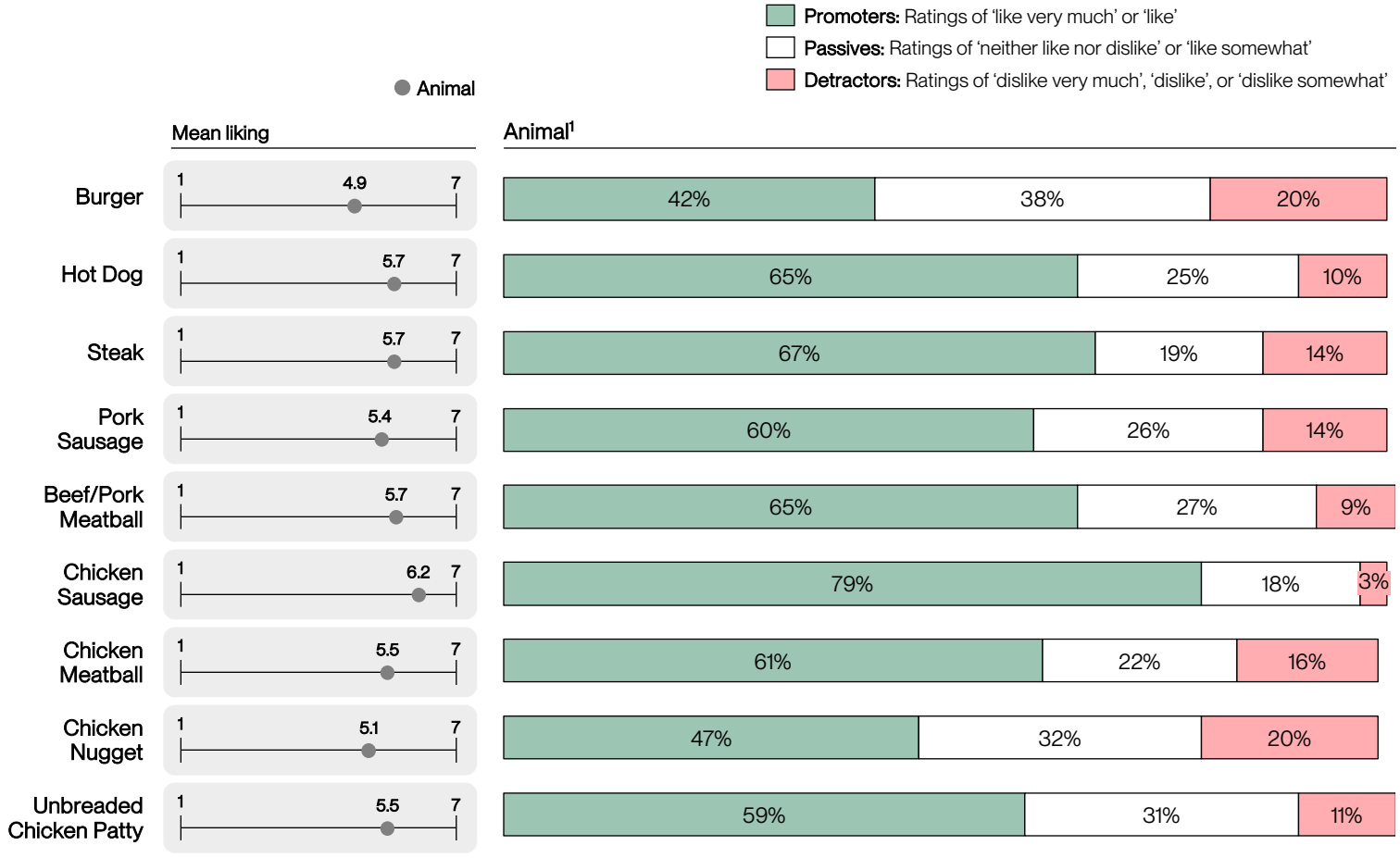
1. Aggregated across all plant-rich products tested for each category. Product count by category; Burger (7), Hot Dog (1), Steak (1), Pork Sausage (2), Beef/Pork Meatball (4), Chicken Sausage (2), Chicken Meatball (2), Chicken Nugget (2), Unbreaded Chicken Patty (1) .
2. The plant-rich product with the highest mean liking of those included in this test. Plant-rich leader is equivalent to plant-rich average in the following categories where only one plant-rich product was tested: Hot Dog, Steak, Unbreaded Chicken Patty.

Cross Category Insights

# Competitive Positioning

# **Animal:** Overall Liking

How would you rate your OVERALL LIKING of XXX?




## Takeaways

### Animal products were generally 'liked'

- Almost all products achieved mean ratings 'like' between 5.5 and 6.5pts.

### Consumers enjoyed chicken sausage more than any other category

- 79% were promoters of chicken sausage.

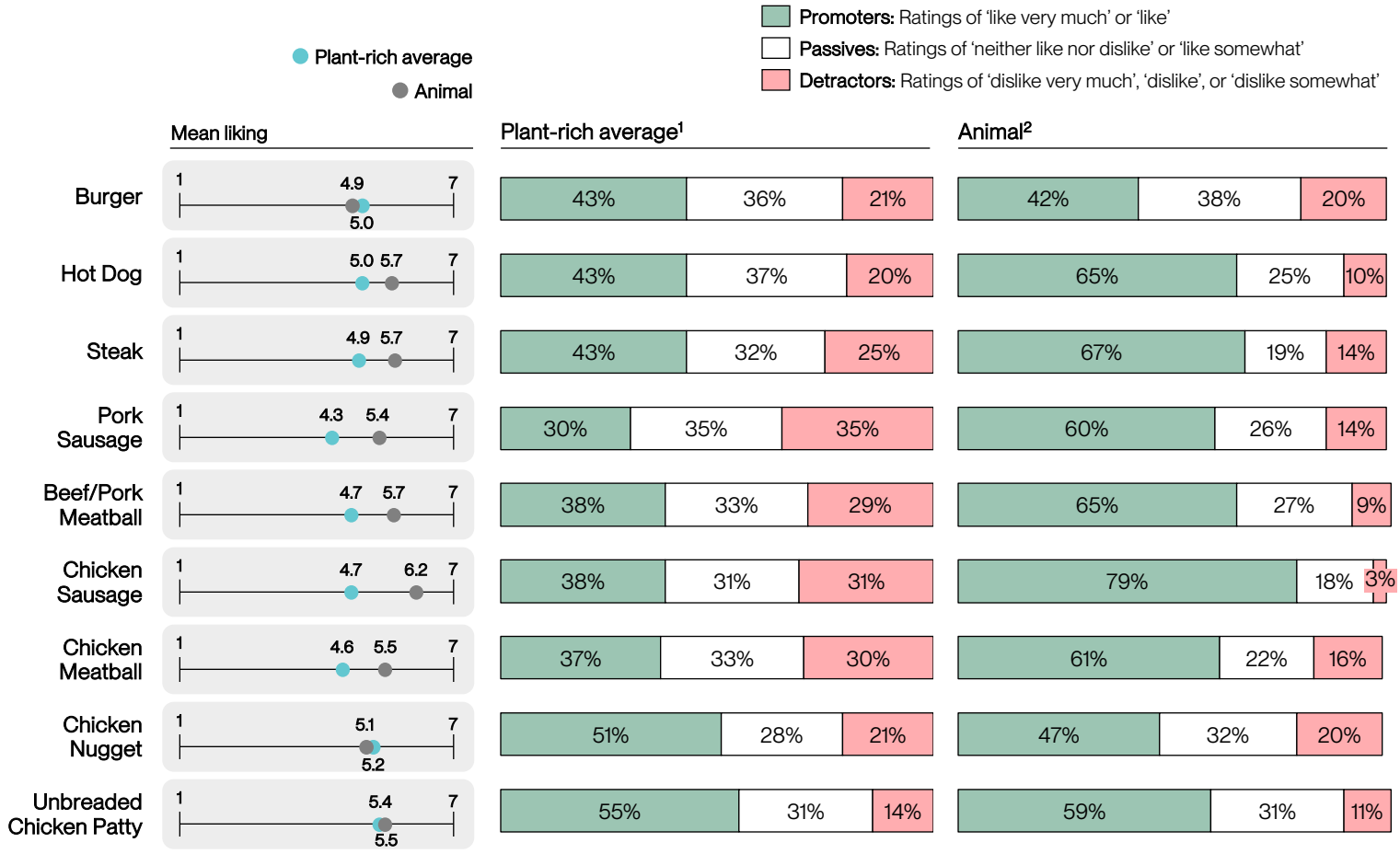
### Burgers and chicken nuggets were liked the least

- Only 42-47% rated burgers or chicken nuggets 'like' or 'like very much.'

1. The highest retail sales volume animal product in each category selected for its representativeness of the animal products in each category.

# **Plant-rich average vs Animal:** Overall Liking

How would you rate your OVERALL LIKING of XXX?




## Takeaways

### Plant-rich chicken nuggets and burgers slightly outperformed animal

- Both categories had mean liking 0.1pts higher than the animal product.

### Unbreaded chicken patties performed at parity with the animal

- Average liking of plant-rich unbreaded chicken patties was 5.4pts (versus 5.5pts for animal).

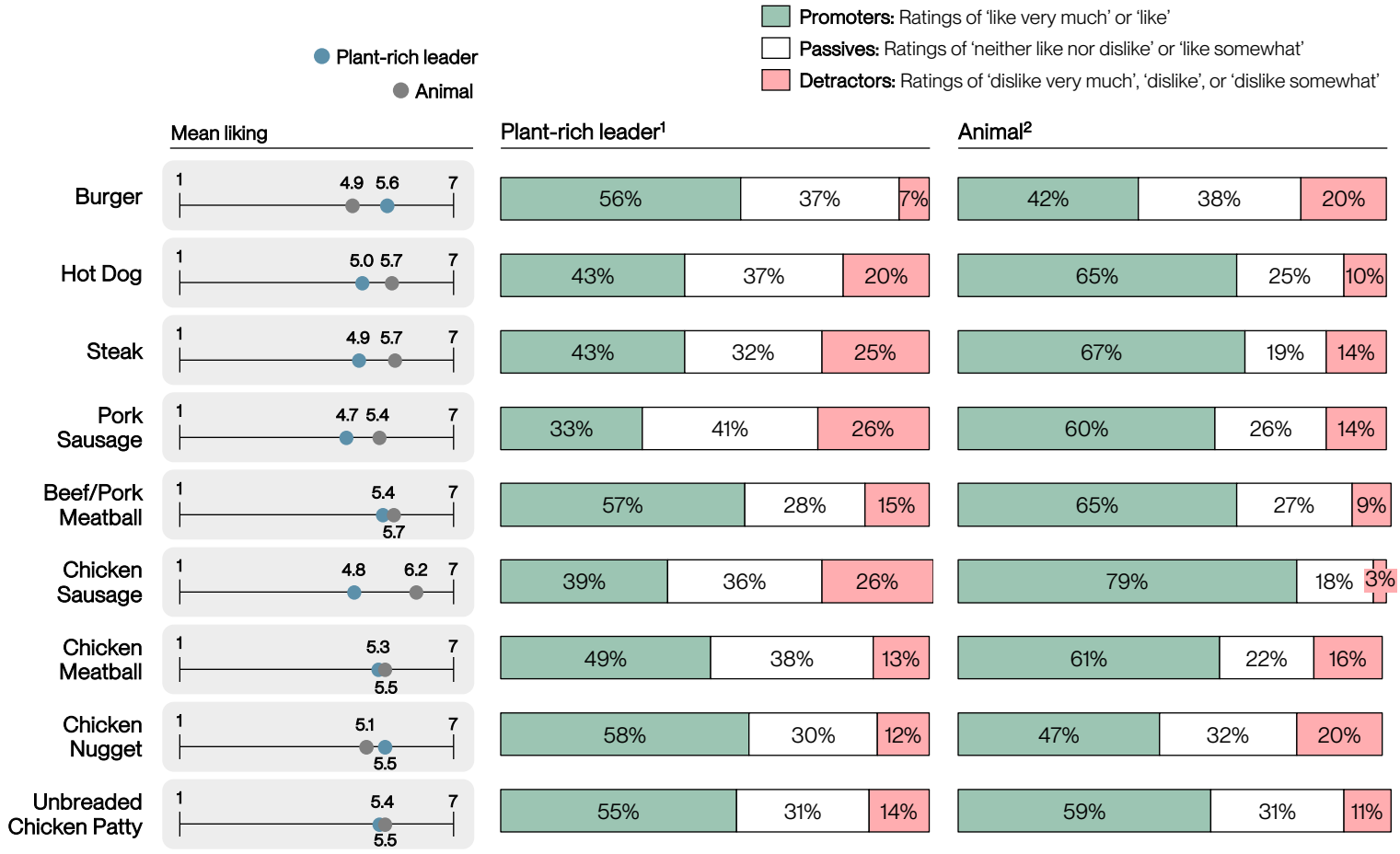
### Further R&D needed for plant-rich hot dogs, steaks, pork sausages, chicken meatballs, and beef/pork meatballs to outperform the animal

- Animal products had 1.5x–2x more promoters than the plant-rich average in these categories.

1. Aggregated across all plant-rich products tested for each category. Product count by category; Burger (7), Hot Dog (1), Steak (1), Pork Sausage (2), Beef/Pork Meatball (4), Chicken Sausage (2), Chicken Meatball (2), Chicken Nugget (2), Unbreaded Chicken Patty (1).
2. The highest retail sales volume animal product in each category selected for its representativeness of the animal products in each category.

# **Plant-rich leader vs Animal:** Overall Liking

How would you rate your OVERALL LIKING of XXX?




## Takeaways

### Plant-rich leader beats animal in burger and chicken nugget

- Average liking 5.6pts for plant-rich leader burger (versus 4.9pts for animal), and 5.5pts for plant-rich chicken nugget (versus 5.1pts for animal).

### Plant-rich leader performed comparably to animal in meatballs

- Plant-rich leader only behind by 0.2-0.3pts in average liking.

### Opportunity to achieve parity or surpass the animal with further R&D in the hot dog, steak, pork sausage, and chicken sausage categories

- Average liking of plant-rich leader lagged 0.7–1.8pts in each of those categories.

1. The plant-rich product with the highest mean liking of those included in this test. For the following categories, only one product was tested and is referred to as the plant-rich leader: Hot Dog, Steak, Unbreaded Chicken Patty.
2. The highest retail sales volume animal product in each category selected for its representativeness of the animal products in each category.

# **Plant-based:** Overall Liking

How would you rate your OVERALL LIKING of XXX?


## Takeaways

### Improvement of plant-based products needed for further adoption

- Most products were rated as 'like somewhat' on average (mean liking of 4.5-5.5pts).

### Steak and chicken nuggets were the top-performing plant-based categories

- 47-49% were promoters of plant-based steak and chicken nuggets.

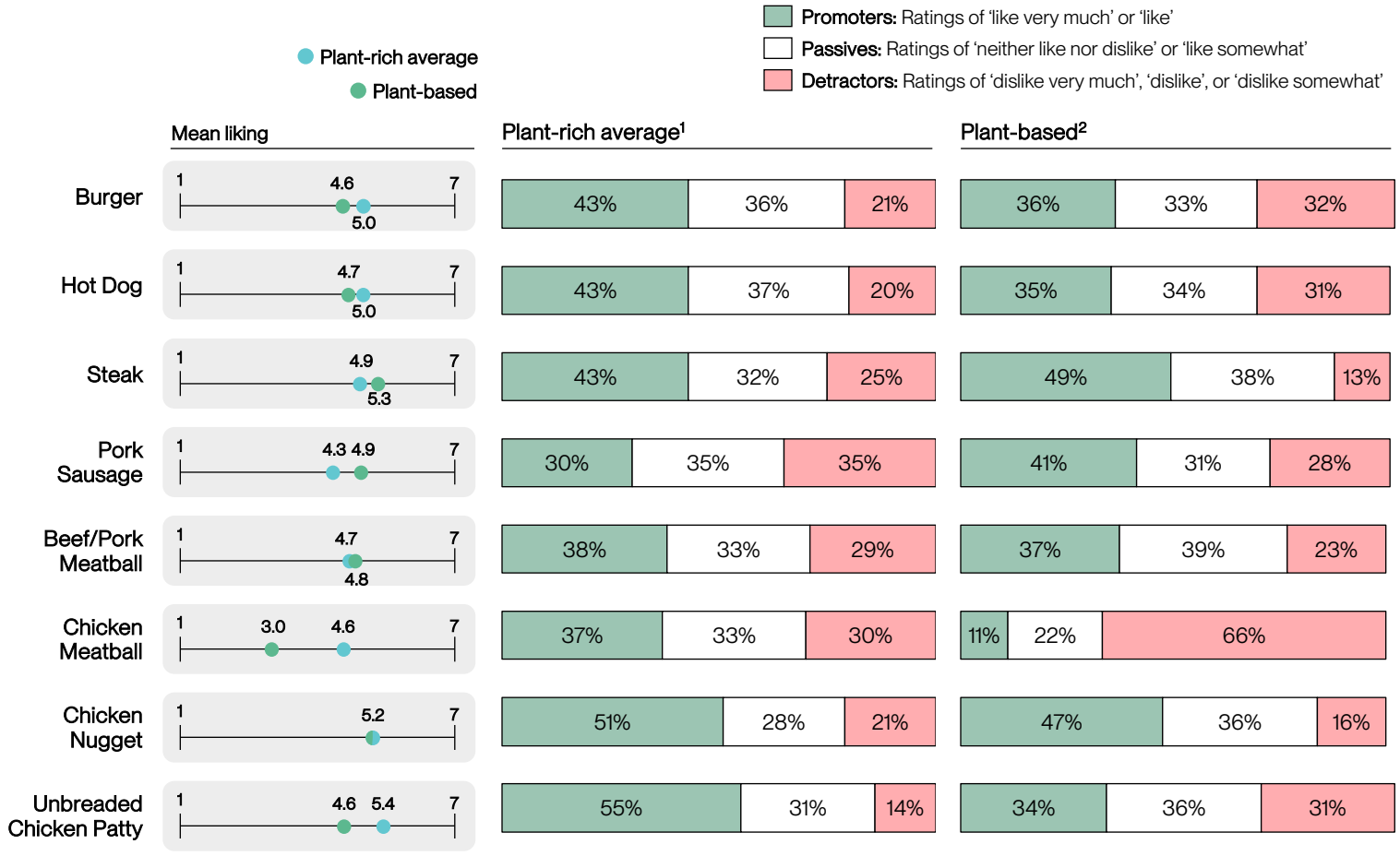
### Plant-based chicken meatball needs improvement

- Only 11% rated plant-based chicken meatball 'like' or 'like very much.'

1. The top-performing plant-based product within each category identified by NECTAR during previous testing (*Taste of Industry 2024*).

# **Plant-rich average vs Plant-based:** Overall Liking

How would you rate your OVERALL LIKING of XXX?




## Takeaways

### Plant-rich average performs comparably to plant-based overall

- Plant-rich average outperformed or was within 0.1pts of plant-based in six of eight categories.

### Plant-rich average already outperforming in burgers, hot dogs, chicken meatballs, and unbreaded chicken patties

- These categories has a median increase in average liking of 0.6pts relative to plant-based.

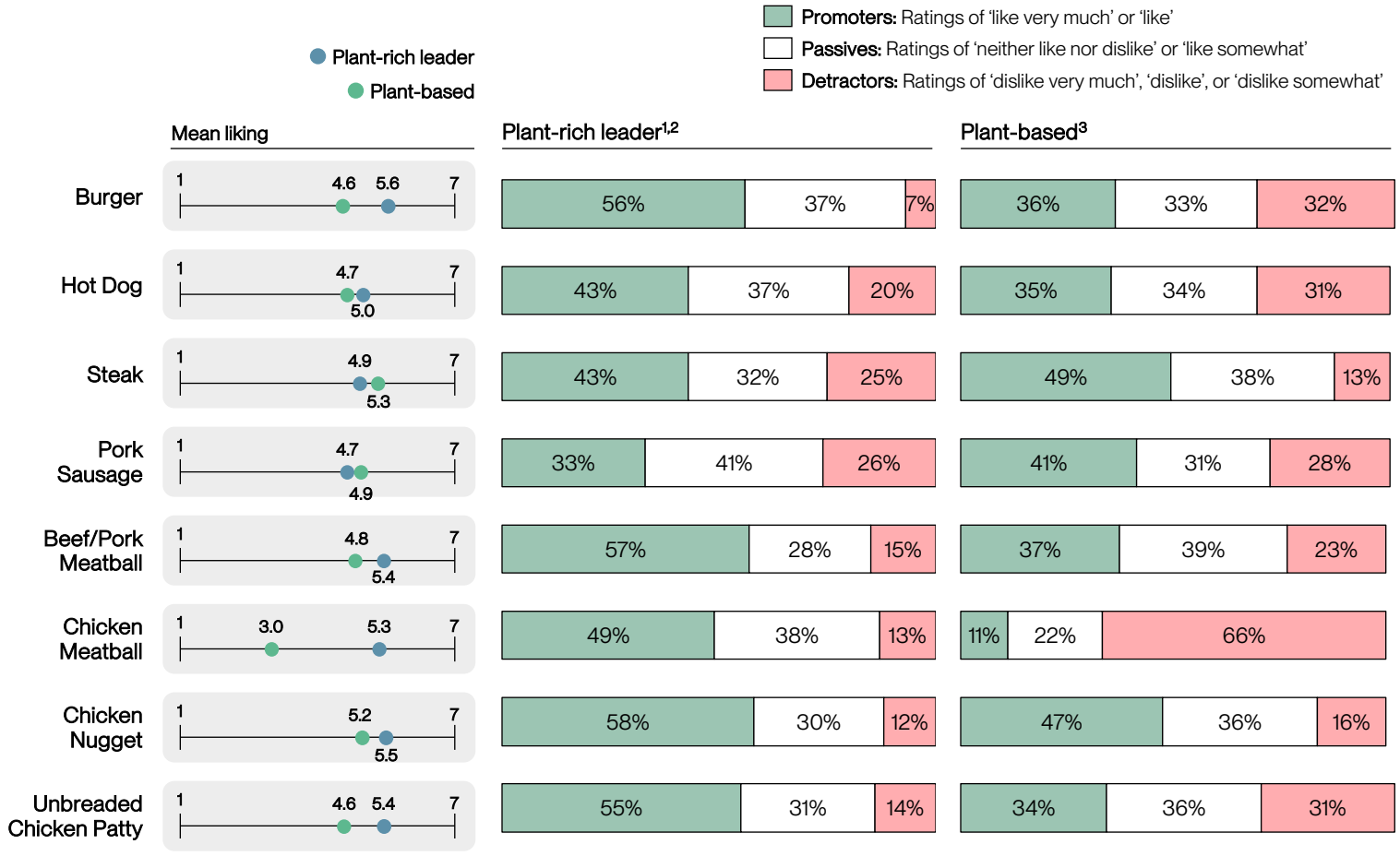
### R&D needed to justify plant-rich pork sausage and steak

- Plant-rich average underperformed against the plant-based average in these categories.

1. Aggregated across all plant-rich products tested for each category. Product count by category; Burger (7), Hot Dog (1), Steak (1), Pork Sausage (2), Beef/Pork Meatball (4), Chicken Sausage (2), Chicken Meatball (2), Chicken Nugget (2), Unbreaded Chicken Patty (1).
2. The top-performing plant-based product within each category identified by NECTAR during previous testing (*Taste of Industry 2024*).

# **Plant-rich leader vs Plant-based:** Overall Liking

How would you rate your OVERALL LIKING of XXX?




## Takeaways

### Plant-rich leader outperforms plant-based in most categories

- Plant-rich leader had higher average liking than plant-based in six of the eight categories.

### Plant-rich leader strongest in burger, beef/pork meatball, and unbreaded chicken patty

- Plant-rich leader had 1.5x-2x more promoters in these categories than plant-based.

### Opportunity for plant-rich leader to improve in steak and pork sausage

- Plant-rich leader behind plant-based by 0.2-0.4pts in steak and pork sausage.

1. The plant-rich product with the highest mean liking of those included in this test. For the following categories, only one product was tested and is referred to as the plant-rich leader: Hot Dog, Steak, Unbreaded Chicken Patty.
2. The top-performing plant-based product within each category identified by NECTAR during previous testing (*Taste of Industry 2024*).

Cross Category Insights

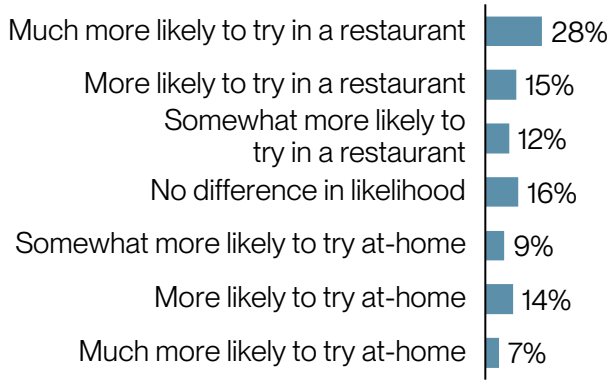
# GTM Strategy

# Product Experience and Willingness to Pay

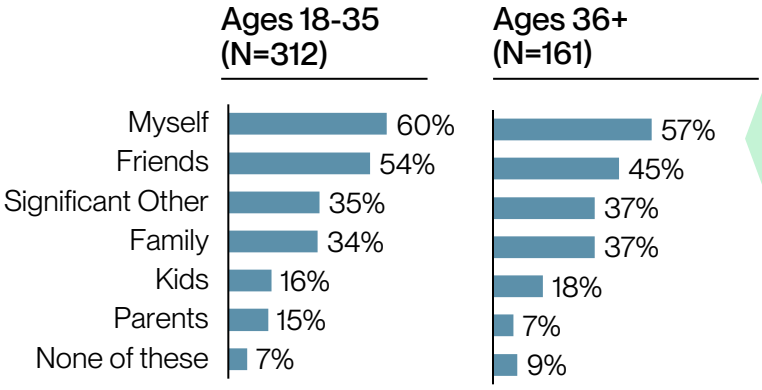
## Participants would be more likely to try plant-rich meats in a restaurant than at home

- 43% said they would be 'more likely' or 'much more likely' to try in a restaurant than at home.

Where would you be most likely to try plant-rich meat for the first time instead of a 100% animal-based product?[1] (N=473)




Which of the following, if any, would you be more likely to serve a plant-rich meat to (relative to conventional meat)?[1]



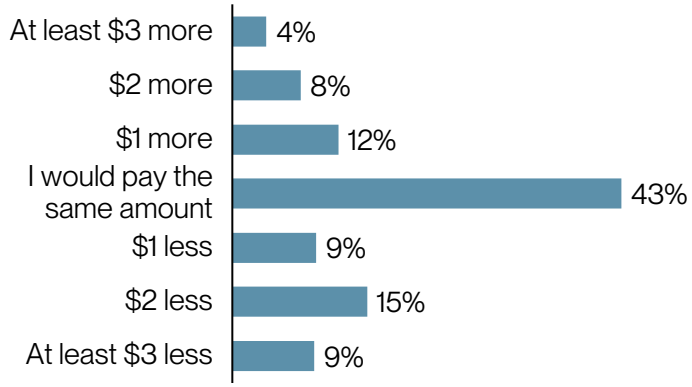

## Consumers are most likely to try plant-rich meats by themselves or with friends

- Most people would try plant-rich meats themselves or with a friend.
- Younger consumers are more likely to serve plant-rich meat to friends or parents.
- 1/3 of participants with children would be more likely to serve plant-rich meat to their kids.

## Most consumers would pay a similar amount for plant-rich meat as animal-based meat

- 43% would pay the same amount for a plant-rich meat relative to the animal product.

How much more or less would you be willing to pay for a plant-rich meat relative to a 100% animal-based product?[1] (N=473)



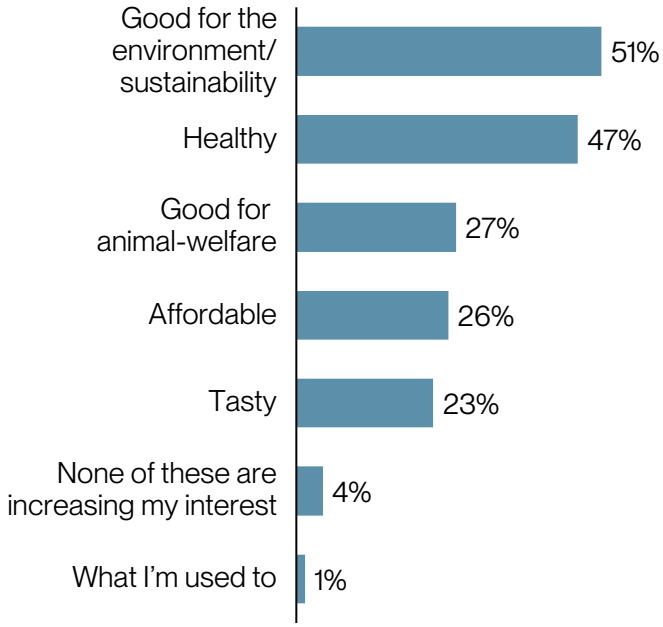

1. Original question phrasing used the term 'blended meat' instead of 'plant-rich meat.'

# Purchase Drivers and Barriers

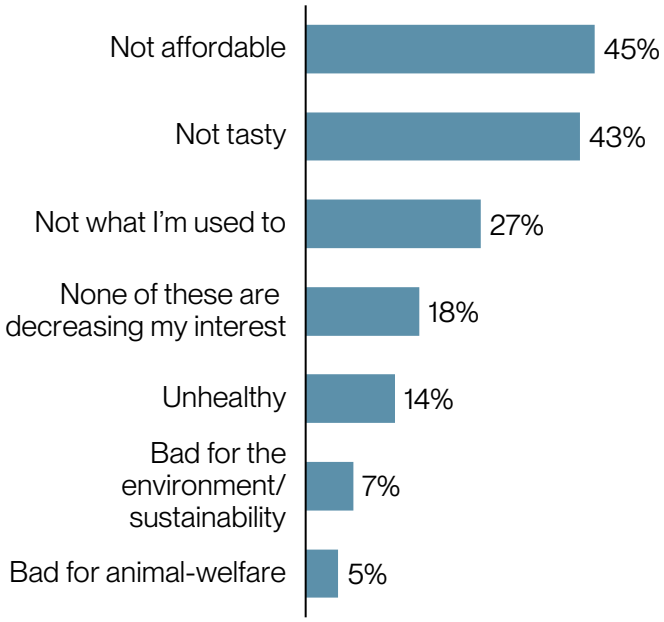
## Consumers recognized the potential of plant-rich meats to improve personal and planetary health

- Just 25% of participants resonated with drivers related to affordability and taste, indicating low consumer expectations that this category will deliver in those areas.
- Good for the environment/sustainability and healthy were cited as interest drivers 2x more often than any other driver, indicating higher consumer buy-in on these selling points.
- Opportunity to lean into messaging on health, a key purchasing criteria for some consumers.

Which of the following is currently increasing your interest in plant-rich meat (if any)?[1] (N=473)




Which of the following is currently decreasing your interest in plant-rich meat (if any)?[1] (N=473)




## Cost and flavor are the primary roadblocks for consumers

- 45% said low affordability decreased their interest in plant-rich meat and 43% said it was 'not tasty.'
- 27% cited low familiarity as a barrier, indicating an opportunity to drive interest through general marketing and familiarization of plant-rich as a concept.

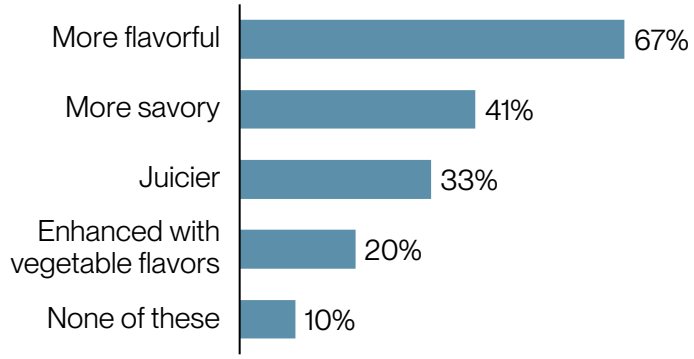
1. Original question phrasing used the term 'blended meat' instead of 'plant-rich meat.'

# Top Benefits

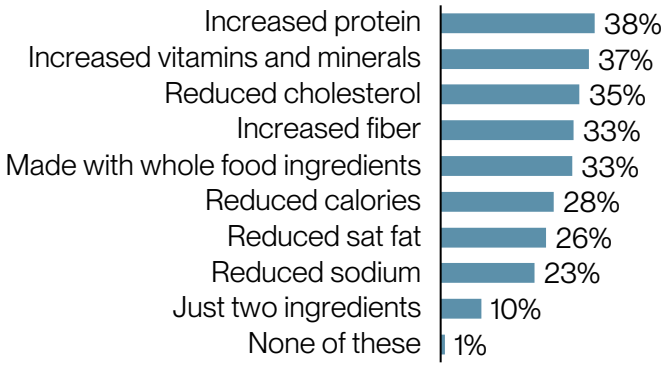
## Flavor claims most effective for improving taste perception

- 'More flavorful' (67% selected) and 'more savory' (41% selected) were the top benefits.
- Flavor benefits that referenced vegetables were less effective – just 20% selected 'enhanced with vegetable flavors.'

Which of the following potential taste benefits would significantly increase your interest in plant-rich meat (if any)?[1] (N=259)




Which of the following potential health benefits would significantly increase your interest in plant-rich meat (if any)?[1] (N=266)



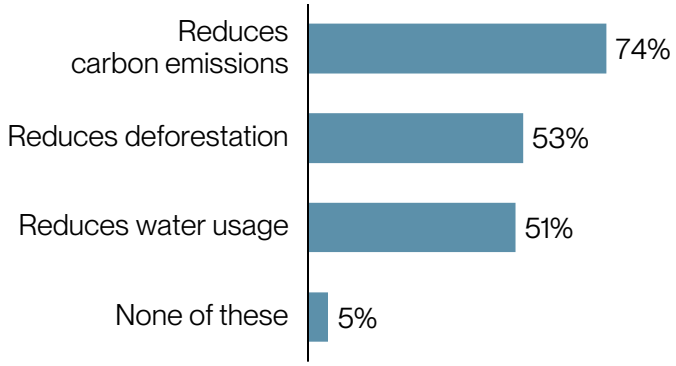

## Consumers were similarly interested in a variety of health benefits

- Over a third of participants indicated that an increase in protein, vitamins and minerals, and fiber; reduced cholesterol; or whole food ingredients would increase their interest in plant-rich meat.
- Claims related to the number of ingredients were not effective – only 10% selected 'just two ingredients.'

## Reduced carbon emissions is the strongest sustainability benefit for driving interest in plant-rich meat

- 74% said that reduced carbon emissions would significantly increase their interest in plant-rich meat.
- Around half of participants said that reduced deforestation or water usage would increase their interest in plant-rich meat.

Which of the following potential sustainability benefits would significantly increase your interest in plant-rich meat (if any)?[1] (N=262)



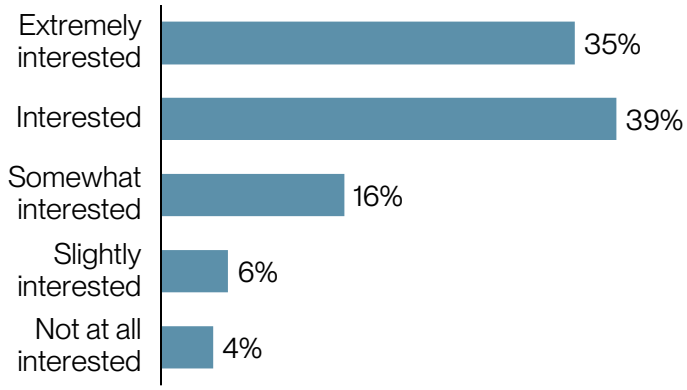

1. Original question phrasing used the term 'blended meat' instead of 'plant-rich meat.'

# Proofpoints

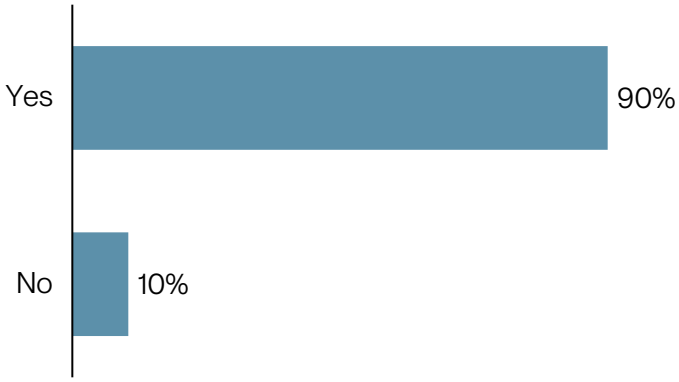
## Consumers are interested in the concept of plant-rich meat

- 74% said they were 'interested' or 'extremely interested.'

How interested are you in the concept of plant-rich meat? (N=473)




Do you consider plant-rich meat to be a unique offering?[1] (N=473)



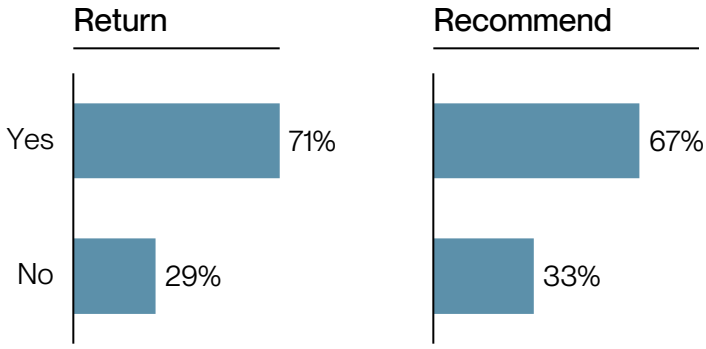

## Plant-rich meat is an opportunity for food service operators and retailers to differentiate themselves

- 90% of consumers consider plant-rich meat a unique offering.

## Plant-rich meat can improve customer attraction and retention for food service operators and retailers

- 71% said they would be more likely to return to a restaurant or grocer that had plant-rich meat.
- 67% would be more likely to recommend a restaurant or grocer with plant-rich meat.

Would you be more likely to XXX a restaurant/ grocer that had plant-rich meat?[1] (N=473)




1. Original question phrasing used the term 'blended meat' instead of 'plant-rich meat.'

# Burger

# Burger

## Executive summary of R&D opportunities

### Performance Overview

Plant-rich burgers as a category outperformed animal and plant-based benchmarks.

- **Plant-rich products are succeeding in the category** – Overall liking for both the plant-rich average and plant-rich leader was ahead of the animal.
- **Plant-rich scored better than animal across flavor, texture, and appearance** – High purchase intent and overall liking scores were driven by wins across all sensory categories.
- **Opportunity for plant-rich average to catch up to plant-rich leader** – Plant-rich average performed meaningfully behind leader, particularly on flavor.

### Top Sensory Opportunities

Plant-rich products can extend their lead on animal and plant-based by focusing on increasing juiciness and balancing cohesiveness and flavor intensity.

- **Opportunity to increase juiciness** – 43%-44% of participants rated the plant-rich average and leader as too dry.
- **Consumers prefer a balanced flavor profile** – Over 50% of participants said the flavor for beef products was ‘too strong’ or ‘too weak,’ with impacts to liking of 1.4-1.6pts.
- **Improve cohesiveness of plant-rich products** – Only 40% found the plant-rich leader to be the right level of cohesiveness (versus 64% for animal).

# Burgers Tested

Burgers from seven commercially available plant-rich burger brands were prepared according to manufacturer instructions on a flat-top and compared against both animal and plant-based burgers.

Participants were screened to exclude consumers who do not eat animal-based meat and only include those who eat burgers at least every 1-2 months.

## Testing Environment

Participants tried the burgers at Flippin' Burger in San Francisco, a restaurant environment, in order to achieve an authentic and natural experience.

## Preparation

All burgers were salted and prepared using a flat-top according to manufacturer instructions. Participants were allowed to add condiments consistently across all burgers to keep the eating experience natural.

## Dish Served

Participants were served four half-burgers. While they ate, participants filled out a mobile phone survey detailing their experience with each product in a randomized order.

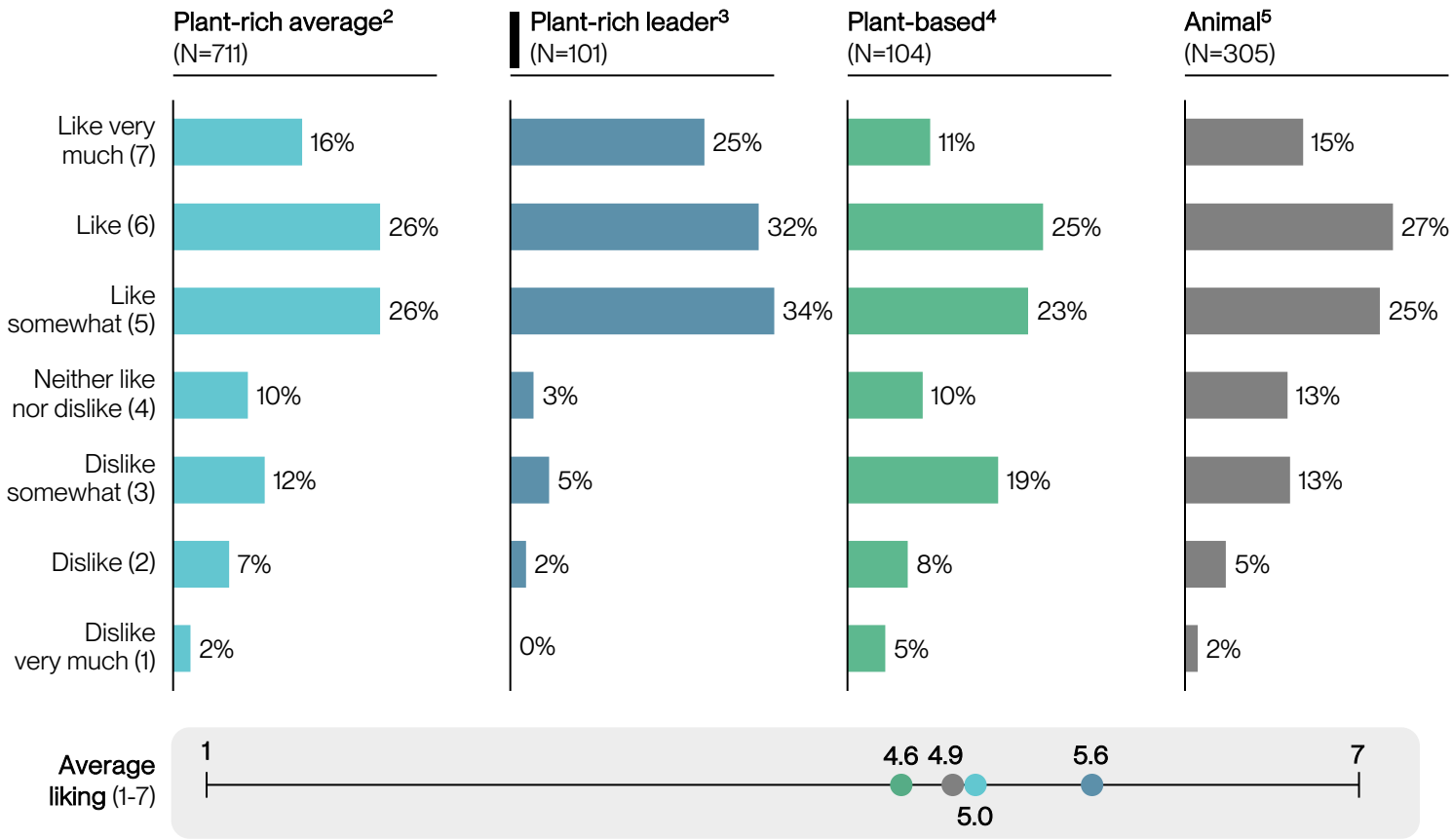
# **Burger:** Overall Liking

How would you rate your OVERALL LIKING of Burger XXX?

**Overall liking,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)







# Takeaways

## Plant-rich leader outperformed animal and plant-based

- The plant-rich leader was rated 'like' or 'like very much' by 57% of participants (versus 42% for the animal and 36% for the plant-based).

## The plant-rich average performed comparably to the animal

- The percentage of participants giving a positive liking rating to the plant-rich average was the same as that of the animal.

## The average overall liking of the plant-rich leader was significantly higher than all other options

- 5.6pts versus 5.0pts for plant-rich average, 4.9pts for animal, and 4.6pts for plant-based.

1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. Aggregated across 7 commercially available plant-rich burger products.
3. The plant-rich product with the highest mean liking of those included in this test.
4. The top-performing plant-based burger identified by NECTAR during previous testing of plant-based burger (*Taste of Industry 2024*).
5. The highest retail sales volume animal burger selected for its representativeness of the animal burger category.

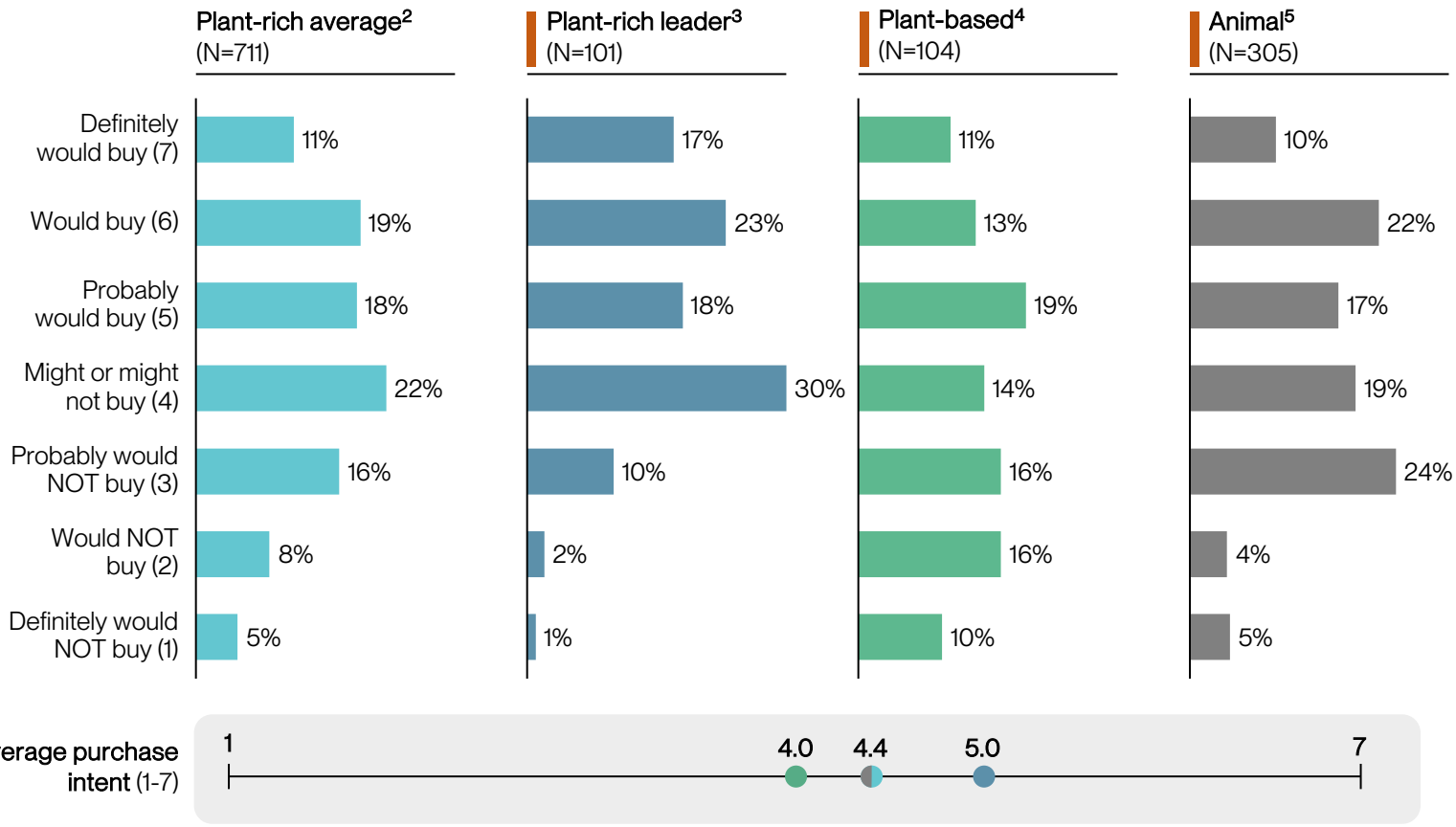
# **Burger:** Purchase Intent

How would you rate your PURCHASE INTENT of Burger XXX?

**Purchase intent,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)







# Takeaways

## Participants were more interested in purchasing the plant-rich leader than any of the other products

- The majority (58%) of the participants indicated an intent to purchase the plant-rich leader.

## Equal interest in purchasing the plant-rich average and animal

- Average purchase intent was 4.4 for both the plant-rich average and animal benchmark.

## More interest in purchasing plant-rich options than plant-based

- Average purchase intent was 0.4pts higher for the plant-rich average than the plant-based.

1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. Aggregated across 7 commercially available plant-rich burger products.
3. The plant-rich product with the highest mean liking of those included in this test.
4. The top-performing plant-based burger identified by NECTAR during previous testing of plant-based burger (*Taste of Industry 2024*).
5. The highest retail sales volume animal burger selected for its representativeness of the animal burger category.

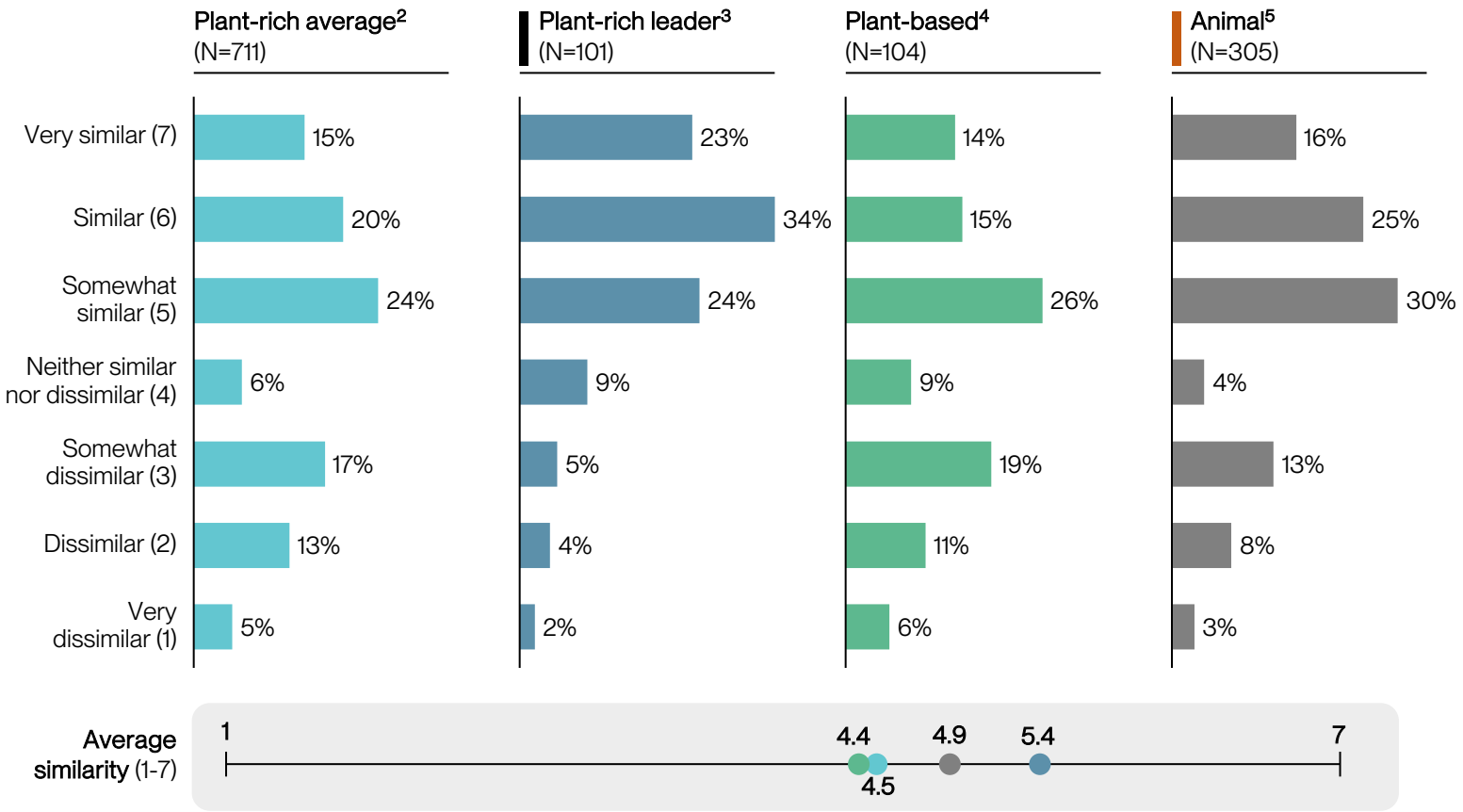
# **Burger:** Similarity

How would you rate your SIMILARITY of XXX to a typical Burger?

**Similarity,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)







# Takeaways

## The plant-rich leader is regarded as quite similar to a 'typical' burger

- Participants found the plant-rich leader to be more similar to a 'typical' burger than the animal benchmark (0.5pts higher average similarity).

## Plant-rich average considered slightly more similar to a 'typical' burger than plant-based

- 59% of participants indicated a similarity between the plant-rich average and a 'typical' burger versus 55% for the plant-based product.

## Plant-rich leader more similar than the plant-rich average

- Average similarity of plant-rich leader 0.9pts higher than the plant-rich average.

1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. Aggregated across 7 commercially available plant-rich burger products.
3. The plant-rich product with the highest mean liking of those included in this test.
4. The top-performing plant-based burger identified by NECTAR during previous testing of plant-based burger (*Taste of Industry 2024*).
5. The highest retail sales volume animal burger selected for its representativeness of the animal burger category.

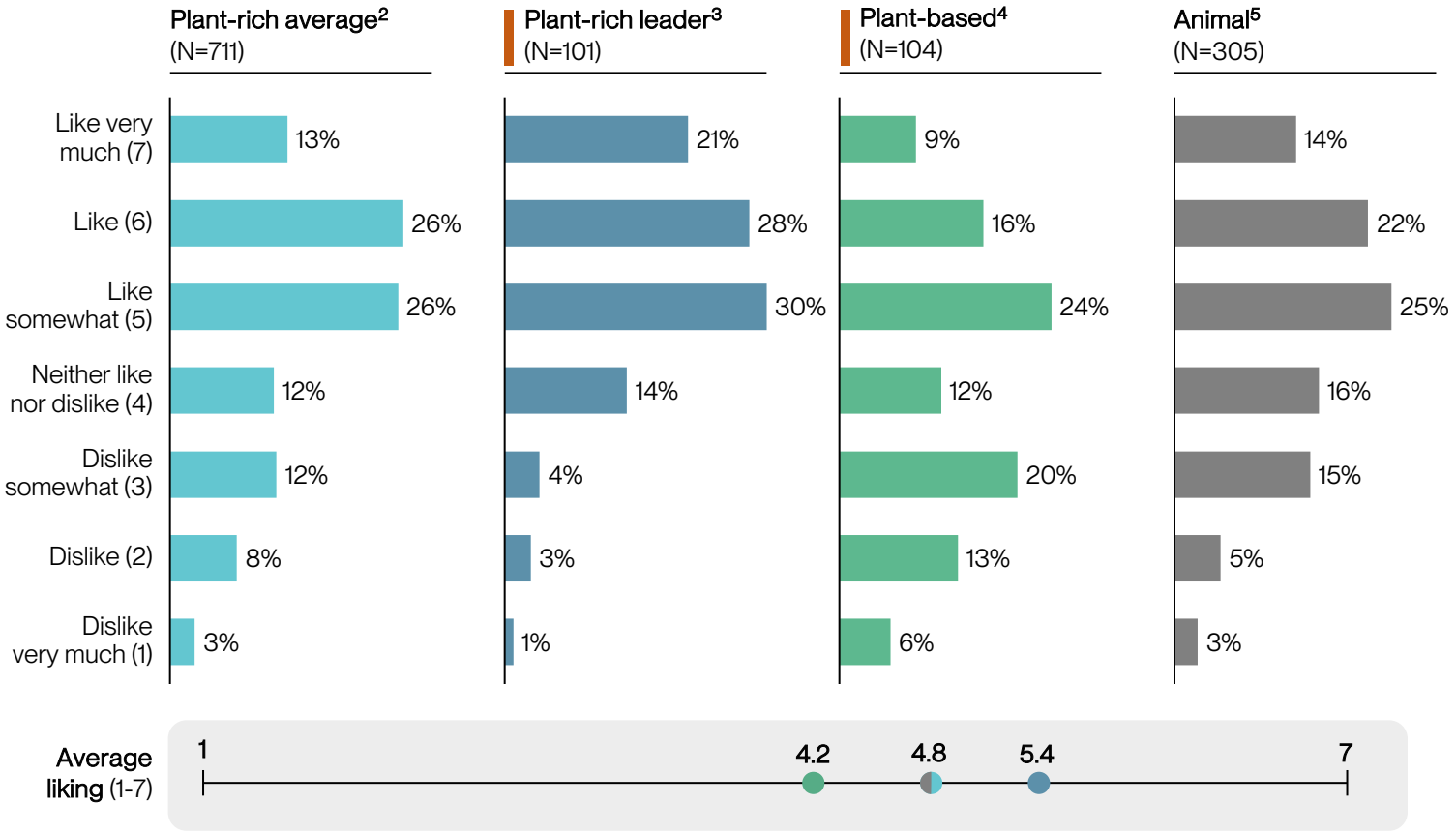
# **Burger:** Flavor

How would you rate your FLAVOR of Burger XXX?

**Flavor,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)




# Takeaways

## Plant-rich leader has a superior flavor to the animal benchmark

- Average liking 0.6pts higher for the plant-rich leader than the animal.

## Opportunity for the plant-rich average to surpass the animal benchmark and catch up to the plant-rich leader in flavor

- Plant-rich average liking equal to the animal benchmark liking.
- Plant-rich average is 0.6pts behind plant-rich leader on flavor liking.

1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. Aggregated across 7 commercially available plant-rich burger products.
3. The plant-rich product with the highest mean liking of those included in this test.
4. The top-performing plant-based burger identified by NECTAR during previous testing of plant-based burger (*Taste of Industry 2024*).
5. The highest retail sales volume animal burger selected for its representativeness of the animal burger category.

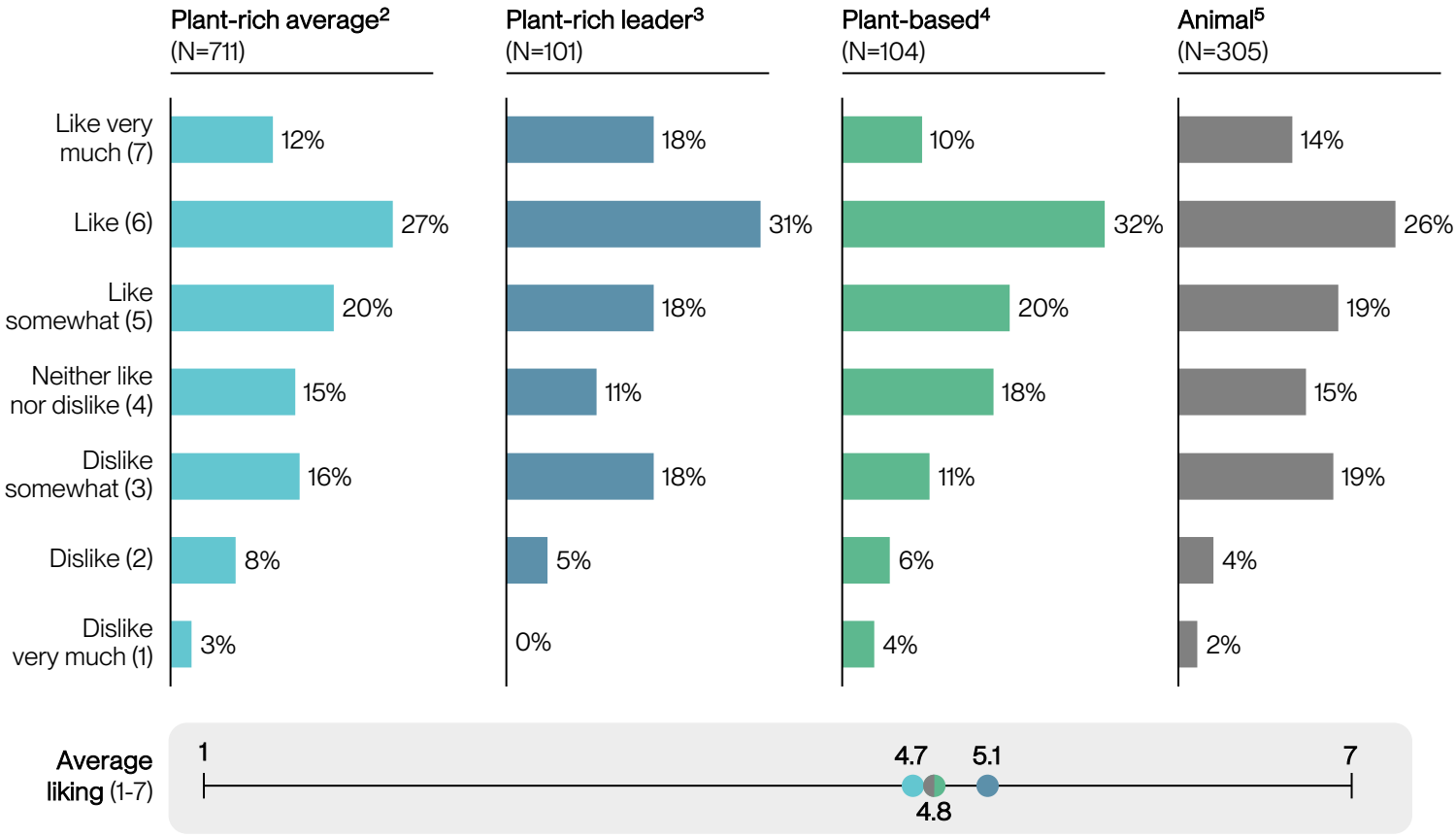
# **Burger:** Texture

How would you rate your TEXTURE of Burger XXX?

**Texture,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)







# Takeaways

## Plant-rich leader had a better texture than animal and plant-based

- 49% rated the texture of the plant-rich leader 'like' or 'like very much' versus 40% for animal and 42% for plant-based.

## Differentiation in purchase intent was more closely aligned to flavor than texture

- The plant-rich average performed similarly to plant-based and animal on texture, while variations in purchase intent were more aligned with the flavor rankings.

1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. Aggregated across 7 commercially available plant-rich burger products.
3. The plant-rich product with the highest mean liking of those included in this test.
4. The top-performing plant-based burger identified by NECTAR during previous testing of plant-based burger (*Taste of Industry 2024*).
5. The highest retail sales volume animal burger selected for its representativeness of the animal burger category.

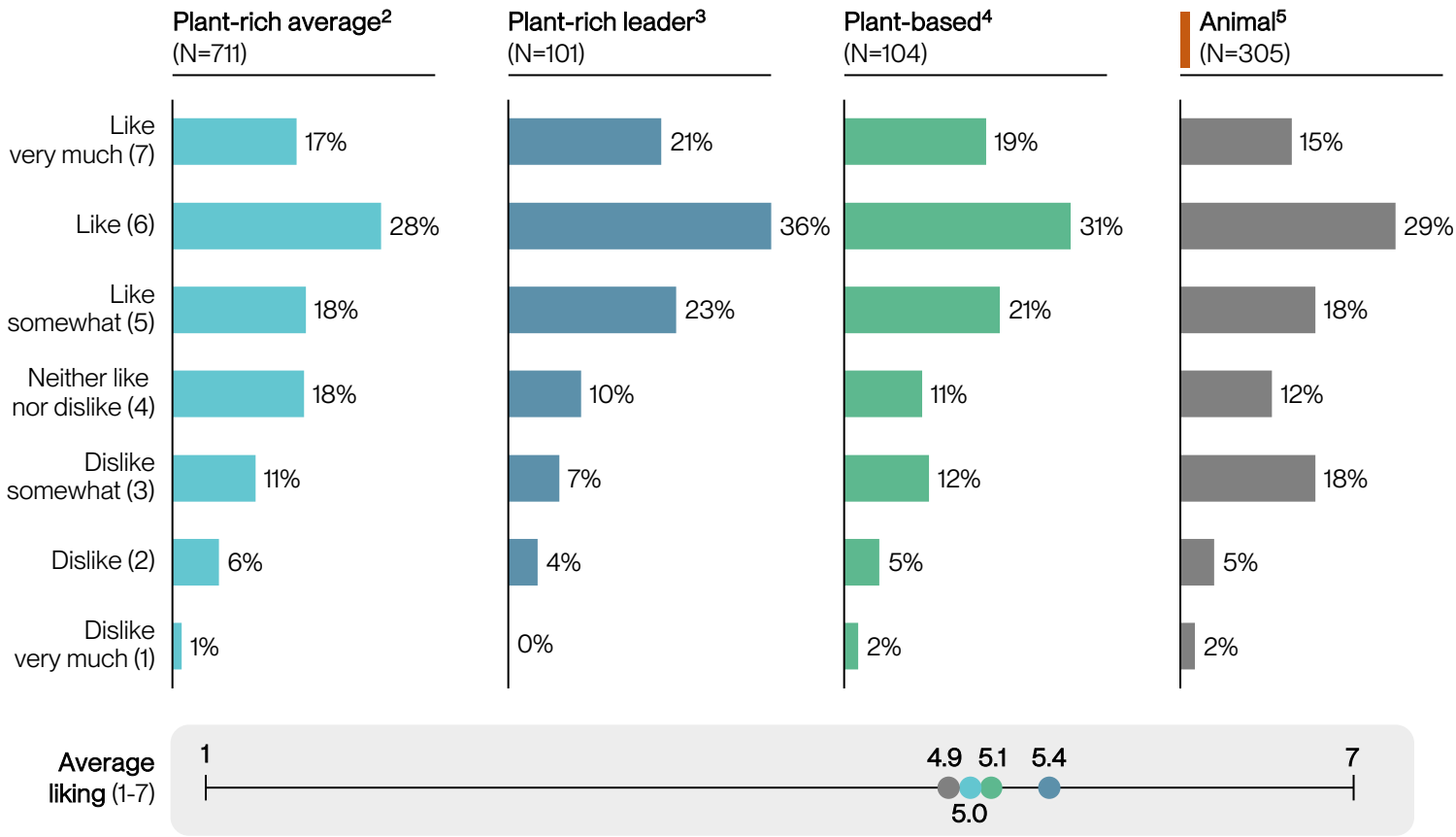
# **Burger:** Appearance

How would you rate your APPEARANCE of Burger XXX?

**Appearance,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)







# Takeaways

## Appearance of the plant-rich leader is better than the plant-based and animal

- Average liking was 5.4pts compared to 5.1 for plant-based and 4.9 for animal.

## Plant-rich average has better appearance than animal but still behind plant-based

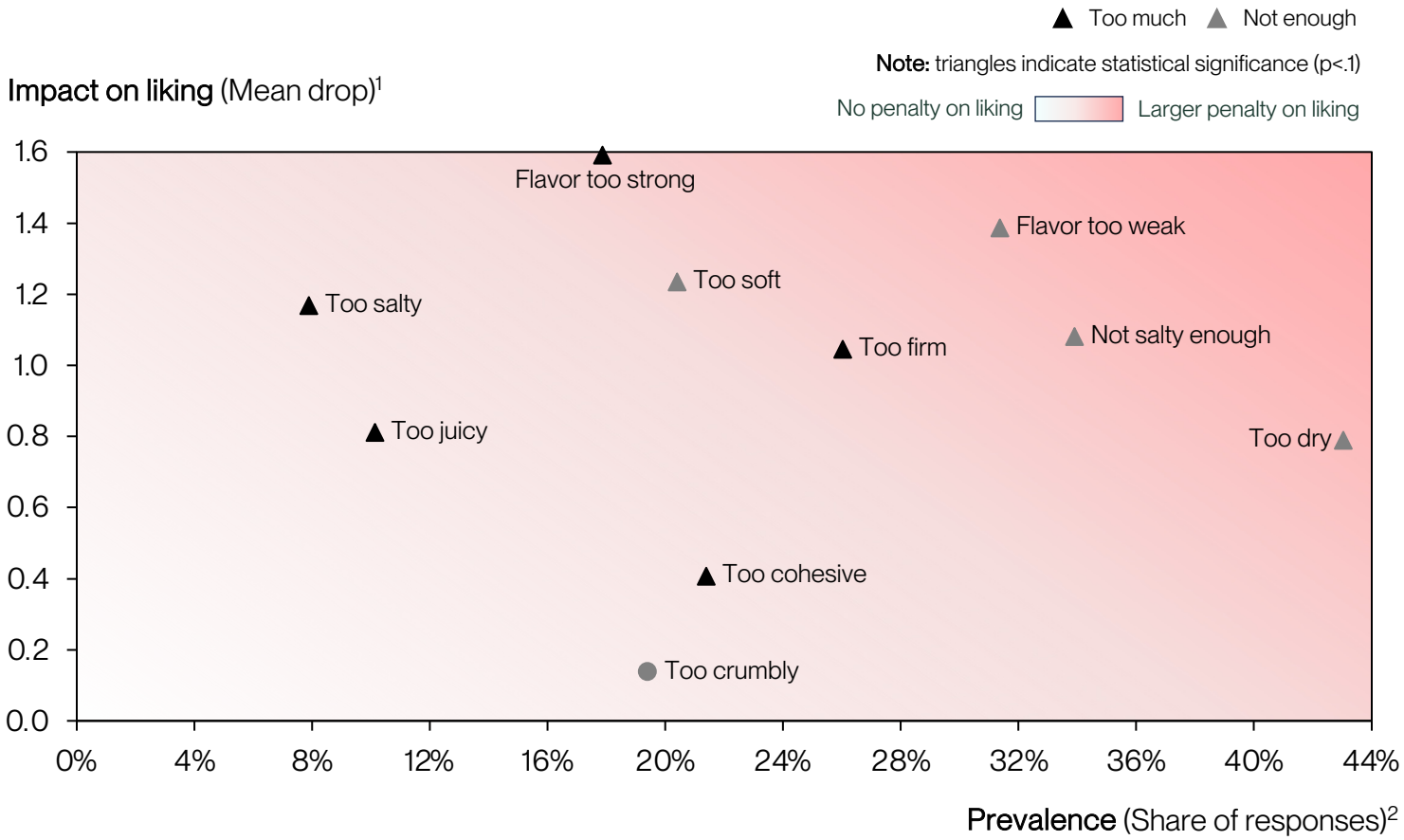
- Average liking 5.0, above animal at 4.9 but below plant-based at 5.1.

1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. Aggregated across 7 commercially available plant-rich burger products.
3. The plant-rich product with the highest mean liking of those included in this test.
4. The top-performing plant-based burger identified by NECTAR during previous testing of plant-based burger (*Taste of Industry 2024*).
5. The highest retail sales volume animal burger selected for its representativeness of the animal burger category.

# **Burger:** Top R&D Opportunities

Prioritization framework for identifying attributes with large impacts on liking

**Penalty analysis, using responses on 'just-about-right' questions,** Mean drop and Prevalence




# Takeaways

## Focus on creating balanced flavors

- Too strong flavor and too weak flavor had strong impacts on liking (1.7pt and 1.4pt drops, respectively), and weak flavor was reported twice as often as strong flavor.

## Cohesion and texture are lower priority attributes

- 16% found the burgers too crumbly, while ~24% found it too cohesive. However, neither complaint had a strong impact on liking, dropping only 0.4 and 0.6pts, respectively.

## Products tend to be not salty enough and too dry

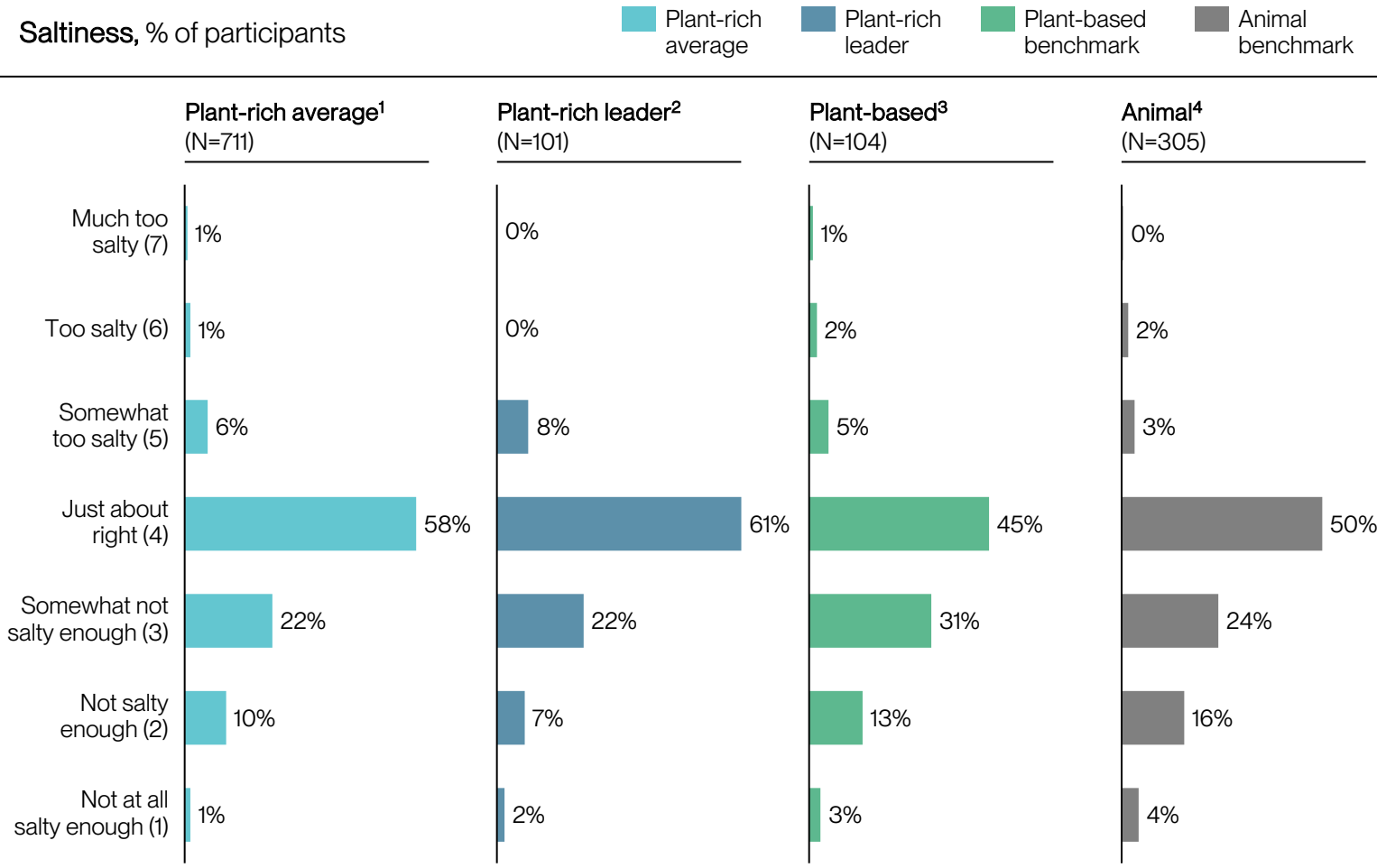
- 33-45% of participants commented on dryness or lack of salt.

1. The average change in overall liking on 7pt scale for products for all responses using the relevant attribute as a descriptor compared to the mean liking for all products rated 'just about right' on that attribute. Calculated as Mean Liking (JAR) minus Mean Liking (descriptor used).
2. Share of responses for all plant-rich products in this category in each direction for each attribute.

# **Burger:** Saltiness

How would you rate your SALTINESS of Burger XXX?

**Saltiness,** % of participants




## Takeaways

### Saltiness was a clear strength for plant-rich

- 61% found it to be 'just about right' for the plant-rich leader, and 58% for the plant-rich average, versus 50% for the animal.

### The plant-rich leader did not differentiate itself on saltiness

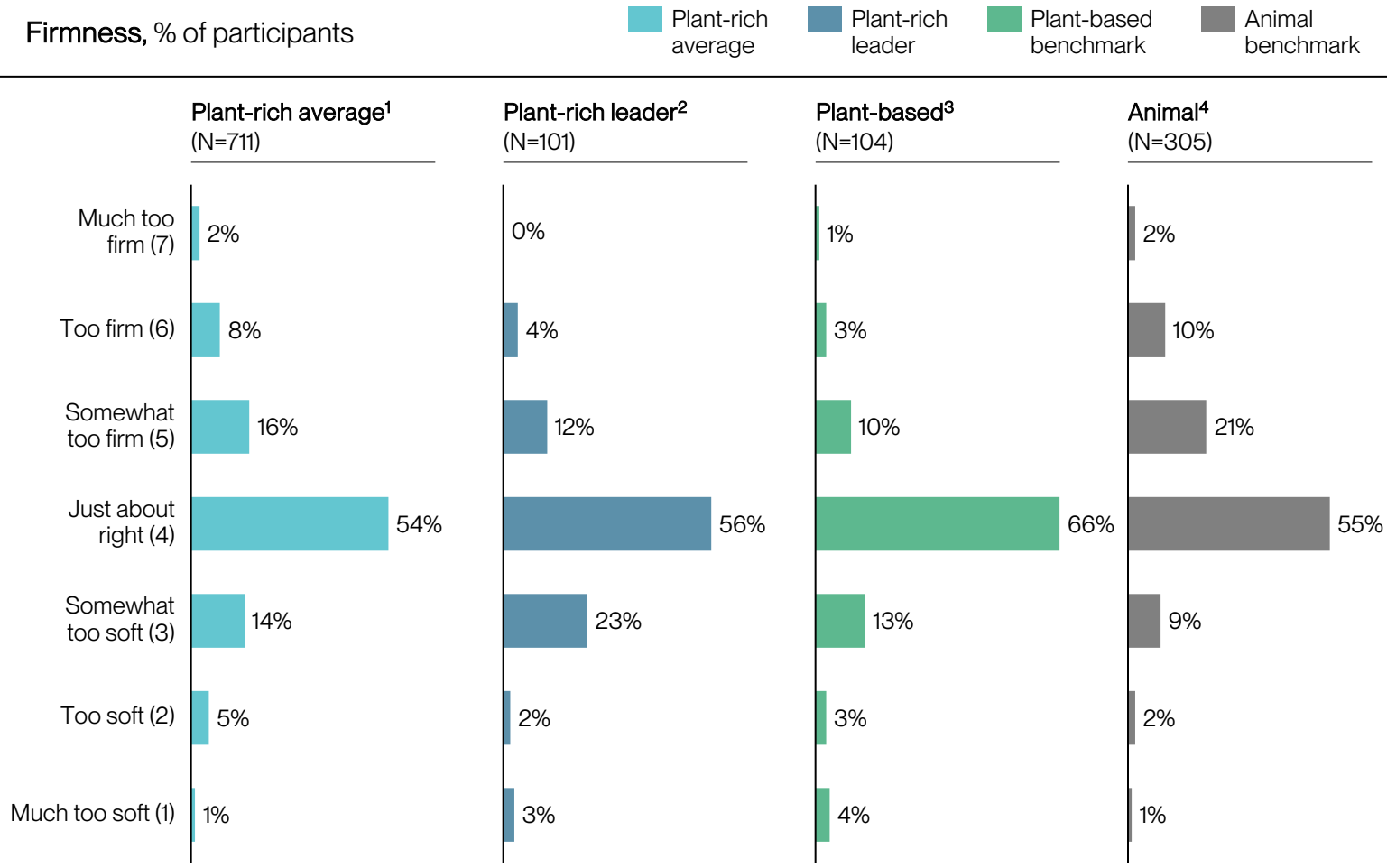
- Participants rated the saltiness of the plant-rich leader very similar to the plant-rich average.

1. Aggregated across 7 commercially available plant-rich burger products.
2. The plant-rich product with the highest mean liking of those included in this test.
3. The top-performing plant-based burger identified by NECTAR during previous testing of plant-based burger (*Taste of Industry 2024*).
4. The highest retail sales volume animal burger selected for its representativeness of the animal burger category.

# **Burger:** Firmness

How would you rate your FIRMNESS of Burger XXX?

**Firmness,** % of participants




# Takeaways

## Plant-rich ranked comparably to animal on firmness

- 54% found the plant-rich average to be 'just about right' firmness, versus 55% for the animal.

## The plant-rich leader does not differentiate itself on firmness

- 56% found the plant-rich leader to be 'just about right' firmness, very similar to the 54% who found the plant-rich average to be 'just about right' firmness.

## Plant-rich burgers don't tend to trend either too soft or too firm

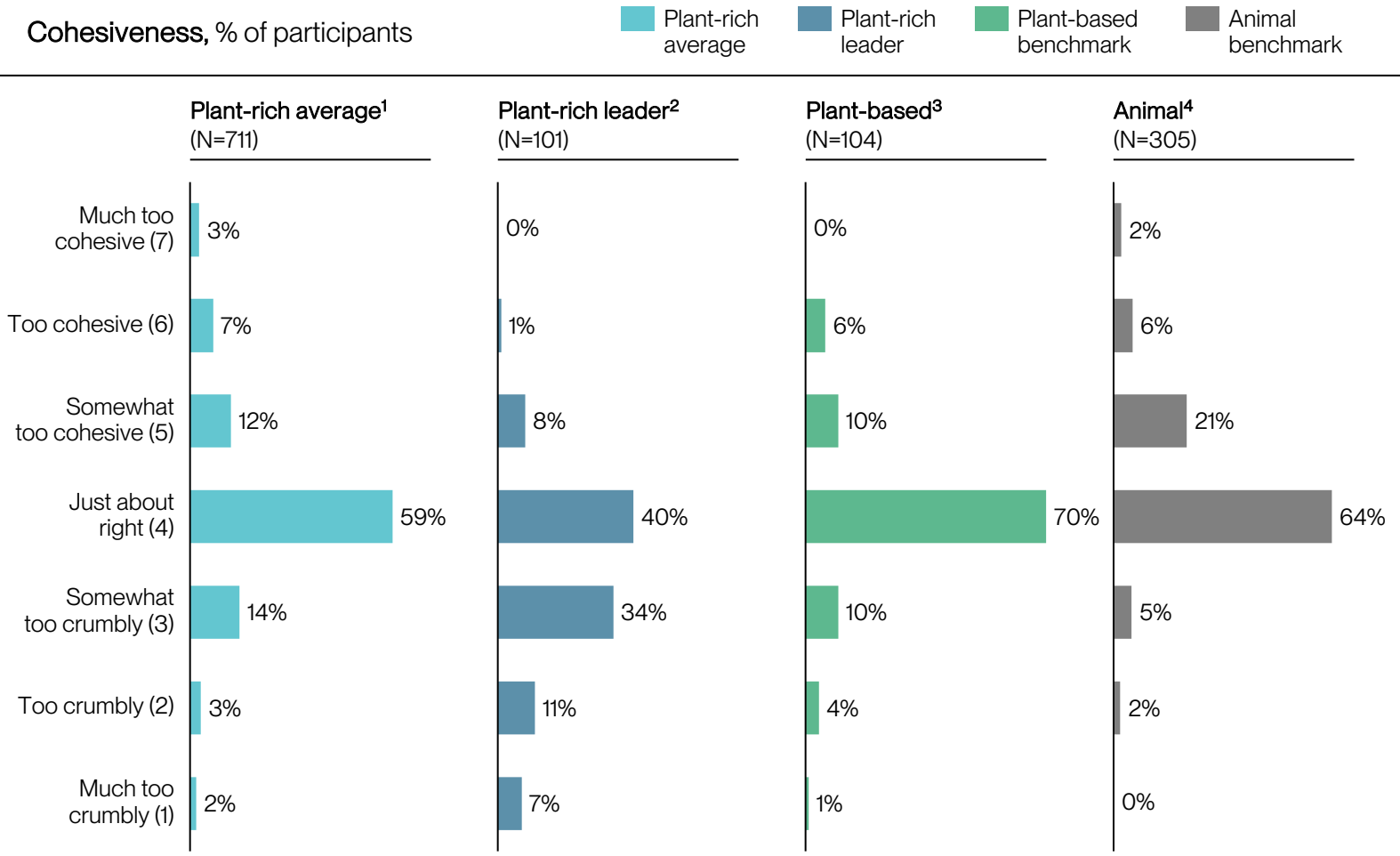
- The plant-rich average had a roughly even split between participants who found them too firm or too soft.

1. Aggregated across 7 commercially available plant-rich burger products.
2. The plant-rich product with the highest mean liking of those included in this test.
3. The top-performing plant-based burger identified by NECTAR during previous testing of plant-based burger (*Taste of Industry 2024*).
4. The highest retail sales volume animal burger selected for its representativeness of the animal burger category.

# **Burger:** Cohesiveness

How would you rate your COHESIVENESS of Burger XXX?

**Cohesiveness,** % of participants




# Takeaways

## Cohesiveness is a weakness for plant-rich

- Just 59% found the plant-rich average to be 'just about right' (versus 70% for the plant-based and 64% for the animal).

## The plant-rich leader was too crumbly

- 52% of participants found the plant-rich leader to be too crumbly.

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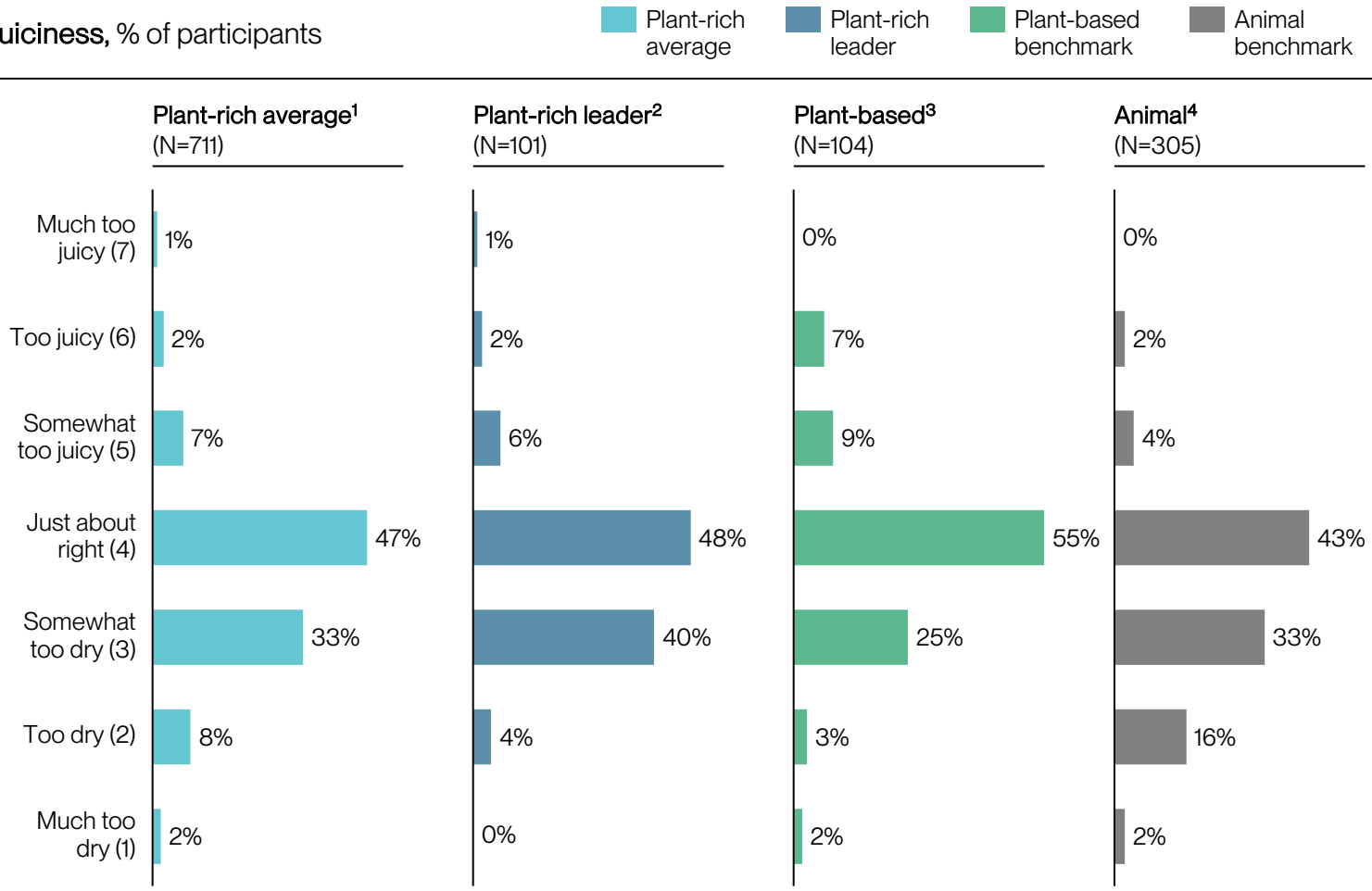
2. The plant-rich product with the highest mean liking of those included in this test.
3. The top-performing plant-based burger identified by NECTAR during previous testing of plant-based burger (*Taste of Industry 2024*).
4. The highest retail sales volume animal burger selected for its representativeness of the animal burger category.

# **Burger:** Juiciness

How would you rate your JUICINESS of Burger XXX?

**Juiciness,** % of participants




# Takeaways

## The plant-rich average and the plant-rich leader narrowly outperformed animal

- 47% of participants rated the plant-rich average 'just about right' compared to 43% for the animal.

## Juiciness is a clear opportunity for plant-rich products

- Only 48% of participants found the plant-rich leader to be 'just about right' compared to 55% of participants for the plant-based benchmark.

## Burgers in general were considered not juicy enough

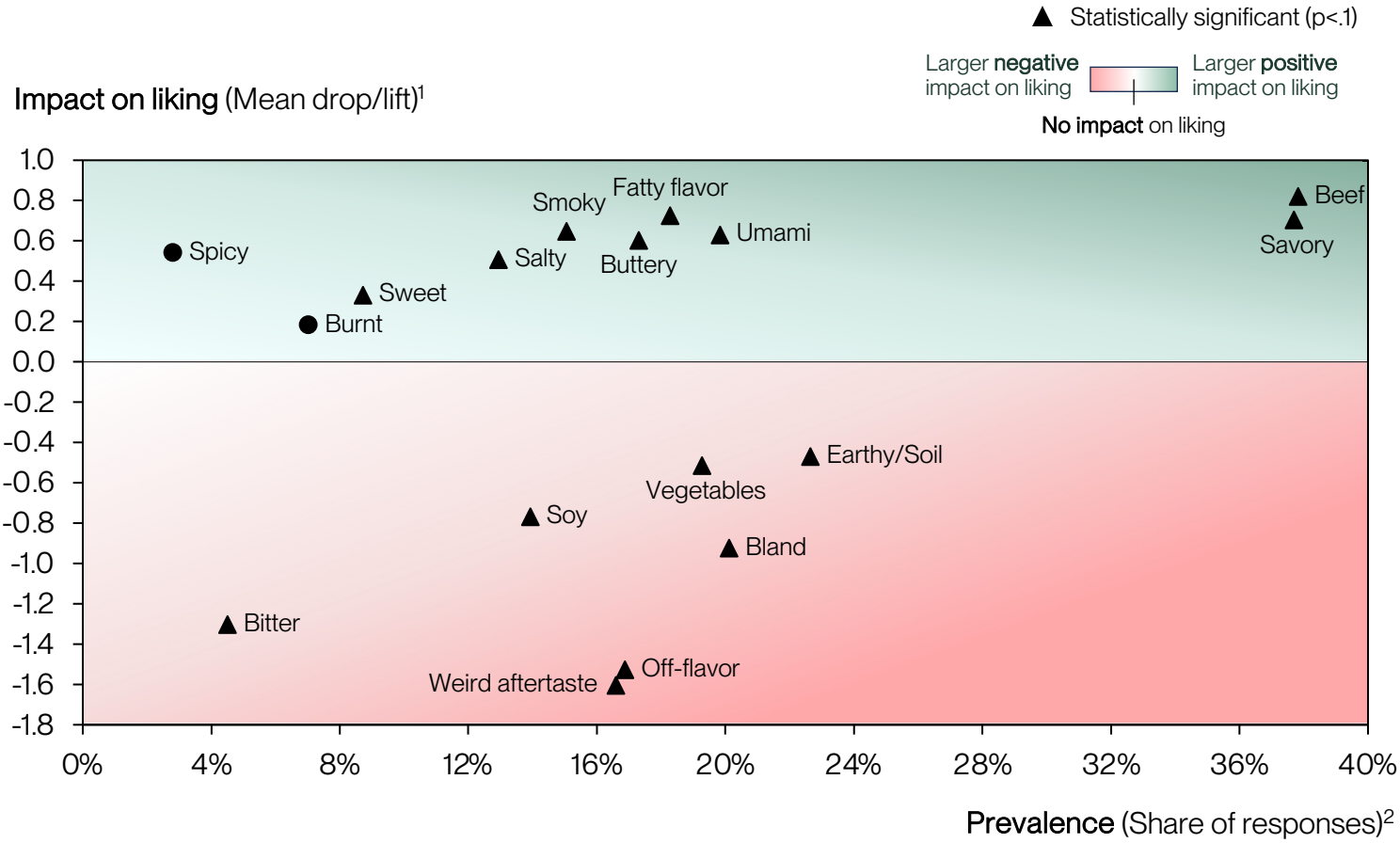
- All products were rated 'too dry' more often than 'too juicy.'

1. Aggregated across 7 commercially available plant-rich burger products.
2. The plant-rich product with the highest mean liking of those included in this test.
3. The top-performing plant-based burger identified by NECTAR during previous testing of plant-based burger (*Taste of Industry 2024*).
4. The highest retail sales volume animal burger selected for its representativeness of the animal burger category.

# **Burger:** Top Flavor R&D Opportunities

Prioritization framework for identifying attributes with large impacts on liking

**Penalty analysis on flavor using check-all-that-apply responses,** Mean drop/lift and Prevalence




# Takeaways

## Prioritize a salty, smoky, fatty, buttery, and umami taste profile to create a differentiated product

- These attributes were less common than 'beef' and 'savory' and had similar positive impacts to mean liking of 0.5-0.8pts.

## Avoid weird aftertastes and off-flavors

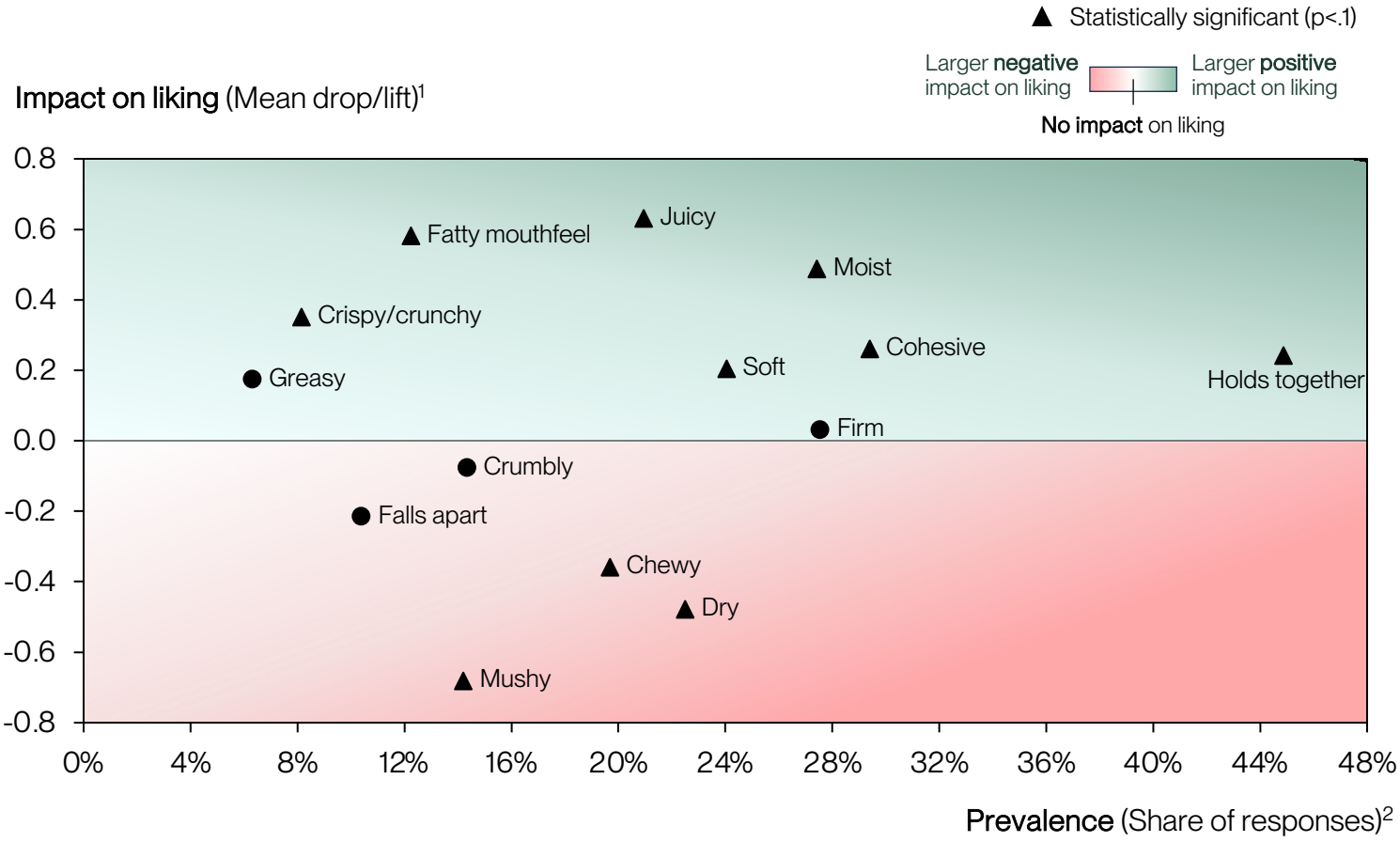
- These attributes were associated with the largest declines in liking of 1.5-1.6pts.

1. The average change in overall liking on 7pt scale for products for all responses using the relevant attribute as a descriptor compared to the mean liking for all products tested in this category. Calculated as mean liking of products with the associated response minus mean liking of all products for all responses.
2. Share of responses for all products in this category (including animal, plant-rich, and plant) in each direction for each attribute.

# **Burger:** Top Texture R&D Opportunities

Prioritization framework for identifying attributes with large impacts on liking

**Penalty analysis on texture using check-all-that-apply responses,** Mean drop/lift and Prevalence




# Takeaways

## Avoid mushy and dry textures

- Mushiness was correlated with the biggest drop in liking, at -0.7pts, followed by dryness and chewiness at -0.5pts and -0.4pts, respectively.

## Consumers enjoy juiciness, moistness, and fatty mouthfeel

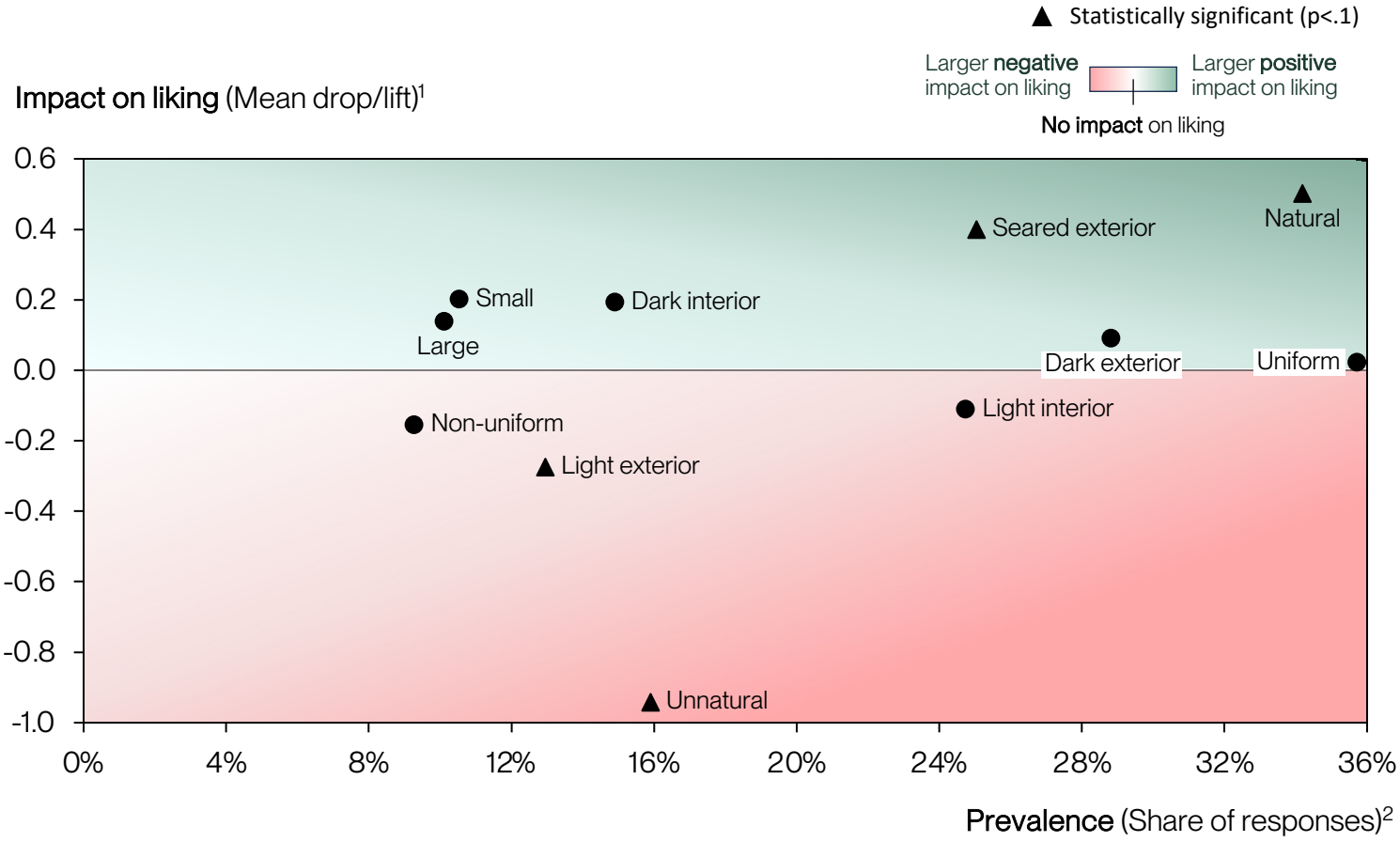
- These attributes are correlated with a 0.4-0.7pt increase in liking.

1. The average change in overall liking on 7pt scale for products for all responses using the relevant attribute as a descriptor compared to the mean liking for all products tested in this category. Calculated as mean liking of products with the associated response minus mean liking of all products for all responses.
2. Share of responses for all products in this category (including animal, plant-rich, and plant) in each direction for each attribute.

# **Burger:** Top Appearance R&D Opportunities

Prioritization framework for identifying attributes with large impacts on liking

**Penalty analysis on appearance using check-all-that-apply responses,** Mean drop/lift and Prevalence




## Takeaways

### Participants much prefer natural-looking products

- Natural appearance had a 0.5 lift to liking versus a -0.9 drop for an unnatural appearance, the largest negative impact across all appearance attributes.

### Darker burgers outperformed light ones

- Dark interiors and exteriors were each associated with an increase in liking, versus a drop in liking for light interiors and exteriors.

### Target a seared exterior in product development

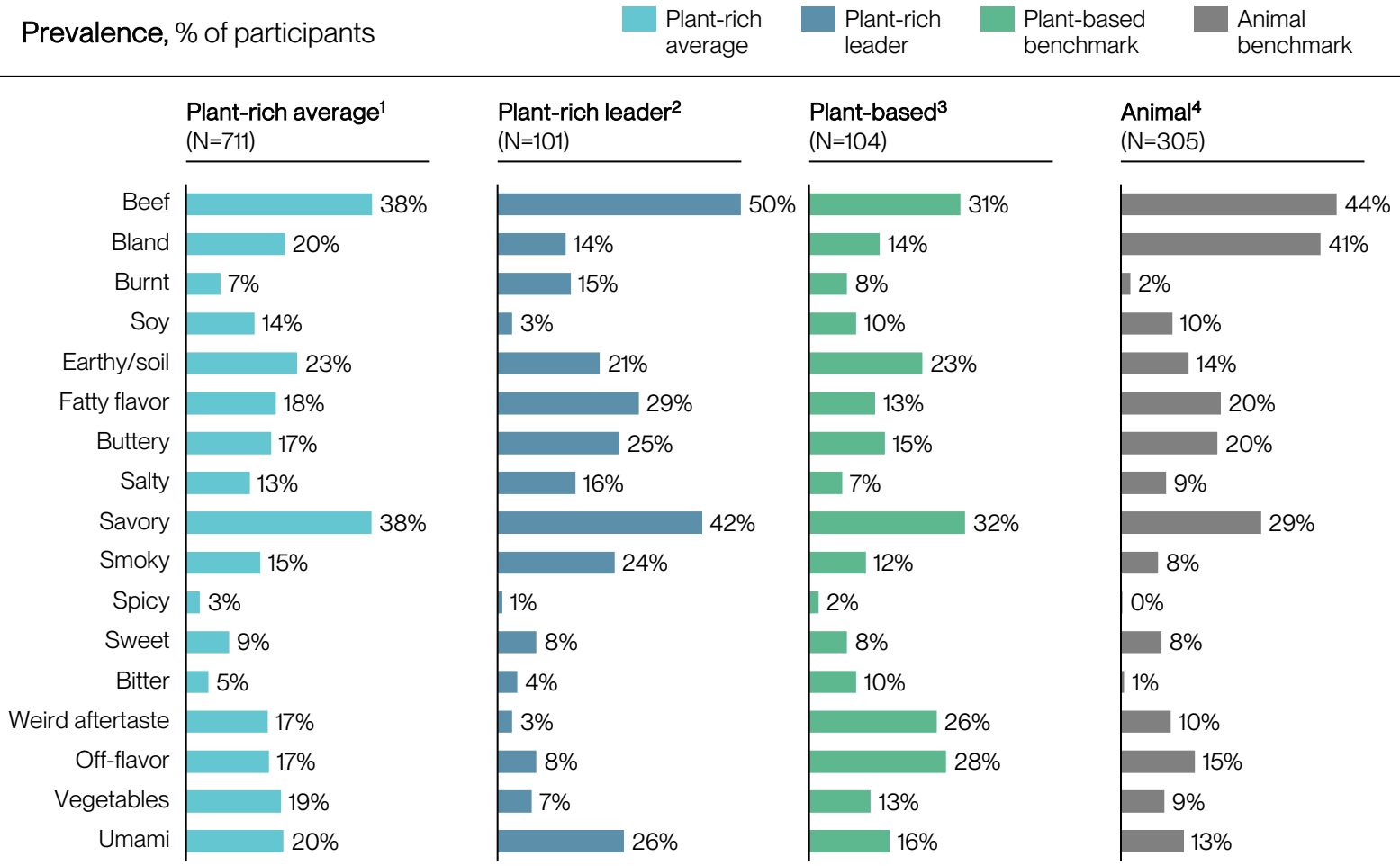
- A seared exterior was associated with an increase in liking of 0.4pts.

1. The average change in overall liking on 7pt scale for products for all responses using the relevant attribute as a descriptor compared to the mean liking for all products tested in this category. Calculated as mean liking of products with the associated response minus mean liking of all products for all responses.
2. Share of responses for all products in this category (including animal, plant-rich, and plant) in each direction for each attribute.

# **Burger:** Flavor Profile

Please check all words or phrases that describe the flavor of XXX.

**Prevalence,** % of participants




# Takeaways

## Plant-rich leader slightly ahead of animal on beef flavor

- 50% described plant-rich leader as having 'beef' flavor, compared to 44% for animal.

## Opportunity for plant-rich average to reduce undesirable flavors

- 17-19% reported 'weird aftertaste,' 'off-flavor,' or 'vegetables' (versus 3-8% for plant-rich leader).

## Plant-rich products beat animal and plant-based on savory flavor

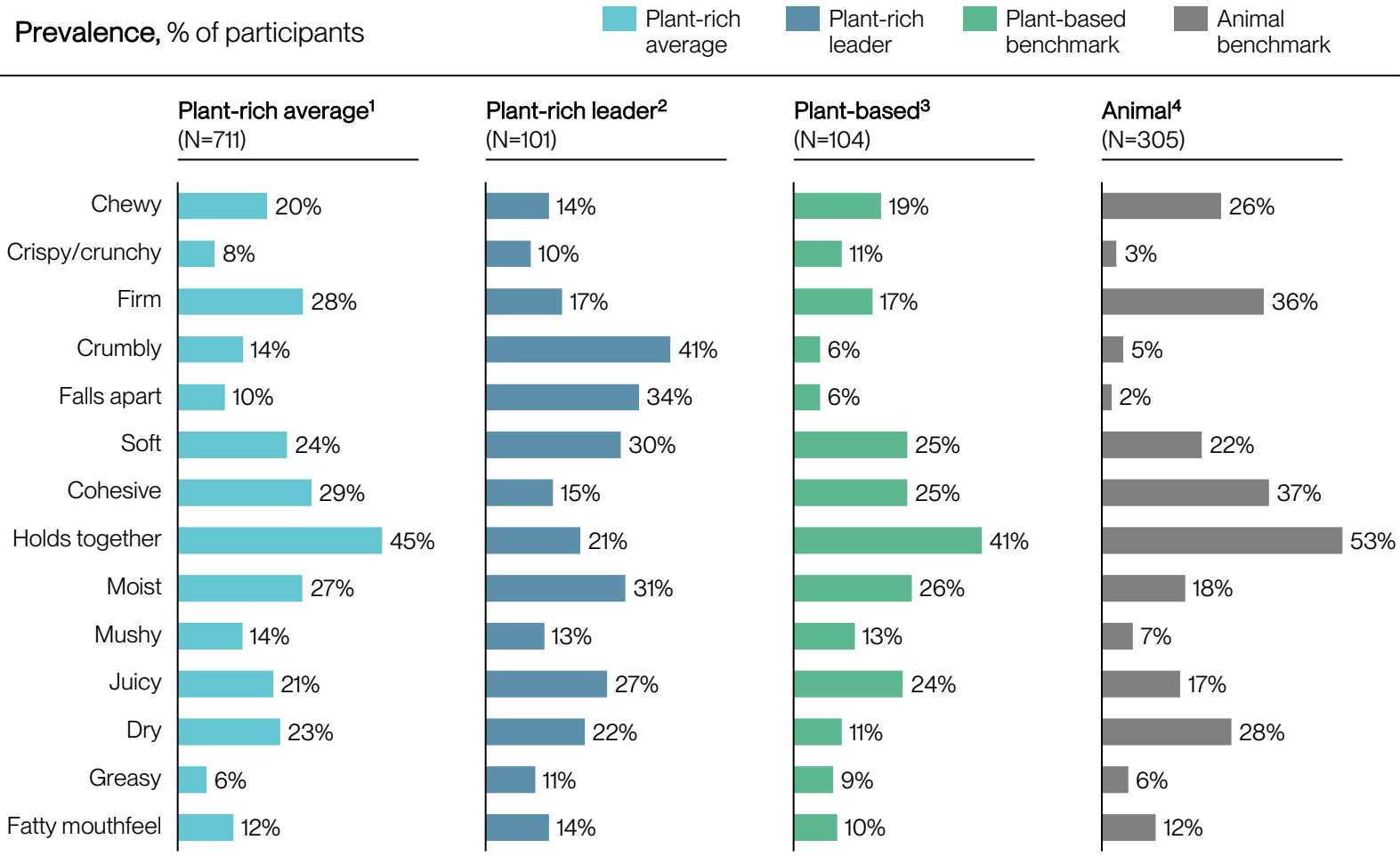
- 38% described plant-rich average as 'savory' (versus 29% for animal and 32% for plant-based).

1. Aggregated across 7 commercially available plant-rich burger products.
2. The plant-rich product with the highest mean liking of those included in this test.
3. The top-performing plant-based burger identified by NECTAR during previous testing of plant-based burger (*Taste of Industry 2024*).
4. The highest retail sales volume animal burger selected for its representativeness of the animal burger category.

# **Burger:** Texture Profile

Please check all words or phrases that describe the texture of XXX.

**Prevalence,** % of participants




# Takeaways

## Plant-rich average holds together better than plant-rich leader

- 45% described plant-rich average as 'holds together' (versus 21% for plant-rich leader).

## Plant-rich leader beats animal on juiciness

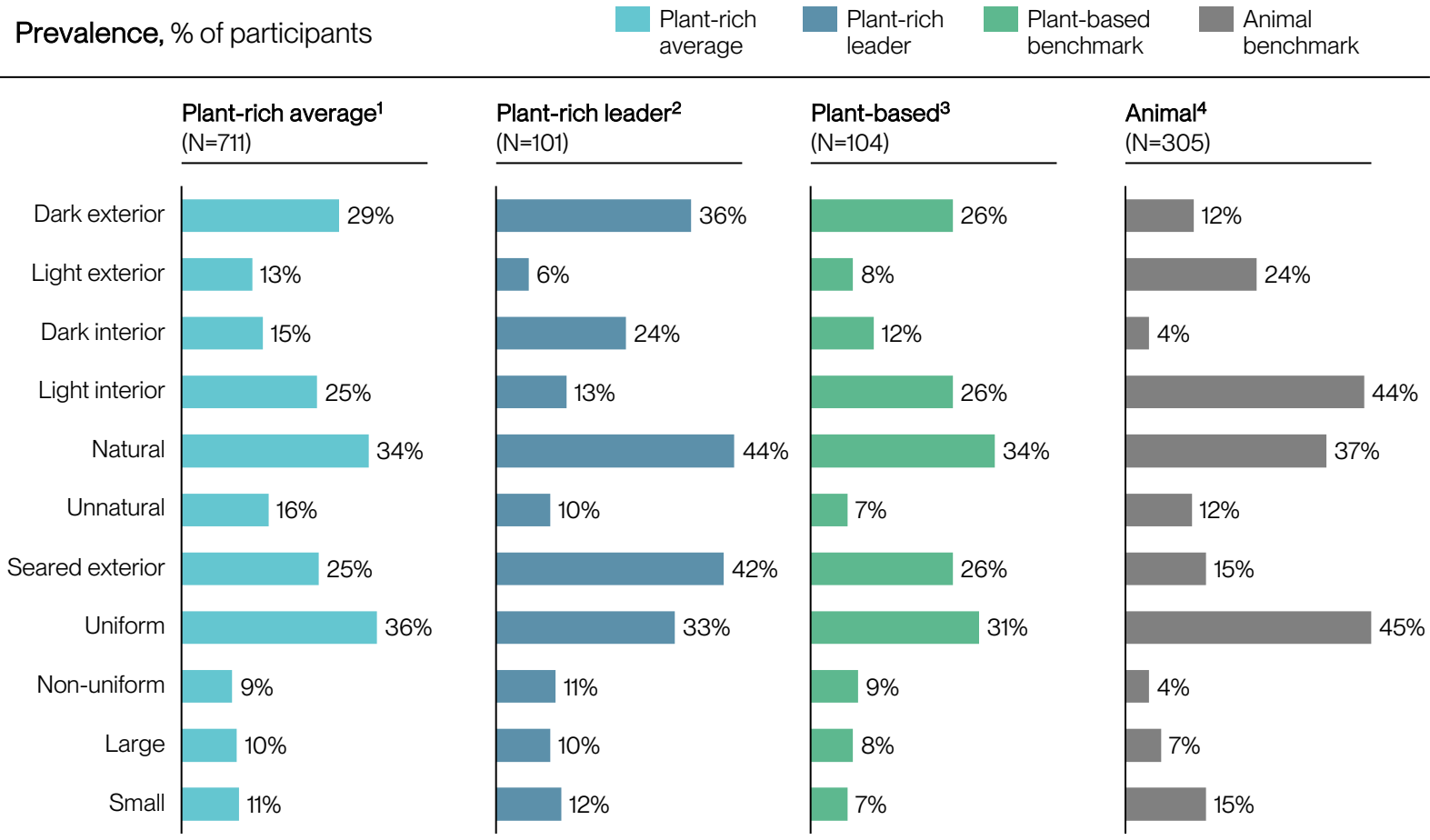
- 27% described plant-rich leader as 'juicy' (versus 17% for animal).

1. Aggregated across 7 commercially available plant-rich burger products.
2. The plant-rich product with the highest mean liking of those included in this test.
3. The top-performing plant-based burger identified by NECTAR during previous testing of plant-based burger (*Taste of Industry 2024*).
4. The highest retail sales volume animal burger selected for its representativeness of the animal burger category.

# **Burger:** Appearance Profile

Please check all words or phrases that describe the appearance of XXX.

**Prevalence,** % of participants




# Takeaways

## Plant-rich leader considered more natural looking

- 44% described the plant-rich leader as appearing ‘natural’ (associated with a 0.5pt increase in liking) versus 37% for animal.

## Plant-rich leader excels on seared exterior

- 42% described plant-rich leader as having ‘seared exterior’ (versus 15% for animal). ‘Seared exterior’ was associated with a 0.4pt increase in liking.

## Plant-rich average slightly ahead of leader on uniformity

- 36% described plant-rich average as ‘uniform’ (versus 33% for plant-rich leader and 45% for animal).

1. Aggregated across 7 commercially available plant-rich burger products.
2. The plant-rich product with the highest mean liking of those included in this test.
3. The top-performing plant-based burger identified by NECTAR during previous testing of plant-based burger (*Taste of Industry 2024*).
4. The highest retail sales volume animal burger selected for its representativeness of the animal burger category.

Category-Specific Deep Dive

# Hot Dog

# Hot Dog

## Executive summary of R&D opportunities

### Performance Overview

Plant-rich hot dogs were preferred over plant-based but fell short of the animal benchmark.

- **Plant-rich hot dog outperformed plant-based hot dog** – Average liking was 5.0pts for plant-rich (versus 4.7 for plant-based), driven by wins in flavor and texture.
- **Consumers preferred animal to plant-rich** – Only 43% of participants rated the plant-rich hot dog as 'like very much' or 'like' (compared to 65% for animal).
- **Animal performed better than plant-based across all sensory categories** – Animal had higher scores across similarity, flavor, texture, and appearance.

### Top Sensory Opportunities

Plant-rich hot dogs can be improved by increasing juiciness and fatty flavor, improving cohesion, and creating a more natural-looking product.

- **Plant-rich hot dogs don't appear natural enough** – Only 32% described the plant-rich hot dog as having a 'natural' appearance (versus 55% for animal).
- **Plant-rich hot dog needs to increase juiciness** – Only 56% rated juiciness 'just about right' (compared to 79% for animal).
- **Opportunity for plant-rich hot dog to improve cohesion** – 68% rated cohesiveness as 'just about right' (versus 82% for animal).
- **Increase fatty flavor** – Only 19% described plant-rich product as having 'fatty flavor' versus 32% for animal. ('Fatty flavor' was associated with a 0.6pt increase in liking.)

# Hot Dogs Tested

Hot dogs from one commercially available plant-rich hot dog brand were prepared according to manufacturer instructions on a flat-top and compared against animal and plant-based hot dogs.

Participants were screened to exclude consumers who do not eat animal-based meat and only include those who eat hot dogs at least every 1-2 months.

## Testing Environment

Participants tried the hot dogs at Flippin' Burger in San Francisco, a restaurant environment, in order to achieve an authentic, natural experience.

## Preparation

All hot dogs were prepared by restaurant staff using a flat-top according to manufacturer instructions. Participants were allowed to add condiments to keep the eating experience natural but were required to apply condiments consistently across all hot dogs.

## Dish Served

All participants were served three hot dogs in trays. While they ate, participants filled out a survey via mobile phone detailing their experience with each product. Products were evaluated in a randomized order.

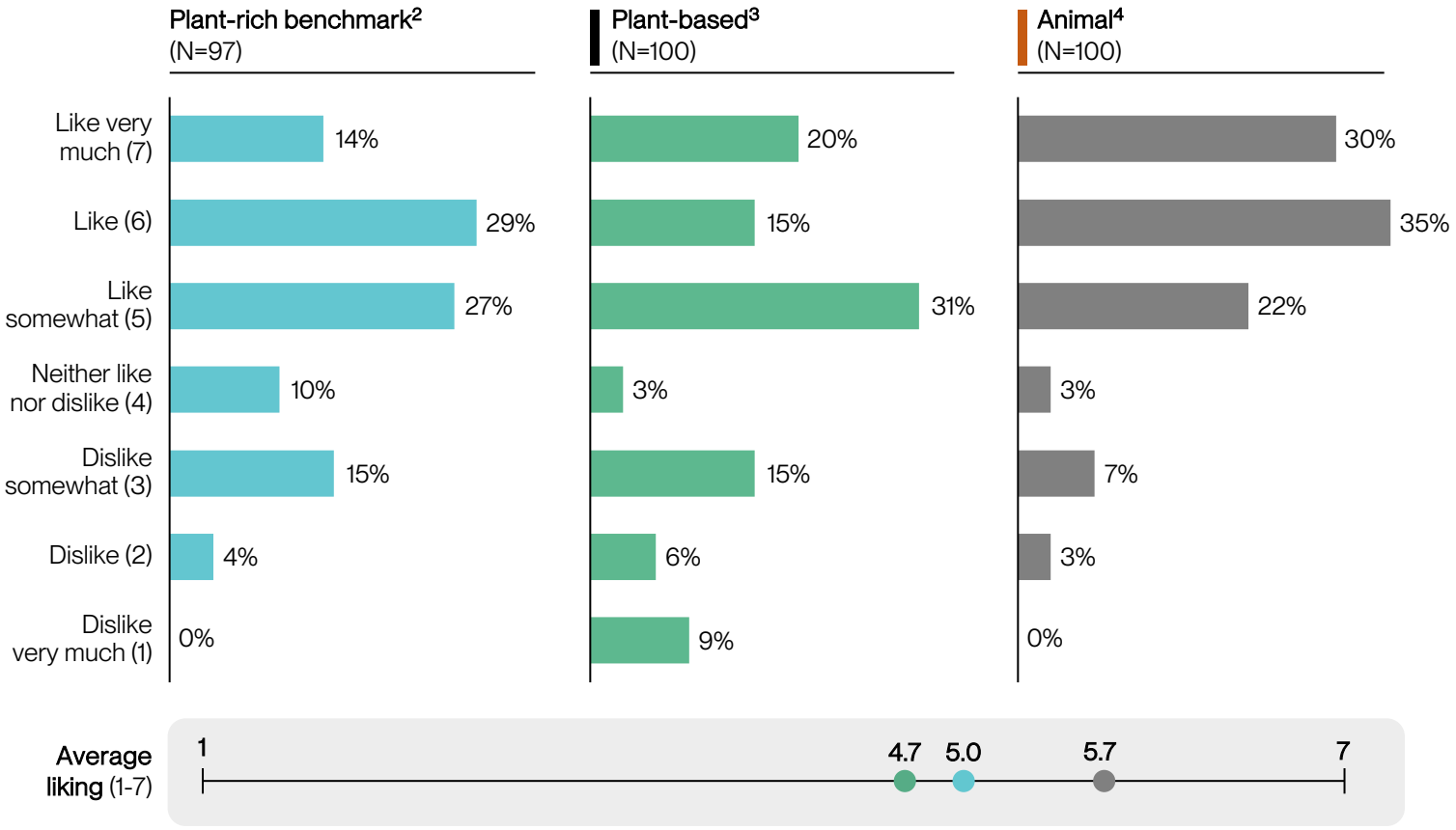
# **Hot Dog:** Overall Liking

How would you rate your OVERALL LIKING of hot dog XXX?

**Overall liking,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)







# Takeaways

## Consumers preferred animal hot dog to plant-rich

- Only 43% of participants rated the plant-rich hot dog as 'like very much' or 'like,' compared to 65% for animal (p<0.05).

## Consumers preferred plant-rich hot dog to plant-based

- Average liking was 5.0pts for plant-rich versus 4.7 for plant-based (p<0.01).

1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. 1 commercially available plant-rich hot dog product.
3. The top-performing plant-based hot dog identified by NECTAR during previous testing of plant-based hot dogs (*Taste of Industry 2024*).
4. The highest retail sales volume animal hot dog selected for its representativeness of the hot dog category.

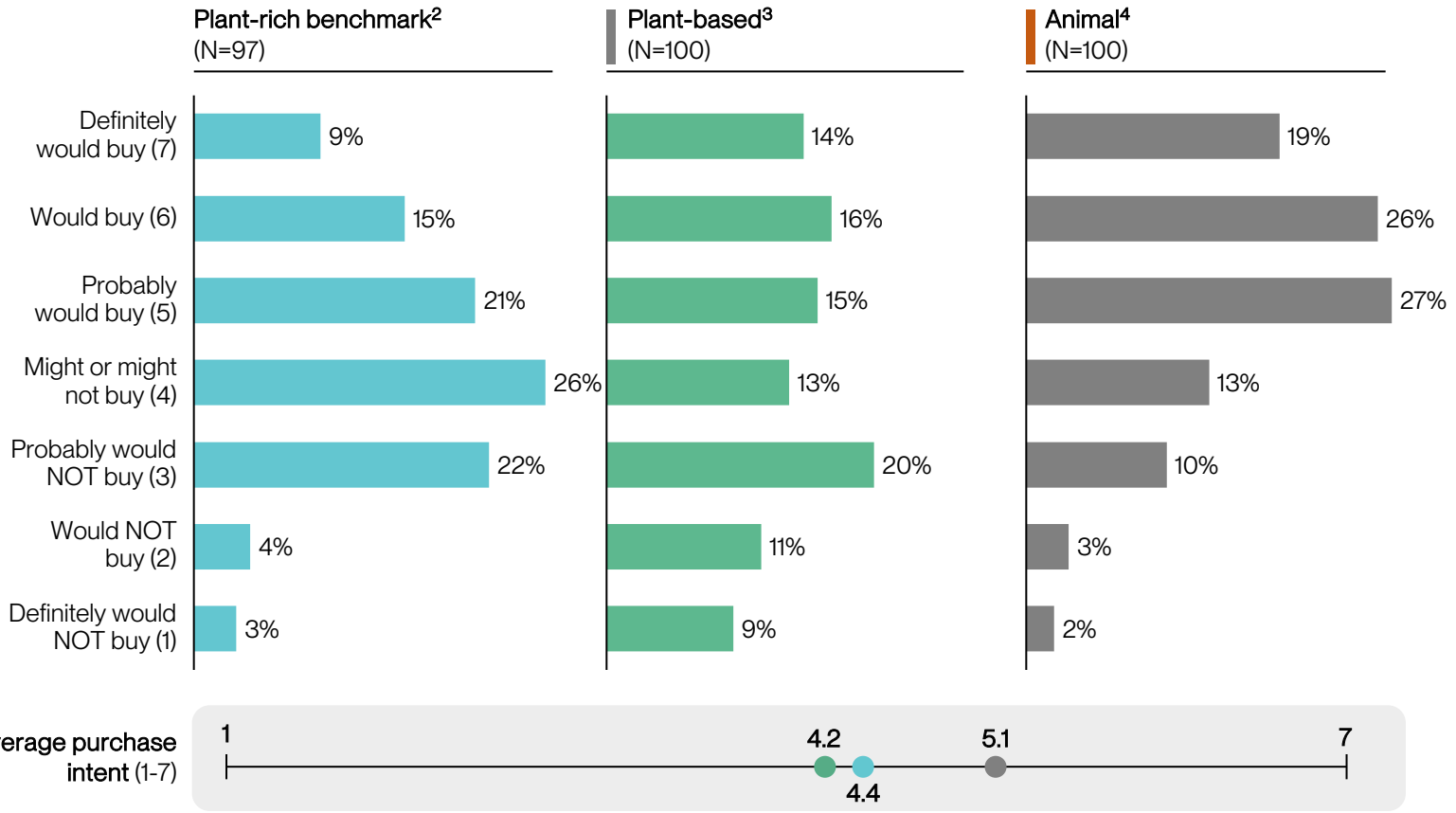
# **Hot Dog:** Purchase Intent

How would you rate your PURCHASE INTENT of hot dog XXX?

**Purchase intent,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)







# Takeaways

## Plant-rich hot dog had lower purchase intent compared to animal

- 24% of participants indicated they would purchase the plant-rich hot dog (versus 45% for animal).

## Similar purchase intent between plant-rich and plant-based

- Plant-rich had purchase intent of 4.4pts compared to 4.2 for plant-based.

1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. 1 commercially available plant-rich hot dog product.
3. The top-performing plant-based hot dog identified by NECTAR during previous testing of plant-based hot dogs (*Taste of Industry 2024*).
4. The highest retail sales volume animal hot dog selected for its representativeness of the hot dog category.

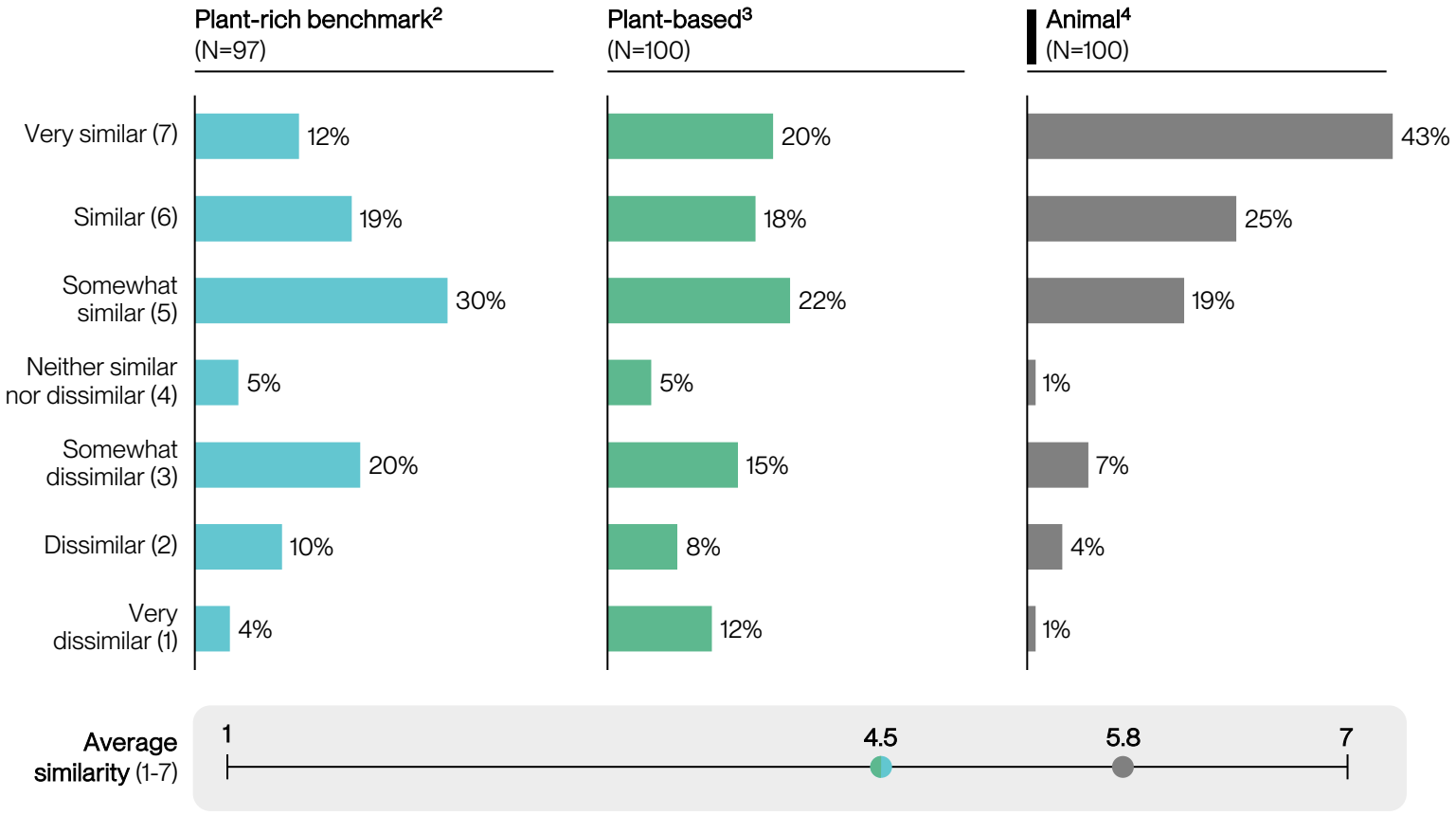
# **Hot Dog:** Similarity

How would you rate your SIMILARITY of XXX to a typical hot dog?

**Similarity,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)







# Takeaways

## Plant-rich hot dog was perceived as less 'similar' to typical hot dog compared to the animal product

- 31% of participants found the plant-rich hot dog to be 'similar' to a typical hot dog (versus 68% for animal).

## Plant-rich hot dog matched plant-based in overall 'similarity'

- Both groups showed an average similarity of 4.5.

1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. 1 commercially available plant-rich hot dog product.
3. The top-performing plant-based hot dog identified by NECTAR during previous testing of plant-based hot dogs (*Taste of Industry 2024*).
4. The highest retail sales volume animal hot dog selected for its representativeness of the hot dog category.

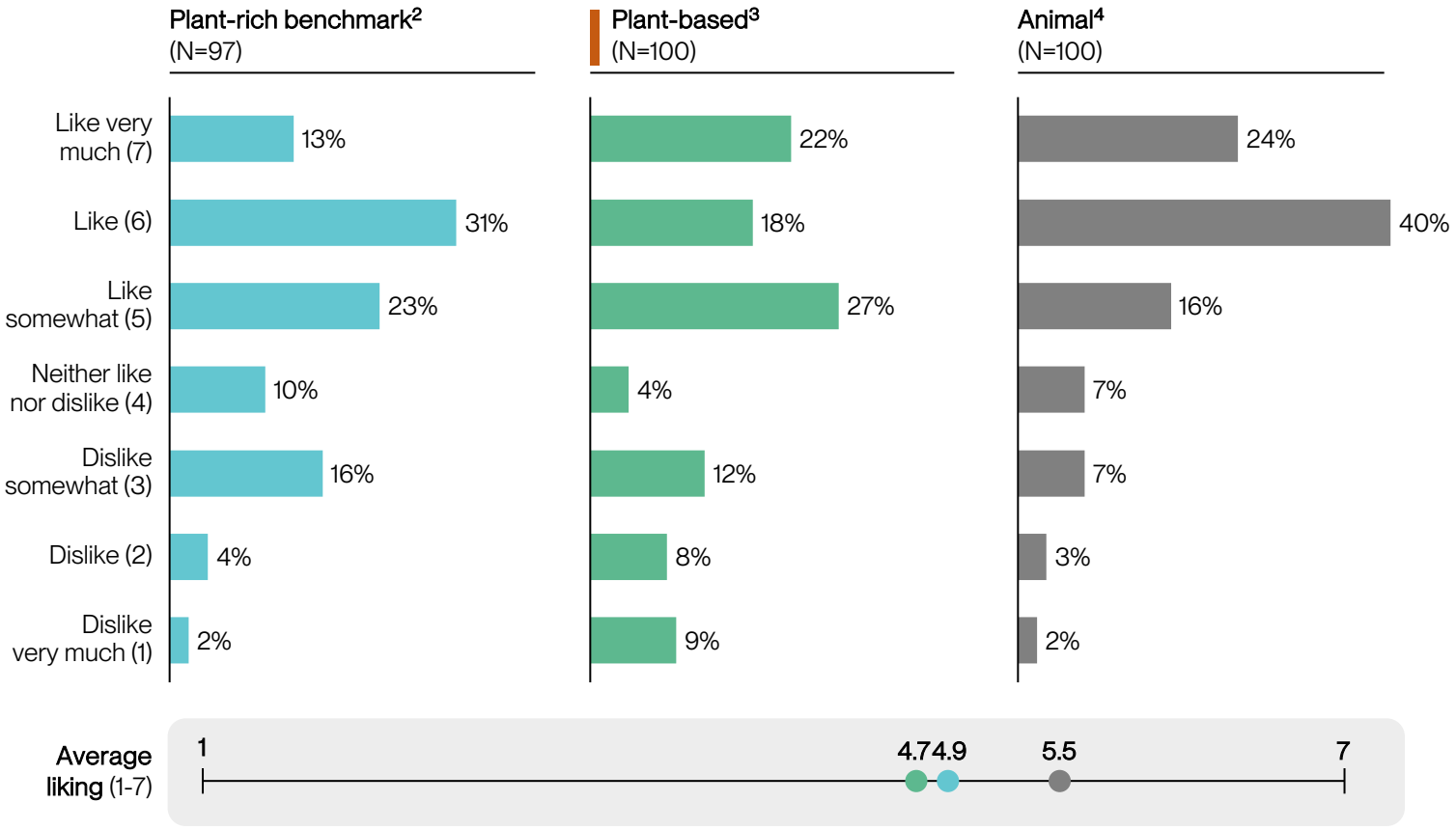
# **Hot Dog:** Flavor

How would you rate your FLAVOR of hot dog XXX?

**Flavor,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)







# Takeaways

## Flavor is a significant area of opportunity for plant-rich hot dog

- Only 44% of participants liked the plant-rich flavor (versus 64% for animal).

## Plant-rich slightly ahead of plant-based on flavor

- Plant-rich exceeds plant-based by 0.2pts on average liking (p<0.5).

1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. 1 commercially available plant-rich hot dog product.
3. The top-performing plant-based hot dog identified by NECTAR during previous testing of plant-based hot dogs (*Taste of Industry 2024*).
4. The highest retail sales volume animal hot dog selected for its representativeness of the hot dog category.

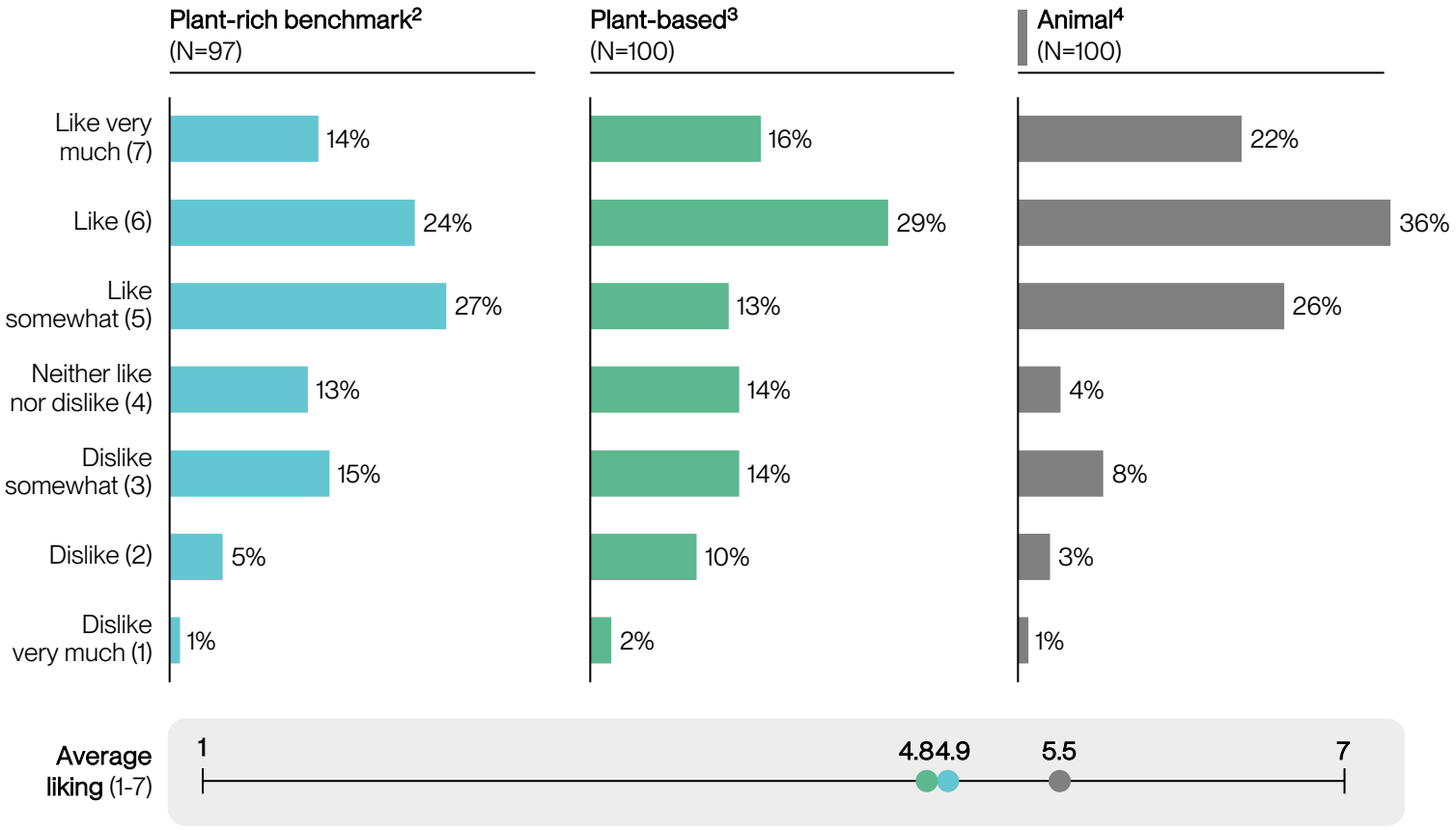
# **Hot Dog:** Texture

How would you rate your TEXTURE of hot dog XXX?

**Texture,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)




## Takeaways

### Plant-rich product shows similar texture performance to plant-based

- Average liking of texture was 4.9pts for plant-rich (versus 4.8pts for plant-based).

### Plant-rich hot dog lags behind animal in texture

- 38% of participants reported liking the texture of the plant-rich hot dog (versus 58% for animal benchmark).

1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. 1 commercially available plant-rich hot dog product.
3. The top-performing plant-based hot dog identified by NECTAR during previous testing of plant-based hot dogs (*Taste of Industry 2024*).
4. The highest retail sales volume animal hot dog selected for its representativeness of the hot dog category.

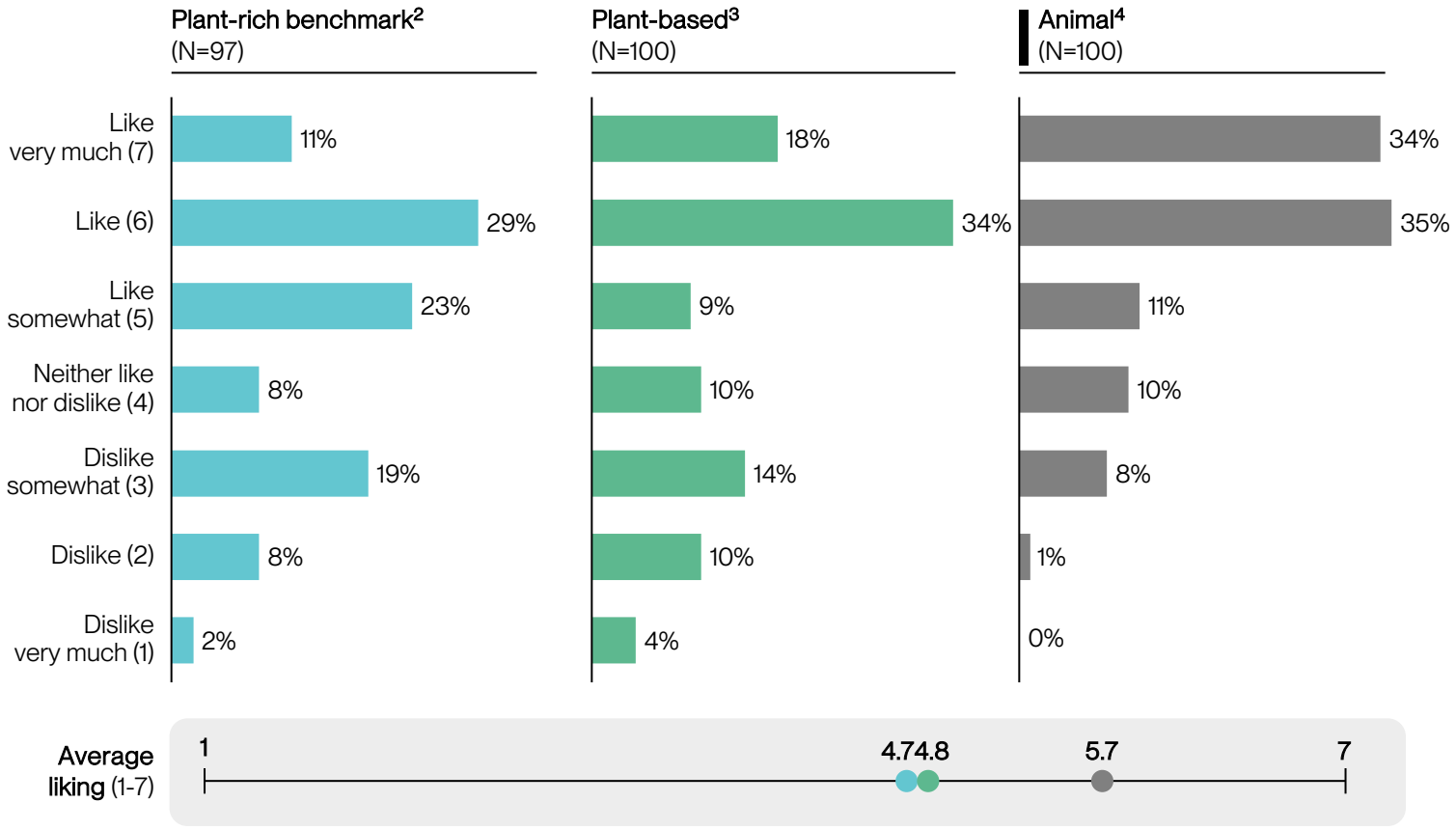
# **Hot Dog:** Appearance

How would you rate your APPEARANCE of hot dog XXX?

**Appearance,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)







# Takeaways

## The plant-rich hot dog is behind on appearance

- Only 40% of participants rated the texture of the hot dog as ‘like’ or ‘like very much’ (versus 69% for animal).

## Plant-rich hot dog scored similarly to plant-based hot dog

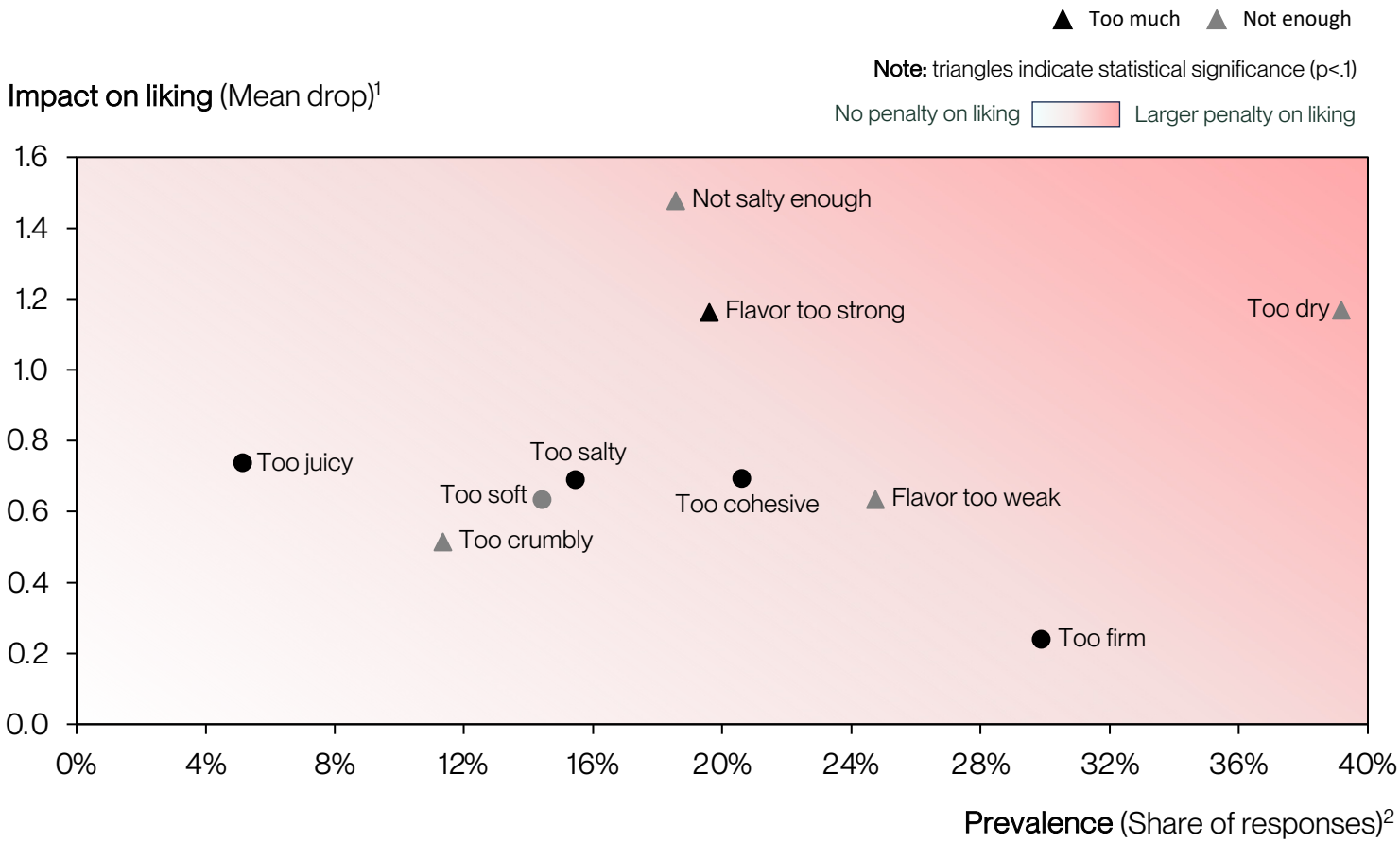
- Average appearance liking of 4.7pts compared to 4.8pts for plant-based.

1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. 1 commercially available plant-rich hot dog product.
3. The top-performing plant-based hot dog identified by NECTAR during previous testing of plant-based hot dogs (*Taste of Industry 2024*).
4. The highest retail sales volume animal hot dog selected for its representativeness of the hot dog category.

# **Hot Dog:** Top R&D Opportunities

Prioritization framework for identifying attributes with large impacts on liking

**Penalty analysis using responses on 'just-about-right' questions,** Mean drop and Prevalence




## Takeaways

### Dryness has a critical impact on overall liking

- 'Too dry' was the most prevalent attribute (~38%) and had a large negative impact on liking (1.2pt drop).

### Consumers cared about saltiness level

- 'Not salty enough' was associated with 1.5pt drop in liking.

### Important to get flavor levels right

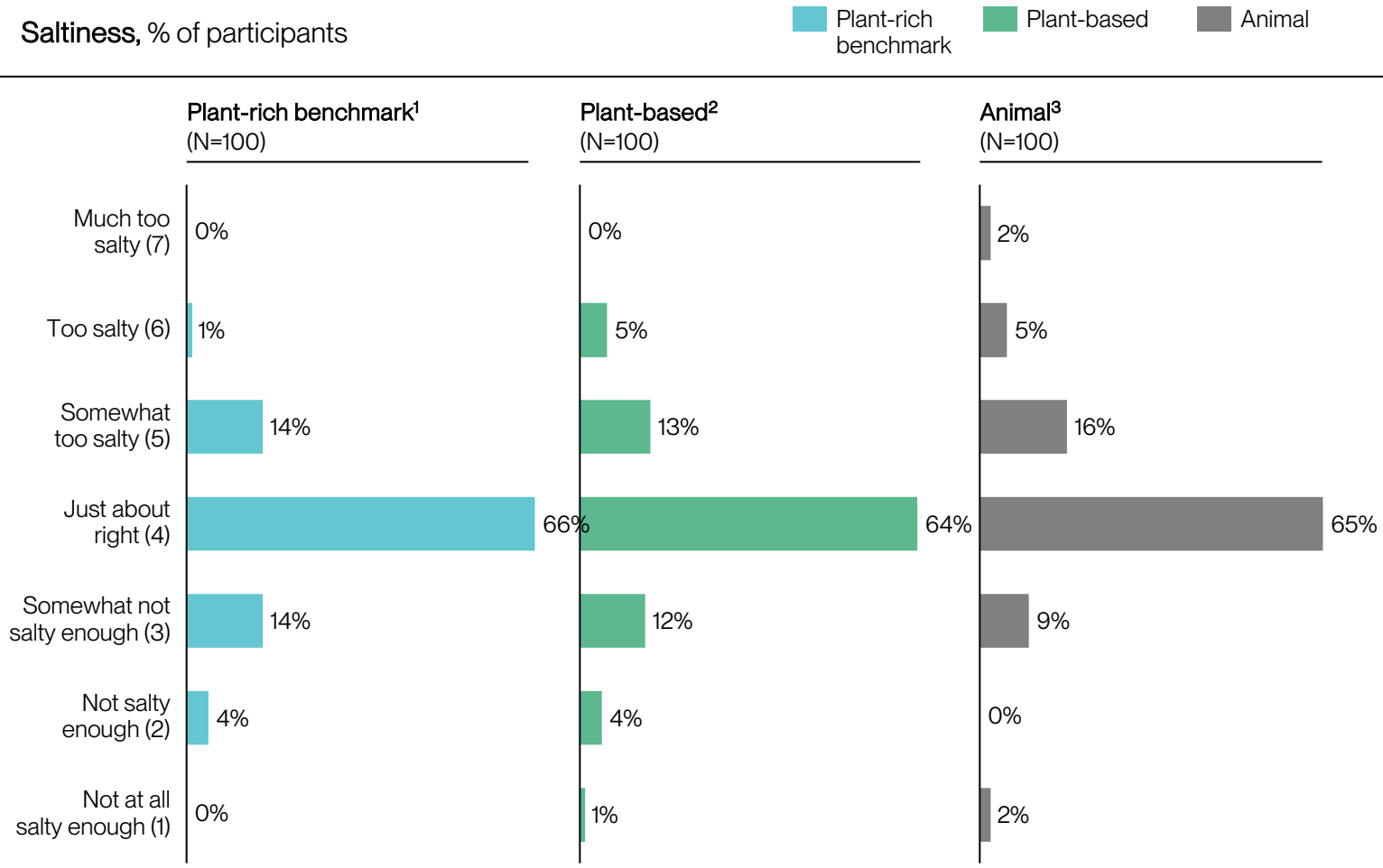
- 'Too strong' and 'too weak' flavors associated with drops in liking (1.2pts and 0.6pts).

1. The average change in overall liking on 7pt scale for products for all responses using the relevant attribute as a descriptor compared to the mean liking for all products rated 'just about right' on that attribute. Calculated as Mean Liking (JAR) minus Mean Liking (descriptor used).
2. Share of responses for all plant-rich products in this category in each direction for each attribute.

# **Hot Dog:** Saltiness

How would you rate your SALTINESS of hot do] XXX?

**Saltiness,** % of participants




## Takeaways

### Plant-rich product matched animal and plant-based on saltiness

- 66% found saltiness 'just about right' compared to 65% for animal and 64% for plant-based.

### Saltiness should be a priority

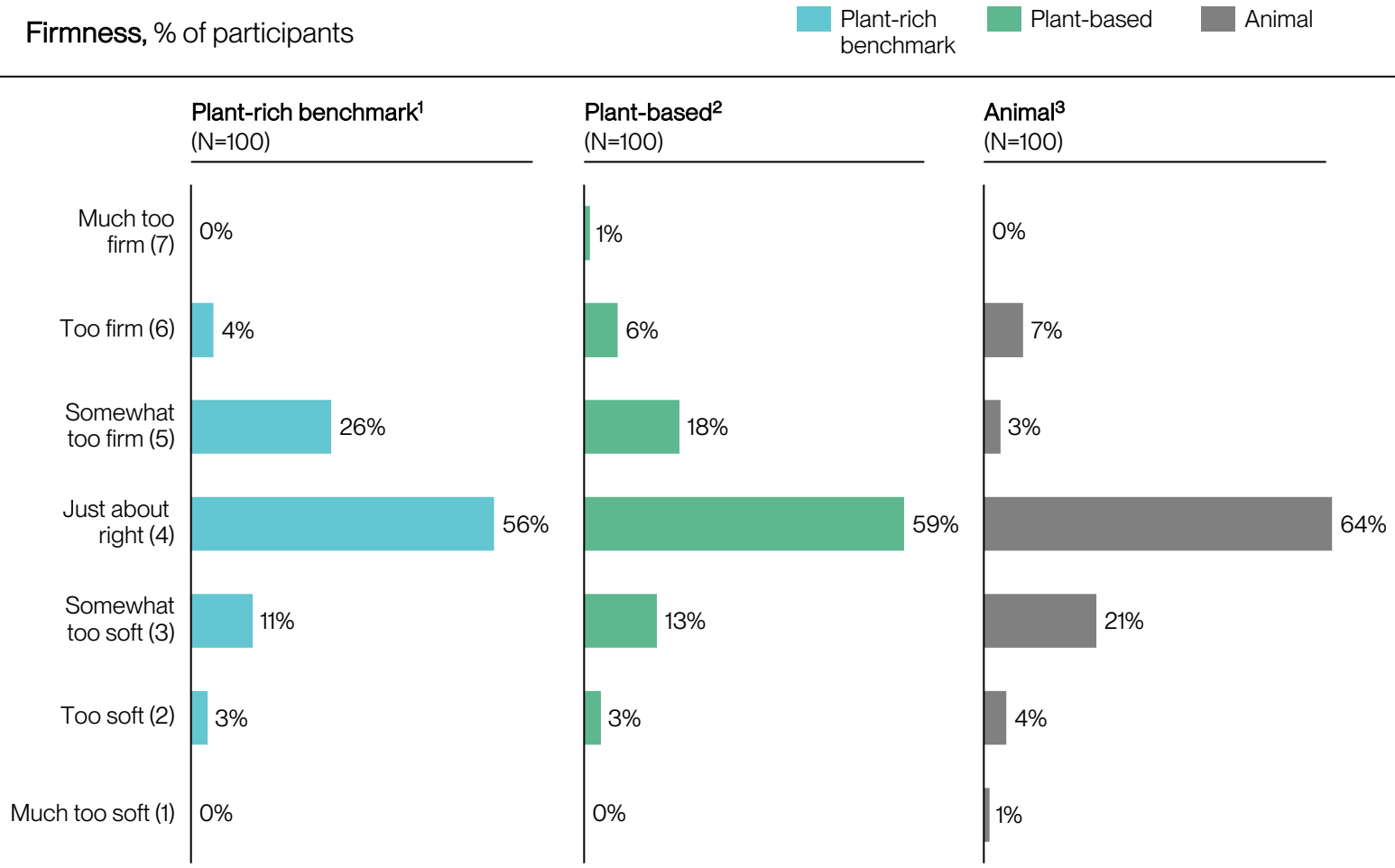
- 'Not salty enough' had a 1.5pt drop to liking, the largest of any sensory attribute.

1. 1 commercially available plant-rich hot dog product.
2. The top-performing plant-based hot dog identified by NECTAR during previous testing of plant-based hot dogs (*Taste of Industry 2024*).
3. The highest retail sales volume animal hot dog selected for its representativeness of the hot dog category.

# **Hot Dog:** Firmness

How would you rate your FIRMNESS of hot dog XXX?

**Firmness,** % of participants




## Takeaways

### Plant-rich hot dog should improve firmness slightly

- 56% rated firmness as 'just about right' (versus 59% for plant-based and 64% for animal).

### Plant-rich products should reduce firmness

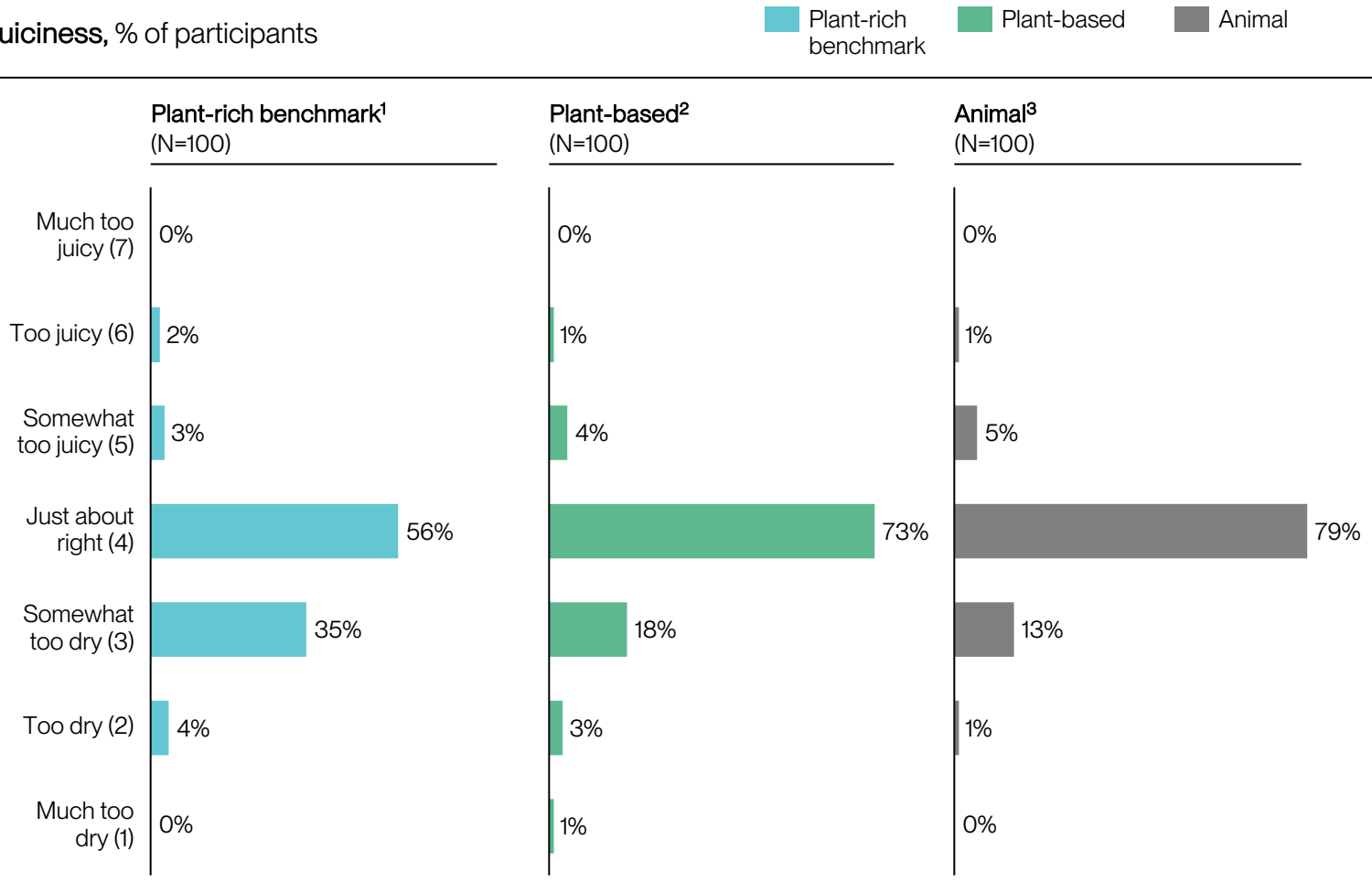
- 30% rated plant-rich product as 'too firm' versus 14% for 'too soft.'

1. 1 commercially available plant-rich hot dog product.
2. The top-performing plant-based hot dog identified by NECTAR during previous testing of plant-based hot dogs (*Taste of Industry 2024*).
3. The highest retail sales volume animal hot dog selected for its representativeness of the hot dog category.

# **Hot Dog:** Juiciness

How would you rate your JUICINESS of hot dog XXX?

**Juiciness,** % of participants




## Takeaways

### Plant-rich hot dog should focus on juiciness in product development process

- Only 56% rated juiciness 'just about right' compared to 79% for animal.

### Plant-rich hot dog were too dry

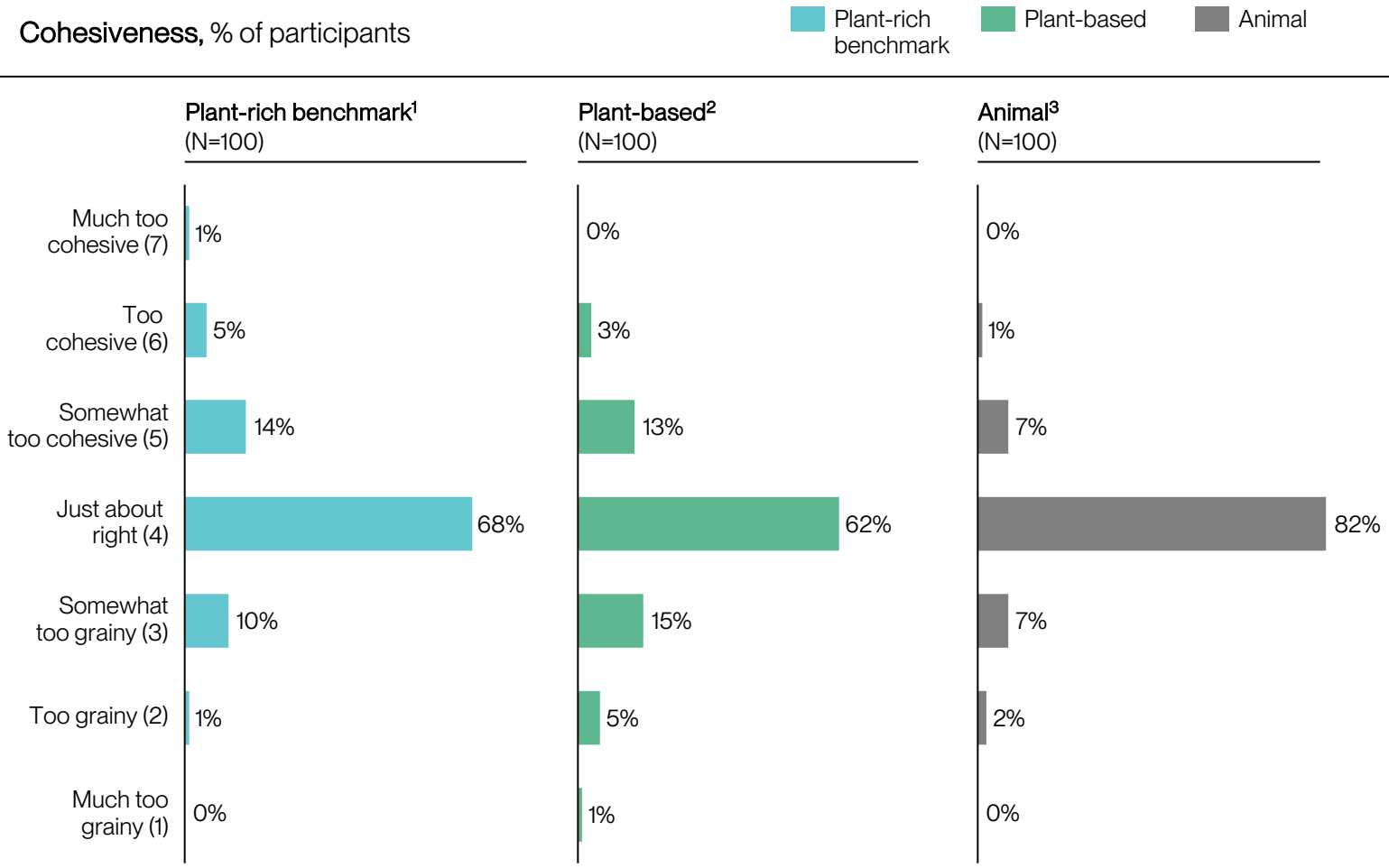
- 39% rated plant-rich product as 'too dry' versus 5% for 'too juicy.' 'Too dry' was associated with a drop in liking of 1.2pts, while 'too juicy' was only -0.8pts.

1. 1 commercially available plant-rich hot dog product.
2. The top-performing plant-based hot dog identified by NECTAR during previous testing of plant-based hot dogs (*Taste of Industry 2024*).
3. The highest retail sales volume animal hot dog selected for its representativeness of the hot dog category.

# **Hot Dog:** Cohesiveness

How would you rate your COHESIVENESS of hot dog XXX?

**Cohesiveness,** % of participants




## Takeaways

### Opportunity for plant-rich hot dog to improve cohesion

- 68% rated cohesiveness as 'just about right' (versus 82% for animal).

### Plant-rich hot dog slightly ahead of plant-based on cohesiveness

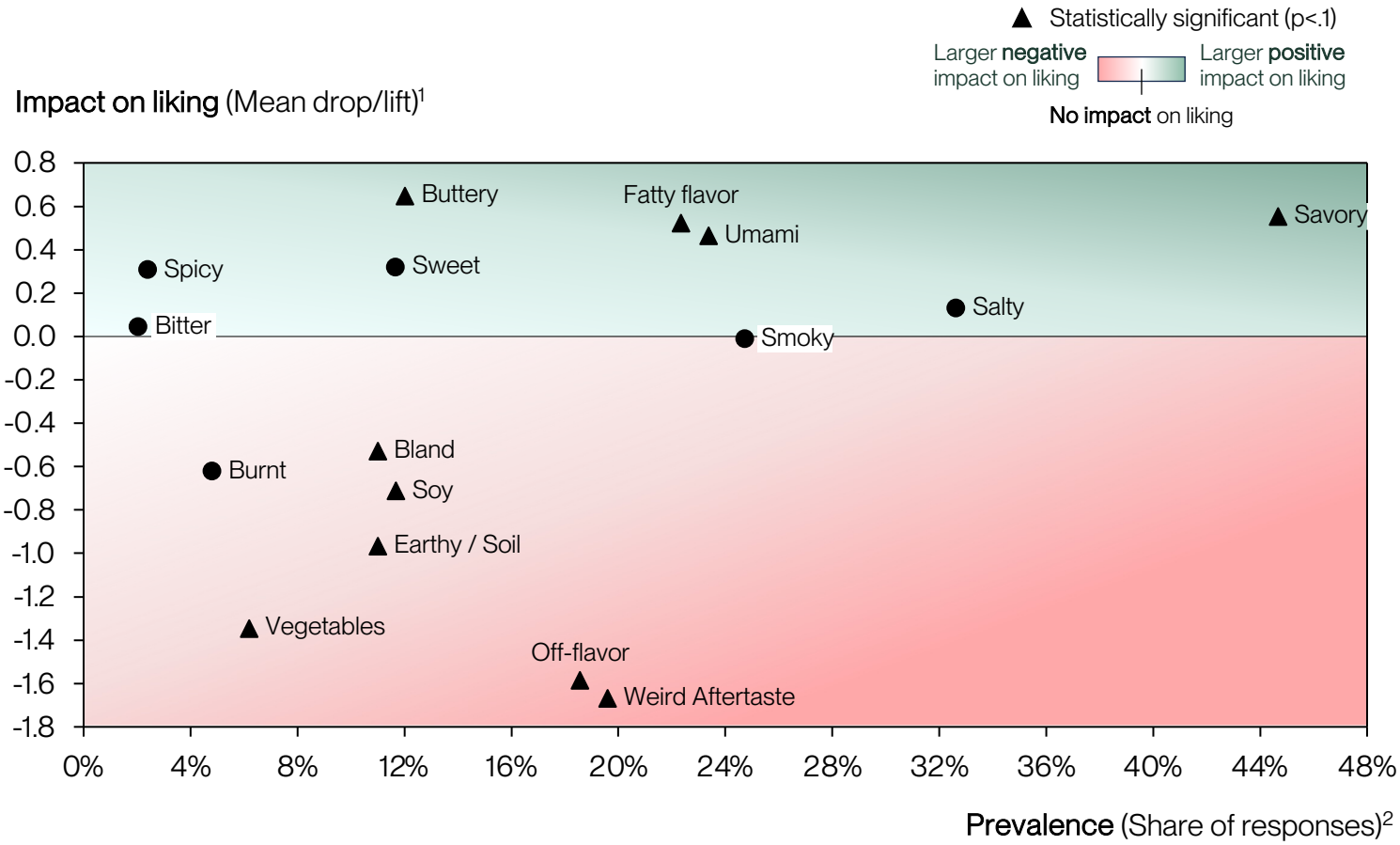
- 68% rated cohesiveness as 'just about right' (versus 62% for plant-based).

1. 1 commercially available plant-rich hot dog product.
2. The top-performing plant-based hot dog identified by NECTAR during previous testing of plant-based hot dogs (*Taste of Industry 2024*).
3. The highest retail sales volume animal hot dog selected for its representativeness of the hot dog category.

# **Hot Dog:** Top Flavor R&D Opportunities

Prioritization framework for identifying attributes with large impacts on liking

**Penalty analysis on flavor using check-all-that-apply responses,** Mean drop/lift and Prevalence




## Takeaways

### Enhance savory, fatty, and umami flavors to boost overall liking

- These flavors are associated with increases in liking of 0.4-0.8pts (p <.1).

### Introducing more buttery flavors can improve liking

- 'Buttery' flavor had the highest positive impact to liking.

### Avoiding off-flavor and weird aftertaste is critical

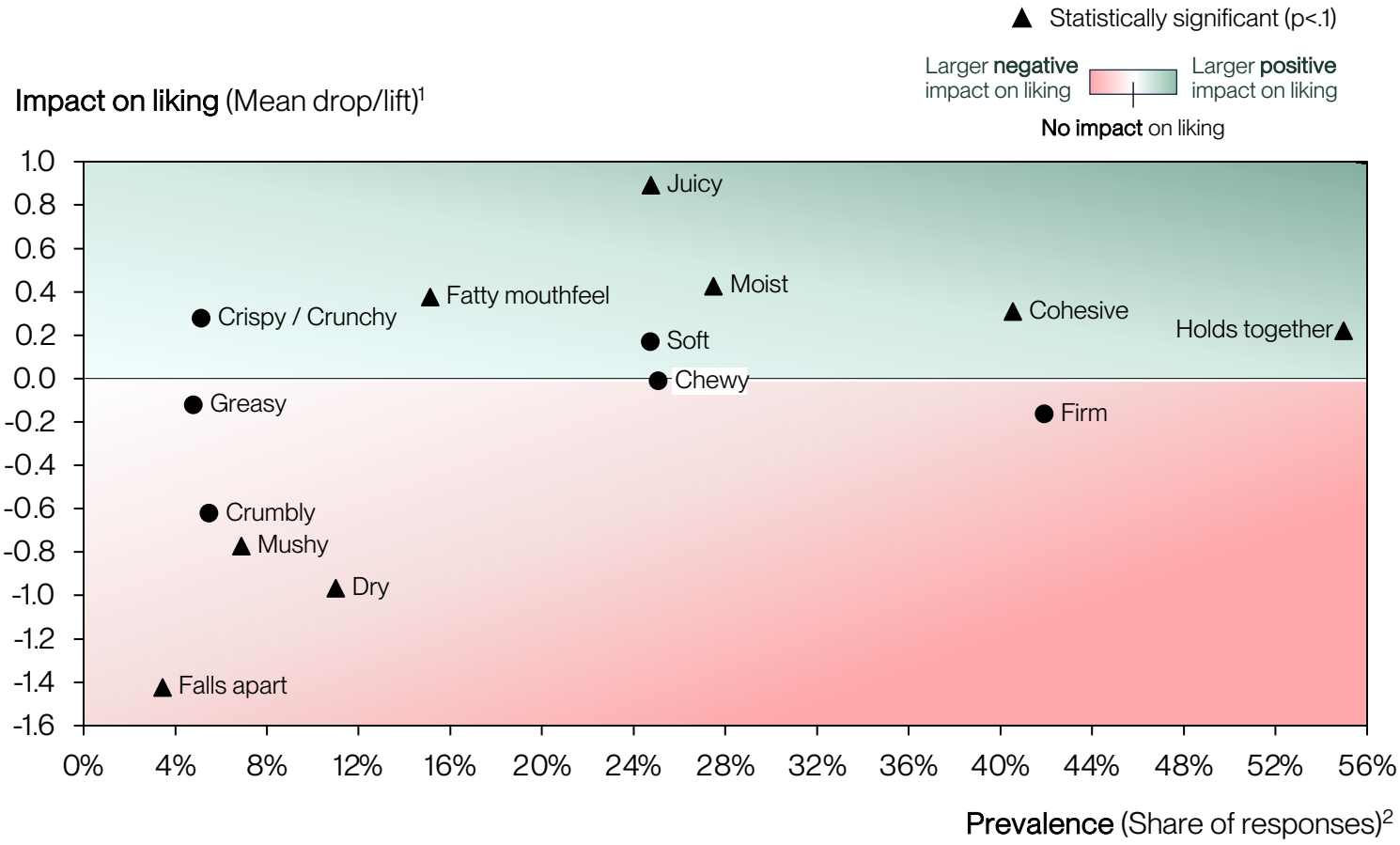
- 'Off-flavor' and 'weird aftertaste' associated with 1.6-1.8pt drops in liking (p<.1).

1. The average change in overall liking on 7pt scale for products for all responses using the relevant attribute as a descriptor compared to the mean liking for all products rated 'just about right' on that attribute. Calculated as Mean Liking (JAR) minus Mean Liking (descriptor used).
2. Share of responses for all products in this category (including animal, plant-rich, and plant) in each direction for each attribute.

# **Hot dog:** Top Texture R&D Opportunities

Prioritization framework for identifying attributes with large impacts on liking

**Penalty analysis on texture using check-all-that-apply responses,** Mean drop/lift and Prevalence




# Takeaways

## Focus on improving juiciness

- 'Juicy' texture has the strongest positive impact on liking of any texture attribute.

## Avoid mushy, dry, and noncohesive texture issues

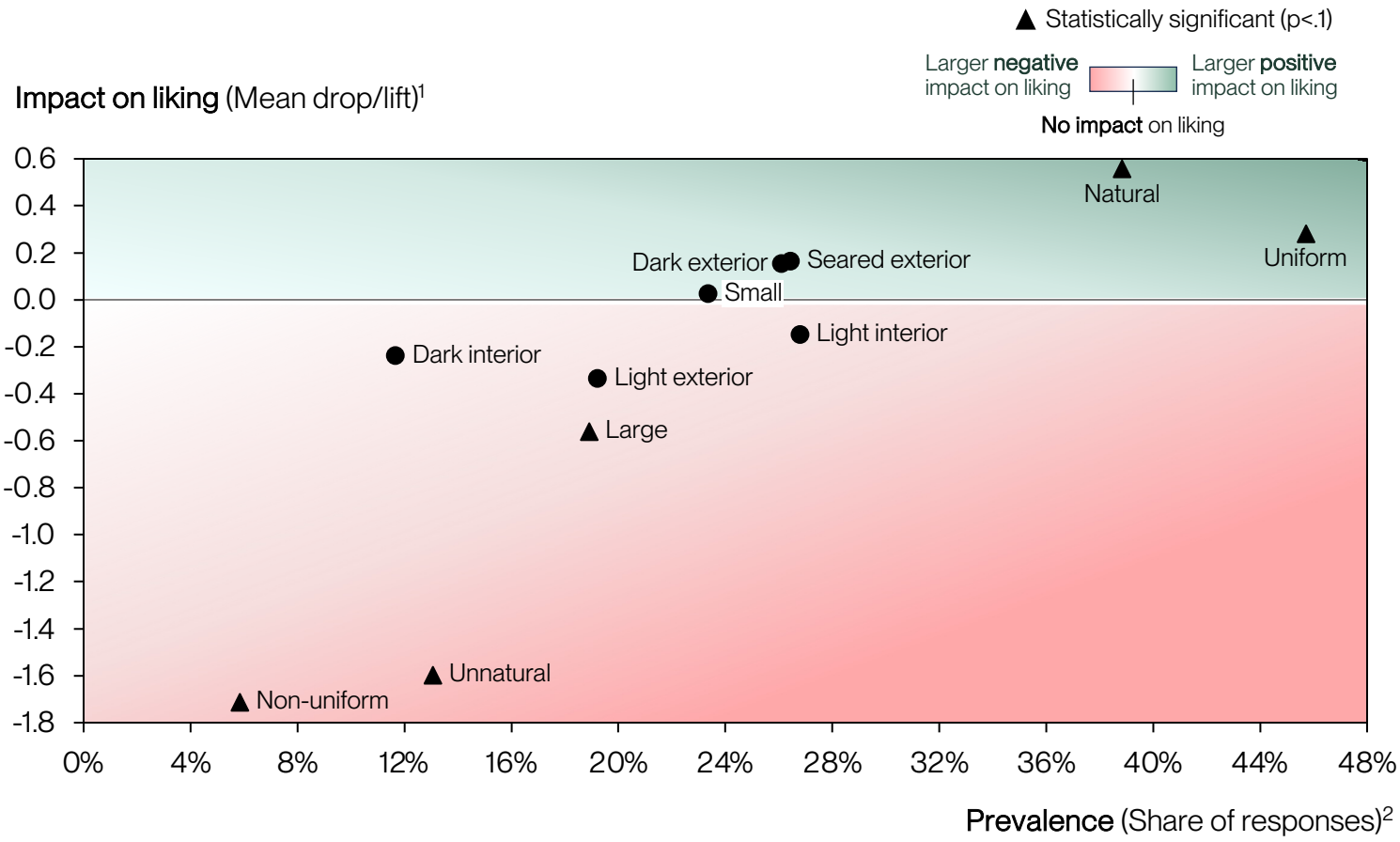
- 'Mushy', 'dry,' and 'falls apart' were associated with the largest drops in liking at 0.8-1.4pts (p<.1) (While 'moist,' 'cohesive,' and 'holds together' were associated with positive lifts of 0.2-0.6pts).

1. The average change in overall liking on 7pt scale for products for all responses using the relevant attribute as a descriptor compared to the mean liking for all products rated 'just about right' on that attribute. Calculated as Mean Liking (JAR) minus Mean Liking (descriptor used).
2. Share of responses for all products in this category (including animal, plant-rich, and plant) in each direction for each attribute.

# **Hot Dog:** Top Appearance R&D Opportunities

Prioritization framework for identifying attributes with large impacts on liking

**Penalty analysis on appearance using check-all-that-apply responses,** Mean drop/lift and Prevalence




# Takeaways

## Focus on natural and uniform appearance

- Each were associated with positive impacts on liking (0.4-0.6pts) as opposed to 'unnatural' and 'non-uniform' which had drops of 1.6-1.8pts.

## Consumers showed slight preference for dark, seared exteriors

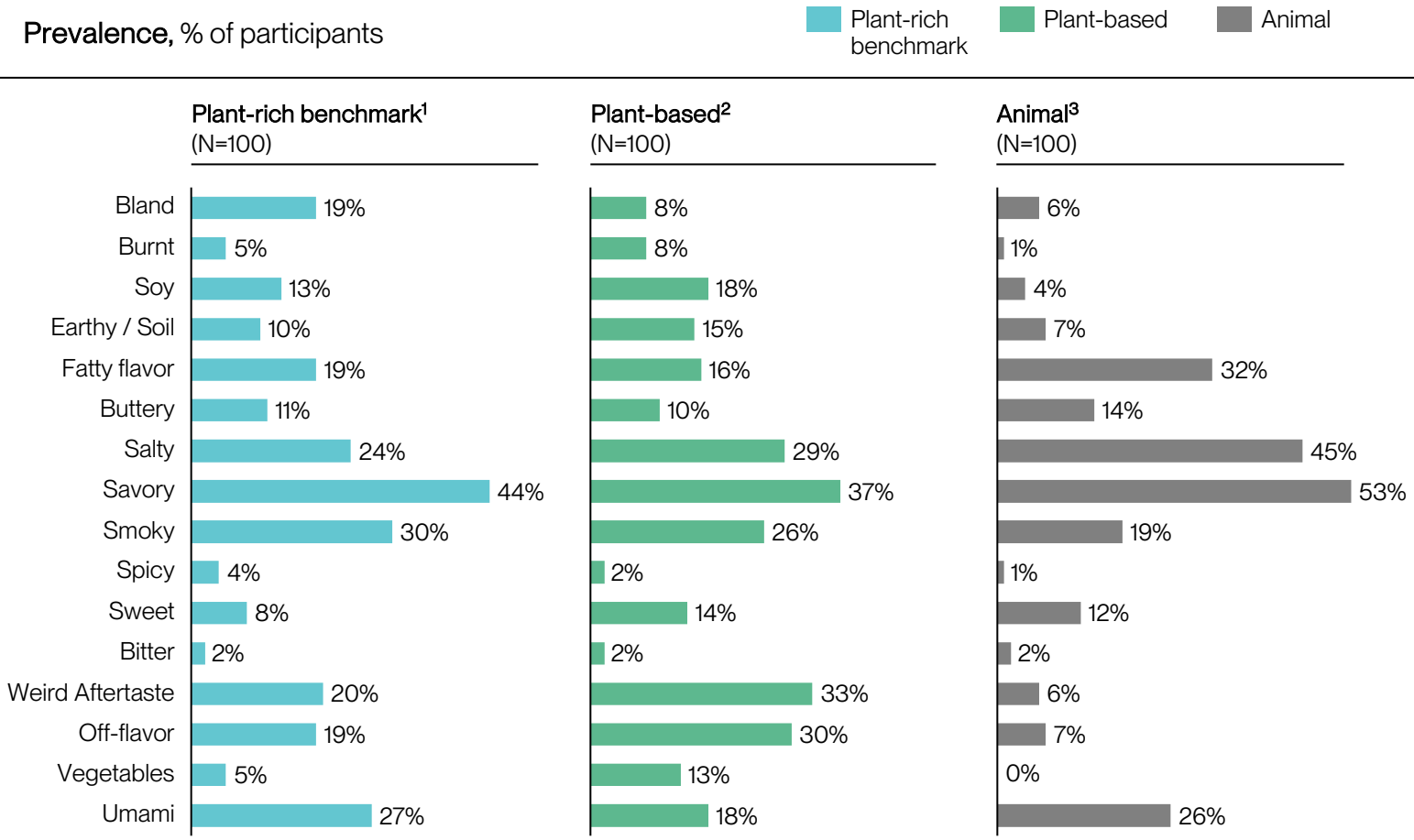
- 'Dark exterior' and 'seared exterior' were associated with 0.2pt increases in liking (versus drop of 0.2 for 'light exterior').

1. The average change in overall liking on 7pt scale for products for all responses using the relevant attribute as a descriptor compared to the mean liking for all products rated 'just about right' on that attribute. Calculated as Mean Liking (JAR) minus Mean Liking (descriptor used).
2. Share of responses for all products in this category (including animal, plant-rich, and plant) in each direction for each attribute.

# **Hot Dog:** Flavor Profile

Please check all words or phrases that describe the flavor of XXX.

**Prevalence,** % of participants




## Takeaways

### Focus on savory flavor in product development

- 44% noted 'savory' flavor for the plant-rich product (versus 53% for animal). 'Savory' was associated with a lift in liking (0.6pts).

### Opportunity to improve fatty flavor

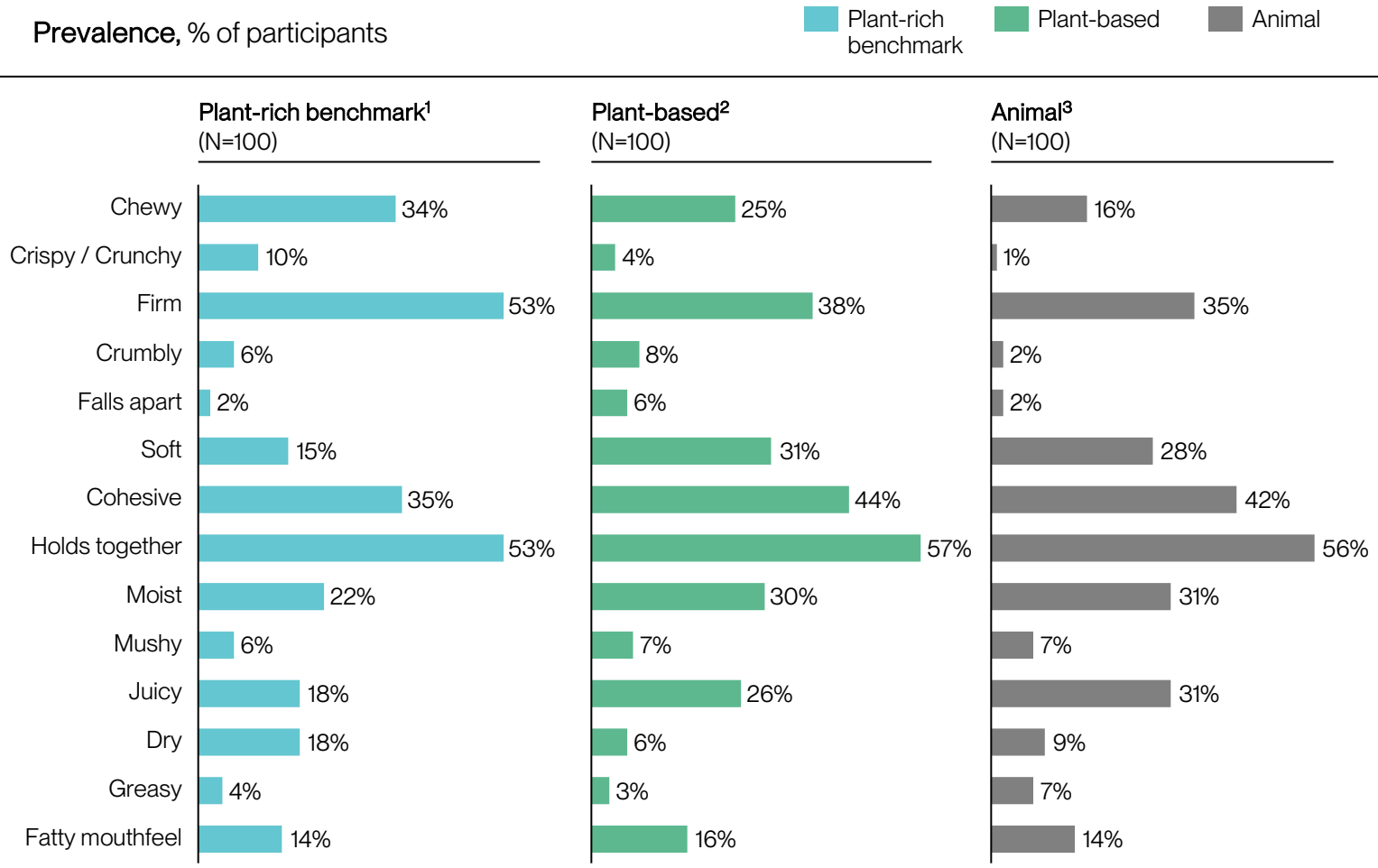
- Only 19% described plant-rich product as having 'fatty flavor' versus 32% for animal. 'Fatty flavor' was associated with a 0.6pt increase in liking.

1. 1 commercially available plant-rich hot dog product.
2. The top-performing plant-based hot dog identified by NECTAR during previous testing of plant-based hot dogs (*Taste of Industry 2024*).
3. The highest retail sales volume animal hot dog selected for its representativeness of the hot dog category.

# **Hot Dog:** Texture Profile

Please check all words or phrases that describe the texture of XXX.

**Prevalence,** % of participants




## Takeaways

### Plant-rich product performed comparably to animal on ability to hold together

- 53% described plant-rich as 'holds together' (versus 56% for animal).

### Opportunity for plant-rich to increase moistness

- Only 22% described plant-rich product as 'moist,' versus 31% for animal. Moistness was associated with an increase in liking of 0.4pts.

### Plant-rich should increase juiciness

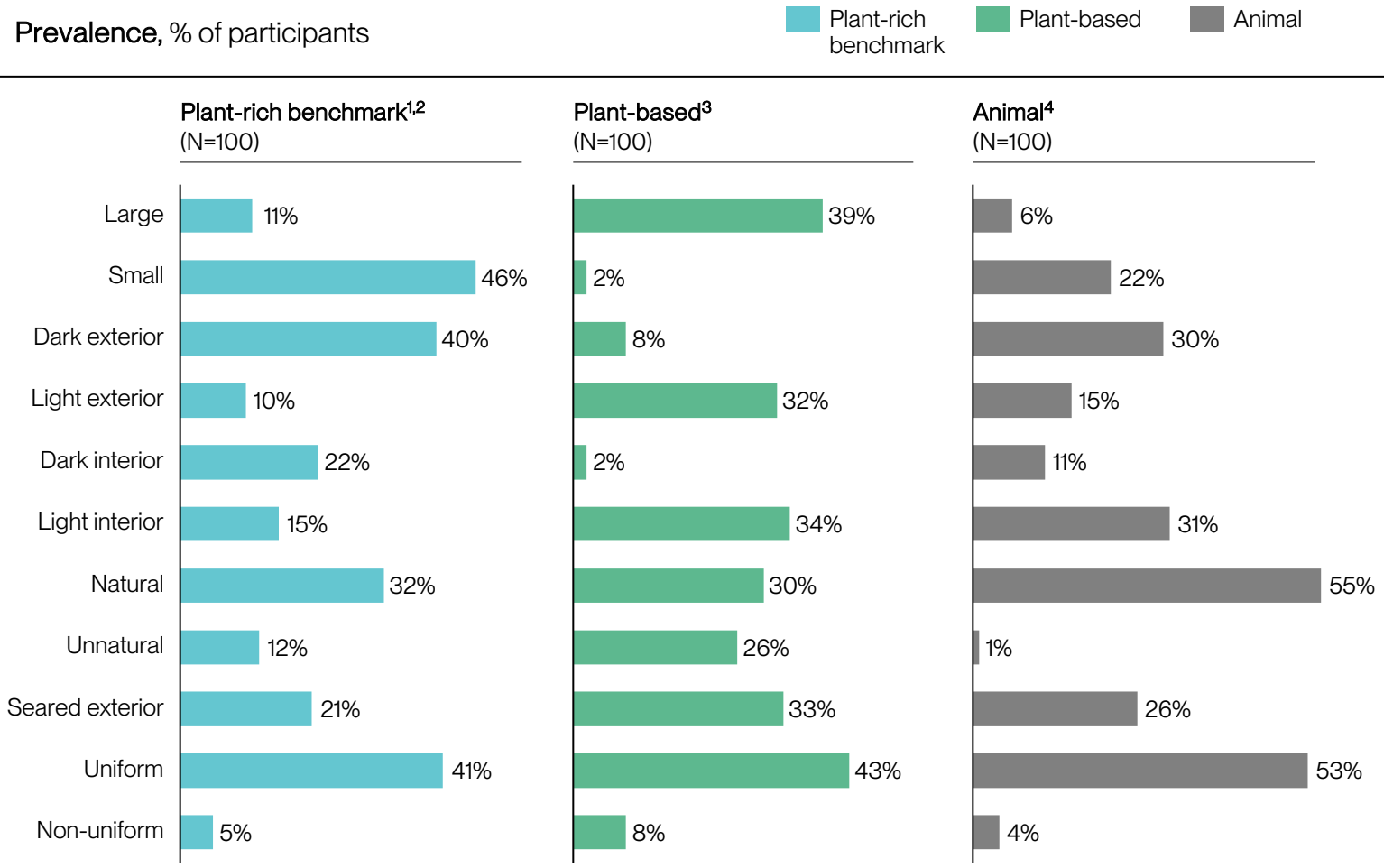
- Only 18% described plant-rich as 'juicy' (versus 31% for animal).

1. 1 commercially available plant-rich hot dog product.
2. The top-performing plant-based hot dog identified by NECTAR during previous testing of plant-based hot dogs (*Taste of Industry 2024*).
3. The highest retail sales volume animal hot dog selected for its representativeness of the hot dog category.

# **Hot Dog:** Appearance Profile

Please check all words or phrases that describe the appearance of XXX.

**Prevalence,** % of participants




## Takeaways

### Plant-rich should focus on improving natural appearance

- Only 32% described plant-rich as 'natural' (versus 55% for animal). 'Natural' had the highest increase in liking of all appearance attributes (0.6pts).

### Opportunity for plant-rich to have a more uniform appearance

- Only 41% described plant-rich product as 'uniform' (versus 53% for animal). 'Uniform' is associated with positive liking (0.4pt increase).

### Plant-rich is more appropriately sized than plant-based

- Plant-rich product was less likely than the plant-based product to be described as 'large,' an attribute which had a negative impact on liking (-0.6pts).

1. 1 commercially available plant-rich hot dog product.
2. The top-performing plant-based hot dog identified by NECTAR during previous testing of plant-based hot dogs (*Taste of Industry 2024*).
3. The highest retail sales volume animal hot dog selected for its representativeness of the hot dog category.

Category-Specific Deep Dive

# Steak

# Steak

## Executive summary of R&D opportunities

### Performance Overview

Plant-rich steak underperformed both plant-based and animal benchmarks.

- **Plant-rich steak lagged behind animal** – Lower overall liking was driven by worse flavor, texture, similarity, and appearance.
- **Consumers preferred plant-based to plant-rich** – Only 43% of participants rated the plant-rich steak as 'like very much' or 'like' (compared to 49% for plant-based).
- **Animal performed comparably to plant-based on appearance** – Both scored 5.5pts on average liking of appearance.

### Top Sensory Opportunities

Opportunities to improve plant-rich steak include adjusting key flavor attributes, increasing firmness, and producing a more natural appearance.

- **Plant-rich steak needs to increase beef flavor** – Only 26% described plant-rich steak as having 'beef' flavor (compared to 72% for animal).
- **Focus on reducing weird aftertaste or off-flavor** – Participants described plant-rich steak as having 'weird aftertaste' or 'off-flavor' 28% and 33%, respectively (compared to only 6% each for animal).
- **Improve natural appearance** – Only 40% described plant-rich steak as 'natural' (versus 63% for animal).
- **Increase firmness of steak** – 34% found plant-rich steak to be 'somewhat,' 'too,' or 'much too soft' compared to 1% for animal.

# Steaks Tested

Steaks from one commercially available plant-rich steak brand were prepared according to manufacturer instructions on a flat-top and compared against animal and plant-based steaks.

Participants were screened to exclude consumers who do not eat animal-based meat and only include those who eat steaks at least every 1-2 months.

## Testing Environment

Participants tried the steaks at North Beach Cantina in San Francisco, a restaurant environment, in order to achieve an authentic, natural experience.

## Preparation

All steaks were prepared by restaurant staff using a flat-top according to manufacturer instructions. Participants were allowed to add condiments to keep the eating experience natural but were required to apply condiments consistently across all steak tacos.

## Dish Served

All participants were served three steak tacos in trays. While they ate, participants filled out a survey via mobile phone detailing their experience with each product. Products were evaluated in a randomized order.

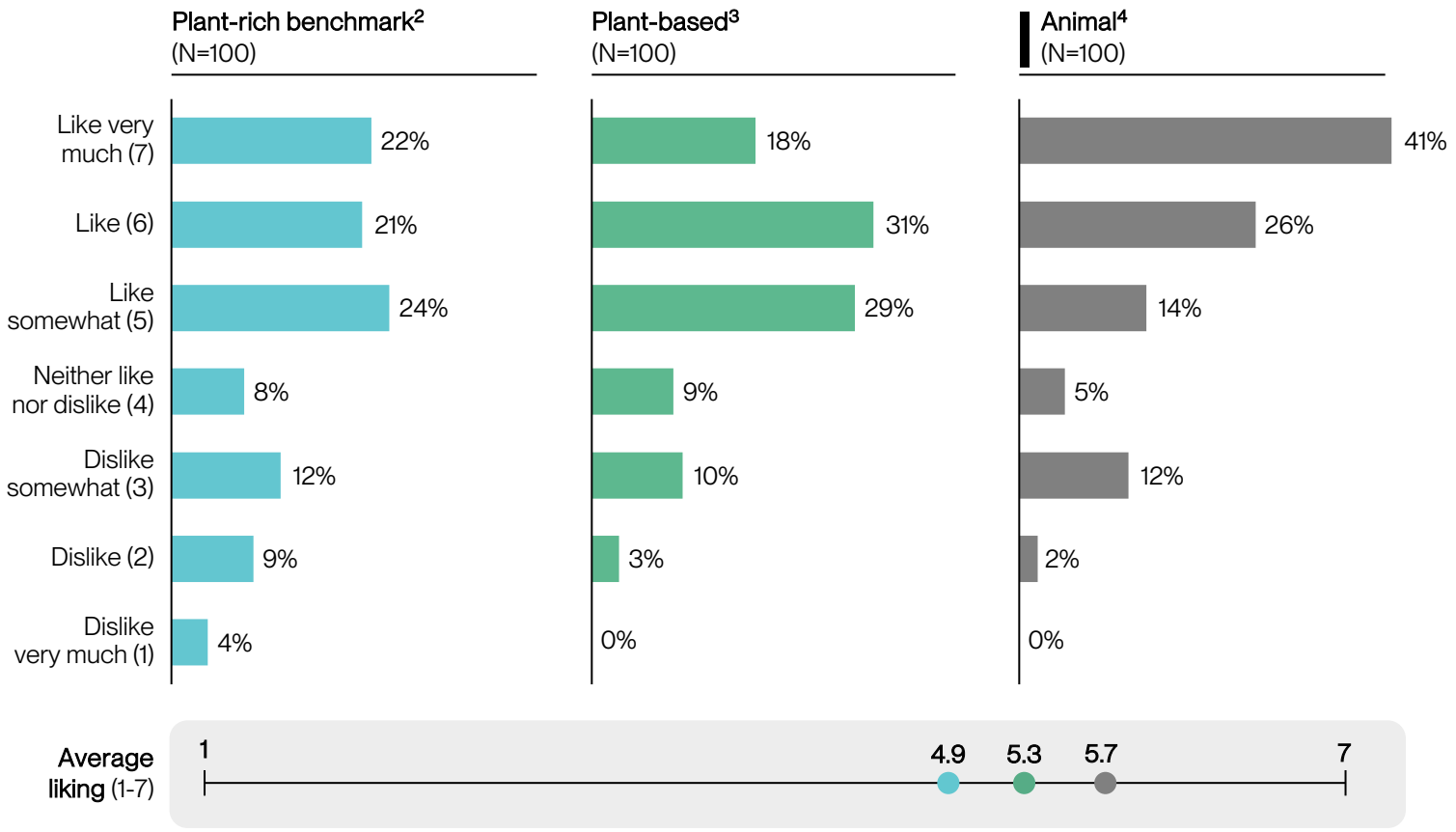
# **Steak:** Overall Liking

How would you rate your OVERALL LIKING of steak XXX?

**Overall liking,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)







# Takeaways

## Participants did not like plant-rich steak as much as animal

- Only 43% indicated 'like' or 'like very much' for the plant-rich steak (versus 67% for animal).

## Plant-rich steak behind plant-based on overall liking

- Plant-rich steak averaged 4.9pts on liking (versus 5.3pts for plant-based).

1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. 1 commercially available plant-rich product.
3. Based on brand-level performance in previous rounds of sensory testing.
4. The highest retail sales volume animal steak selected for its representativeness of the animal steak category.

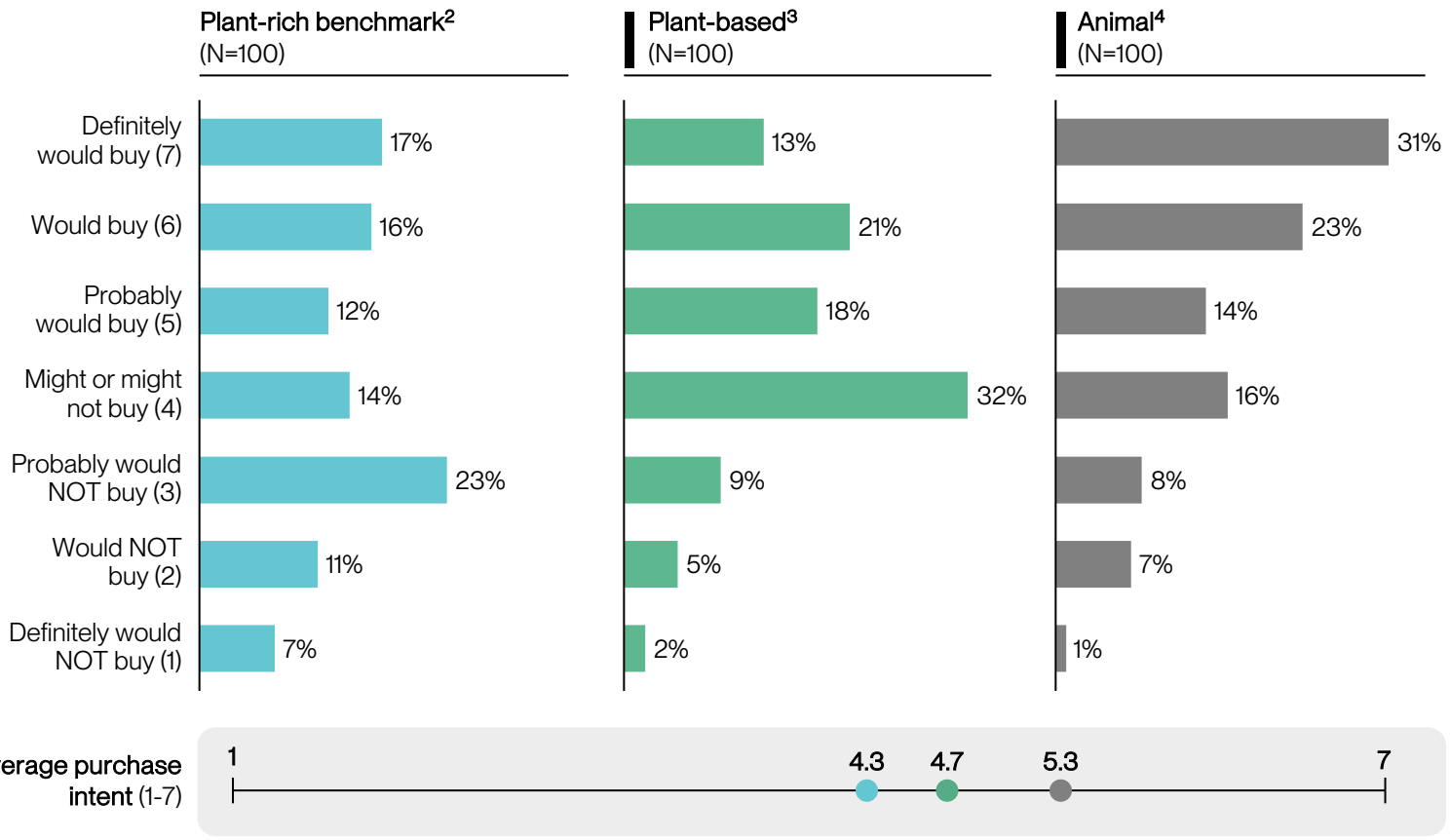
# **Steak:** Purchase Intent

How would you rate your PURCHASE INTENT of steak XXX?

**Purchase intent,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)







# Takeaways

## Purchase intent of plant-rich product much lower than animal

- Average purchase intent 4.3pts for plant-rich versus 5.3 for animal.

## Purchase intent of plant-rich product trails plant-based

- Average purchase intent 4.3pts for plant-rich versus 4.7 for plant-based.

1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. 1 commercially available plant-rich product.
3. Based on brand-level performance in previous rounds of sensory testing.
4. The highest retail sales volume animal steak selected for its representativeness of the animal steak category.

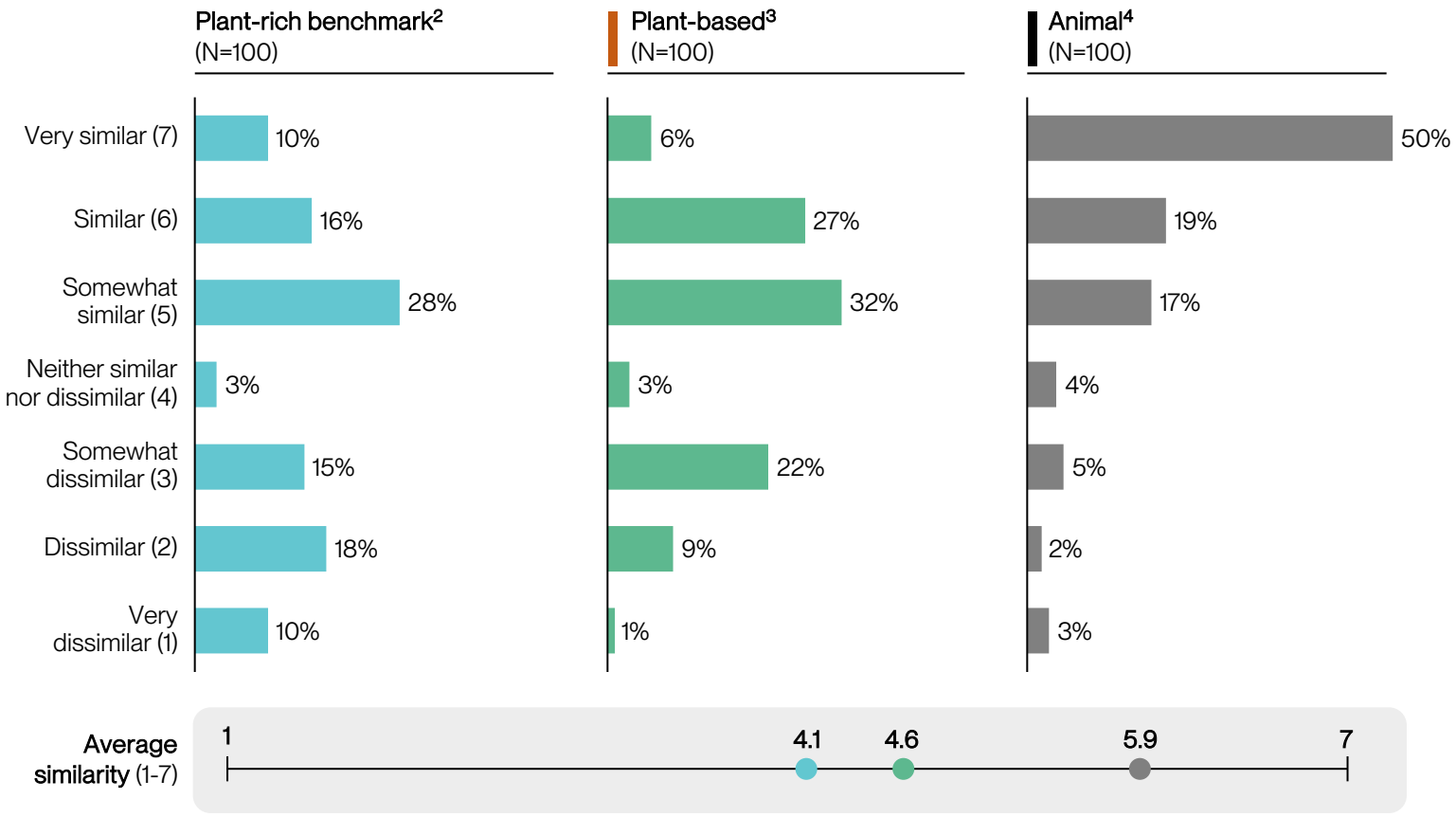
# **Steak:** Similarity

How would you rate your SIMILARITY of XXX to a typical steak?

**Similarity,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)




## Takeaways

### Opportunity for plant-rich to catch up to animal on similarity

- Only 26% found the plant-rich steak to be 'similar' or 'very similar' to a typical steak (compared to 69% for animal).

### Plant-rich product lags behind plant-based on similarity

- Average similarity 4.1pts versus 4.6pts for plant-based.

1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. 1 commercially available plant-rich product.
3. Based on brand-level performance in previous rounds of sensory testing.
4. The highest retail sales volume animal steak selected for its representativeness of the animal steak category.

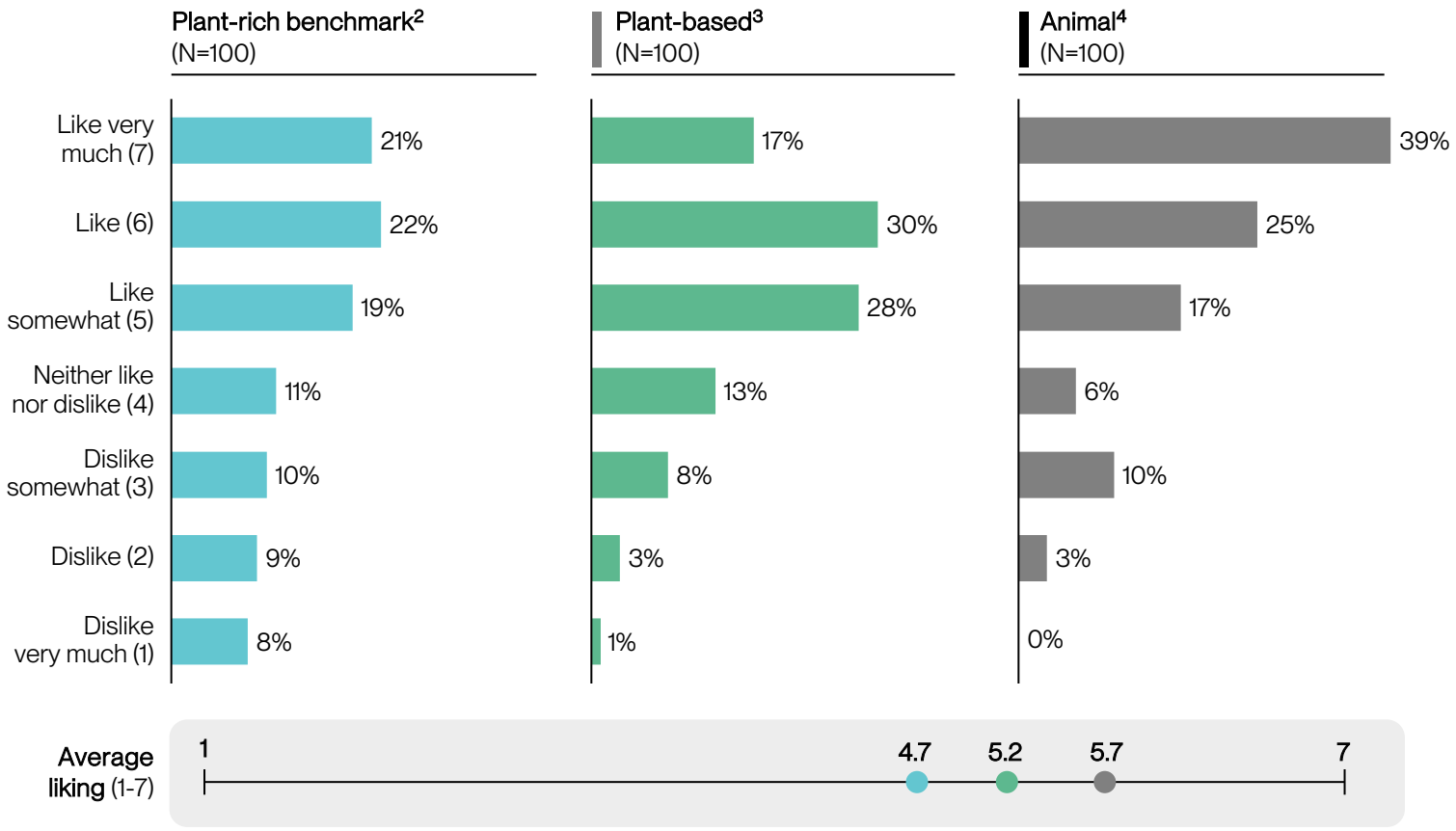
# **Steak:** Flavor

How would you rate your FLAVOR of steak XXX?

**Flavor,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)




# Takeaways

## Plant-rich steak behind animal and plant-based on flavor

- Only 43% indicated they 'like' or 'like very much' the flavor of the plant-rich product (versus 64% for animal and 47% for plant-based).

1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. 1 commercially available plant-rich product.
3. Based on brand-level performance in previous rounds of sensory testing.
4. The highest retail sales volume animal steak selected for its representativeness of the animal steak category.

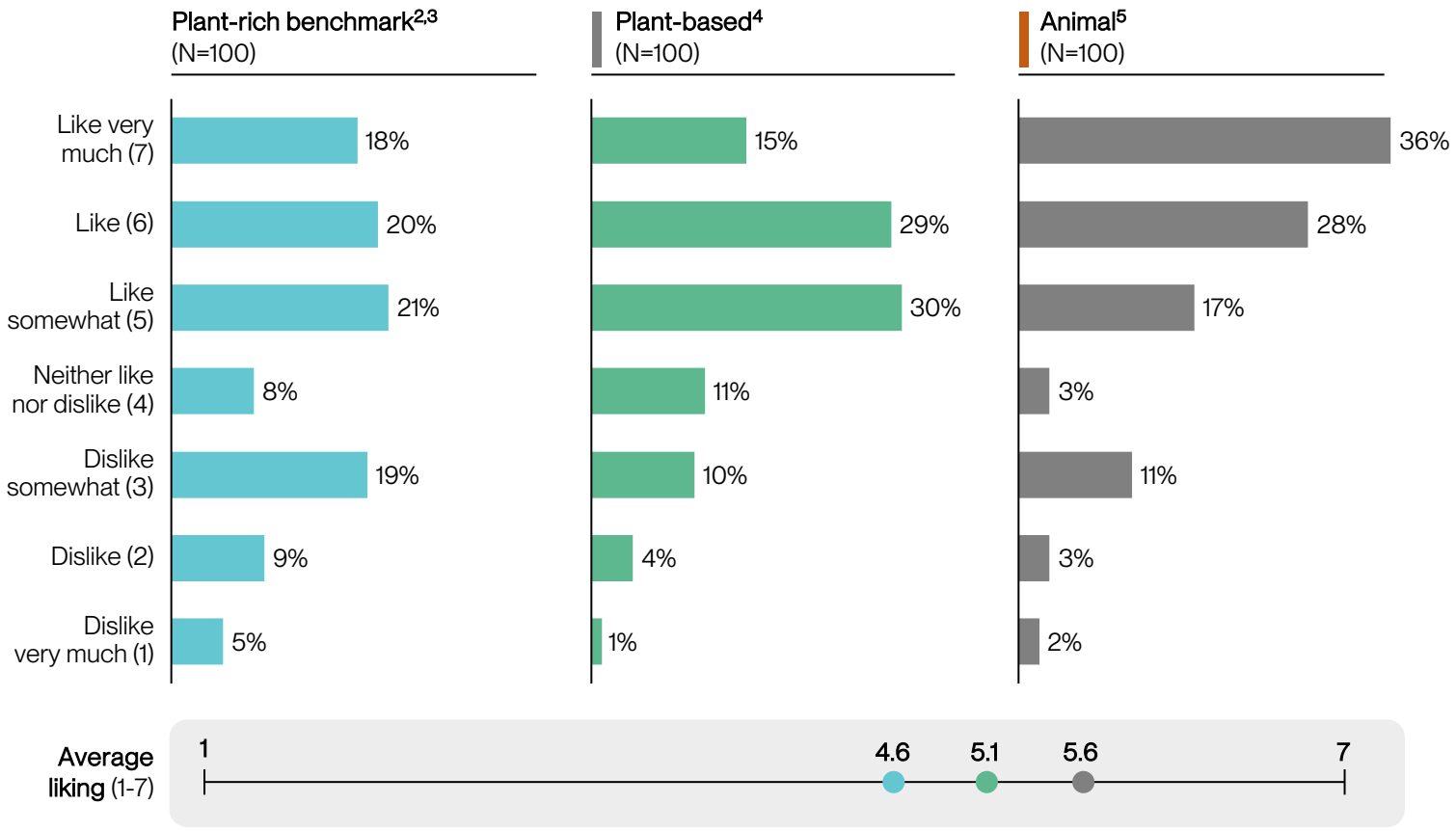
# **Steak:** Texture

How would you rate your TEXTURE of steak XXX?

**Texture,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)




# Takeaways

## Plant-rich steak behind on texture compared to animal and plant-based

- 38% rated the plant-rich steak texture 'like' or 'like very much like' (versus 64% for animal).
- Average liking of plant-rich steak texture was 4.6pts (versus 5.1 for plant-based).

1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. 1 commercially available plant-rich product.
3. Based on brand-level performance in previous rounds of sensory testing.
4. The highest retail sales volume animal steak selected for its representativeness of the animal steak category.

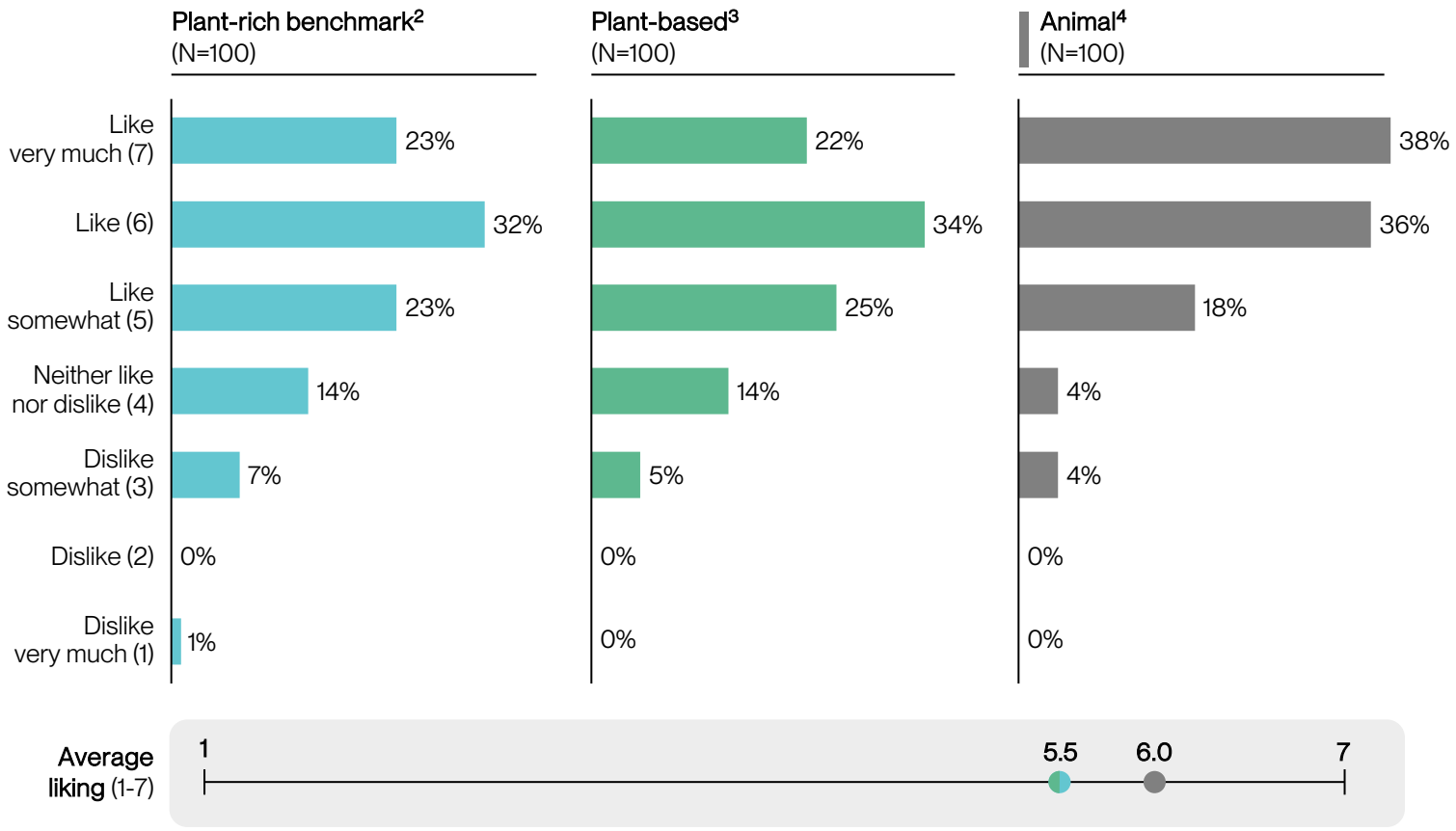
# **Steak:** Appearance

How would you rate your APPEARANCE of steak XXX?

**Appearance,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)




# Takeaways

## Plant-rich steak equal in appearance to plant-based

- Both scored 5.5pts on average liking of appearance.

## Opportunity for plant-rich to continue improving on appearance

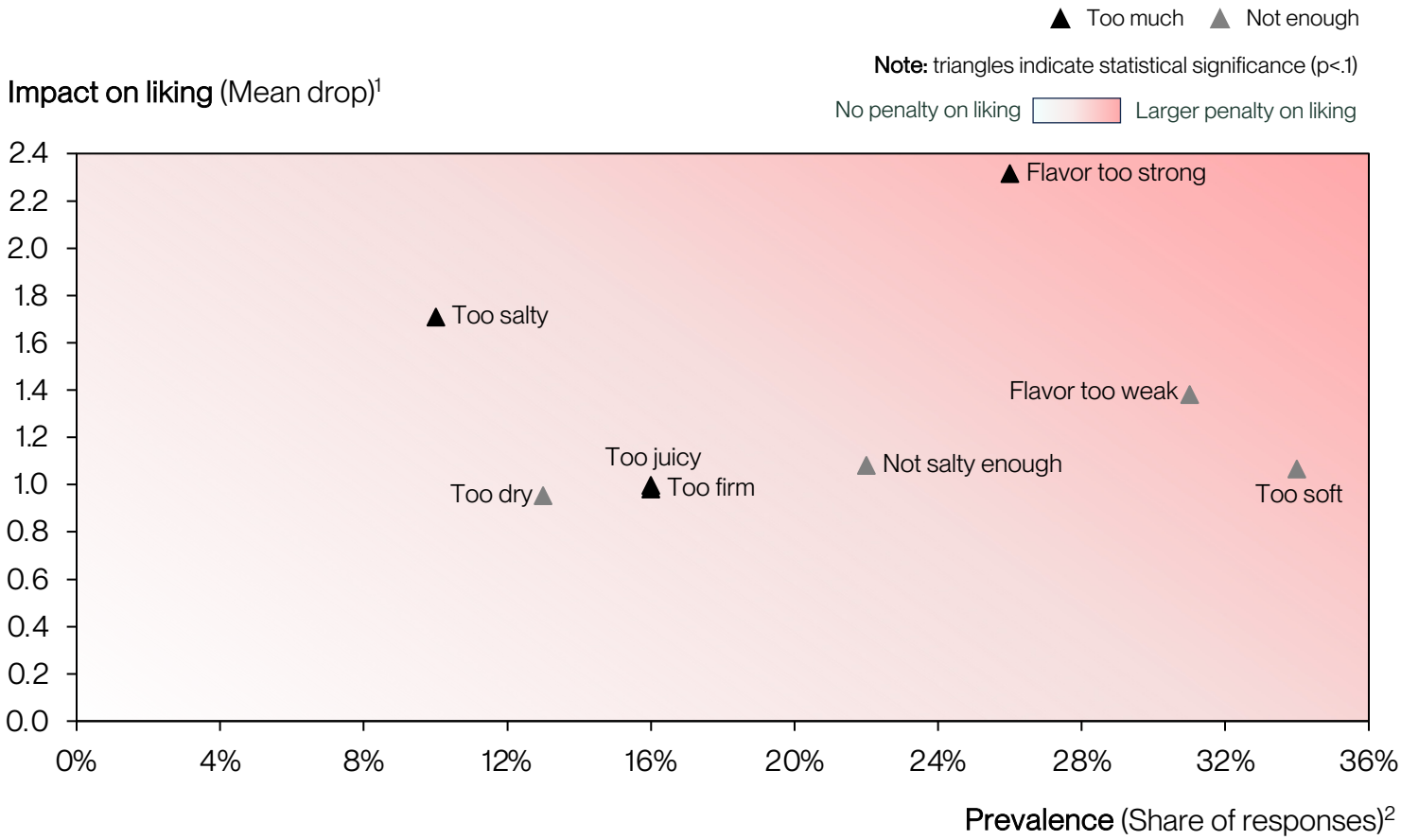
- Only 45% indicated they 'like' or 'like very much' the appearance of plant-rich versus 74% for animal.

1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. 1 commercially available plant-rich product.
3. Based on brand-level performance in previous rounds of sensory testing.
4. The highest retail sales volume animal steak selected for its representativeness of the animal steak category.

# **Steak:** Top R&D Opportunities

Prioritization framework for identifying attributes with large impacts on liking

**Penalty analysis using responses on 'just-about-right' questions,** Mean drop and Prevalence




# Takeaways

## Avoid overly strong flavors

- 'Flavor too strong' had the biggest impact on liking, with a mean drop of 2.4pts.

## Consumers prefer steak that is too salty over not salty enough

- While both sides had a negative impact on liking, 'too salty' dropped liking 1.8pts while 'not salty enough' only dropped liking by ~1pt.

## Participants often found steak too soft

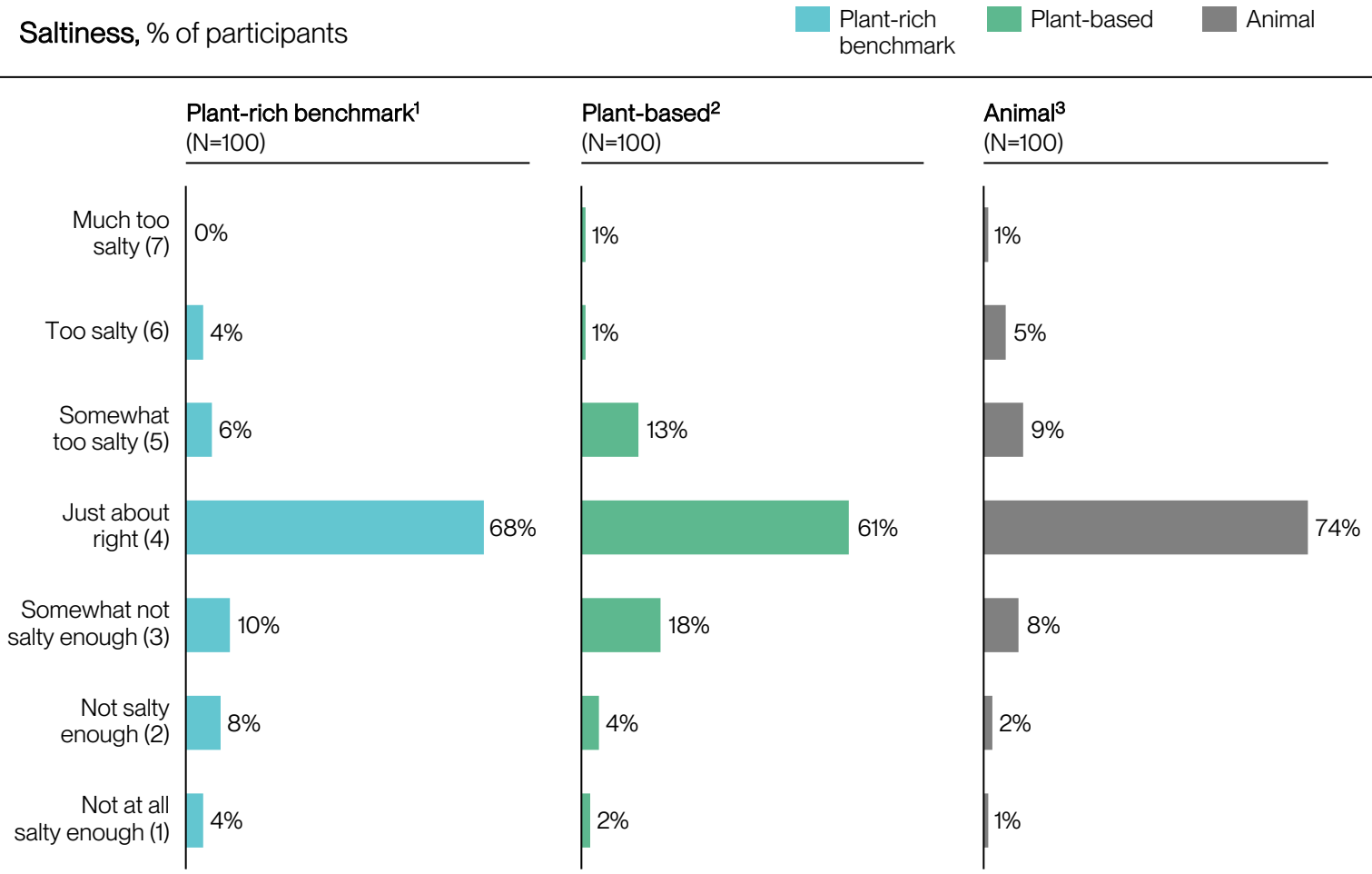
- A third of participants rated steak as 'too soft,' which was associated with a 1pt drop to liking.

1. The average change in overall liking on 7pt scale for products for all responses using the relevant attribute as a descriptor compared to the mean liking for all products rated 'just about right' on that attribute. Calculated as Mean Liking (JAR) minus Mean Liking (descriptor used).
2. Share of responses for all plant-rich products in this category in each direction for each attribute.

# **Steak:** Saltiness

How would you rate your SALTINESS of steak XXX?

**Saltiness,** % of participants




# Takeaways

## Plant-rich steak performs well in saltiness

- 68% indicated the saltiness of the steak was 'just about right,' compared to 74% for the animal benchmark.

## Plant-rich product ahead of plant-based in saltiness

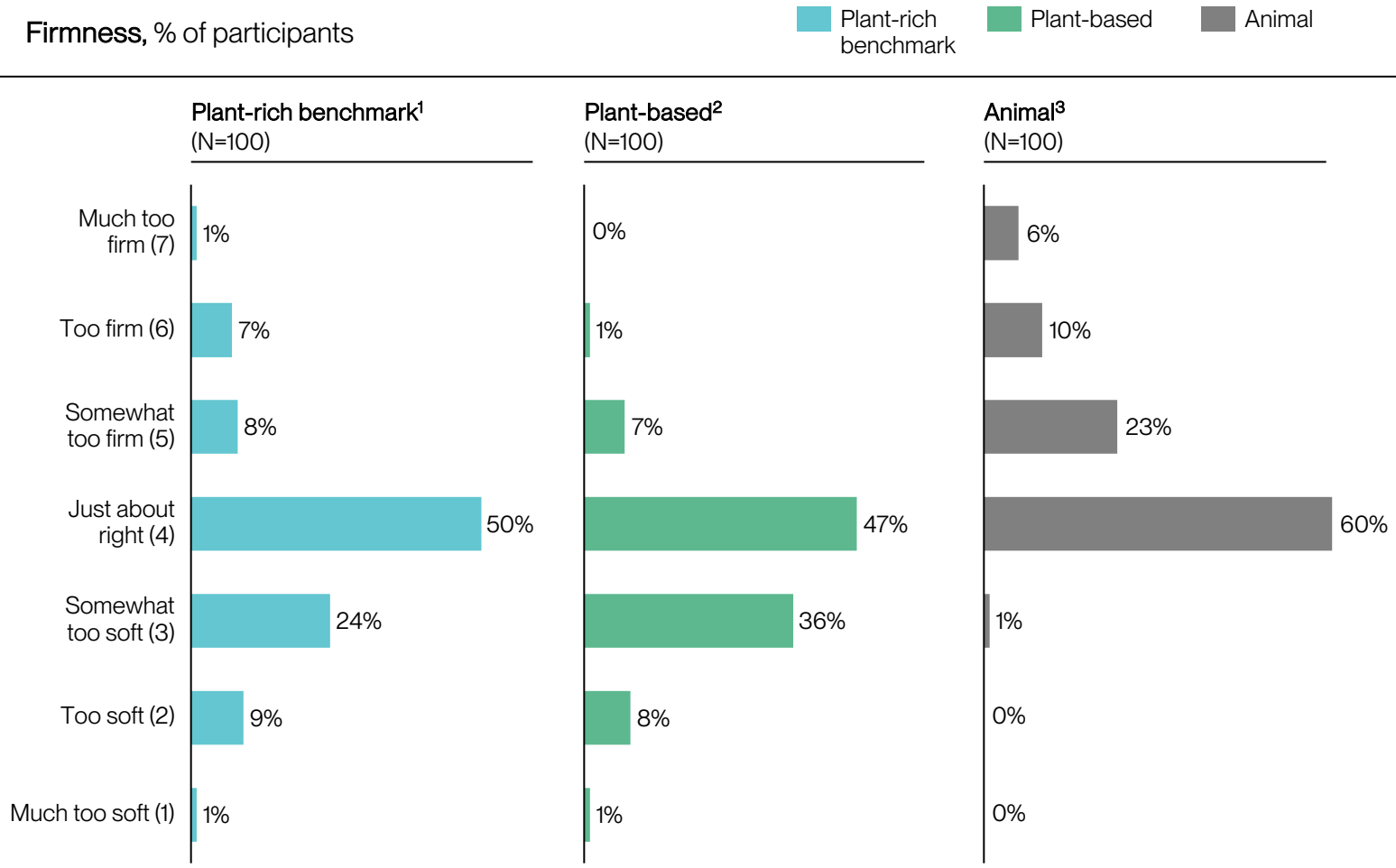
- 68% indicated the saltiness of the steak was 'just about right,' compared to 61% for the plant-based benchmark.

1. 1 commercially available plant-rich product.
2. Based on brand-level performance in previous rounds of sensory testing.
3. The highest retail sales volume animal steak selected for its representativeness of the animal steak category.

# **Steak:** Firmness

How would you rate your FIRMNESS of steak XXX?

**Firmness,** % of participants




# Takeaways

## Plant-rich steak should increase firmness

- 34% found plant-rich steak to be 'somewhat,' 'too,' or 'much too soft' versus 16% for too firm.

## Plant-rich product slightly outperforms plant-based on softness

- 50% found plant-rich steak to be 'just about right' firmness versus 47% for plant-based.

## Important to achieve the right firmness

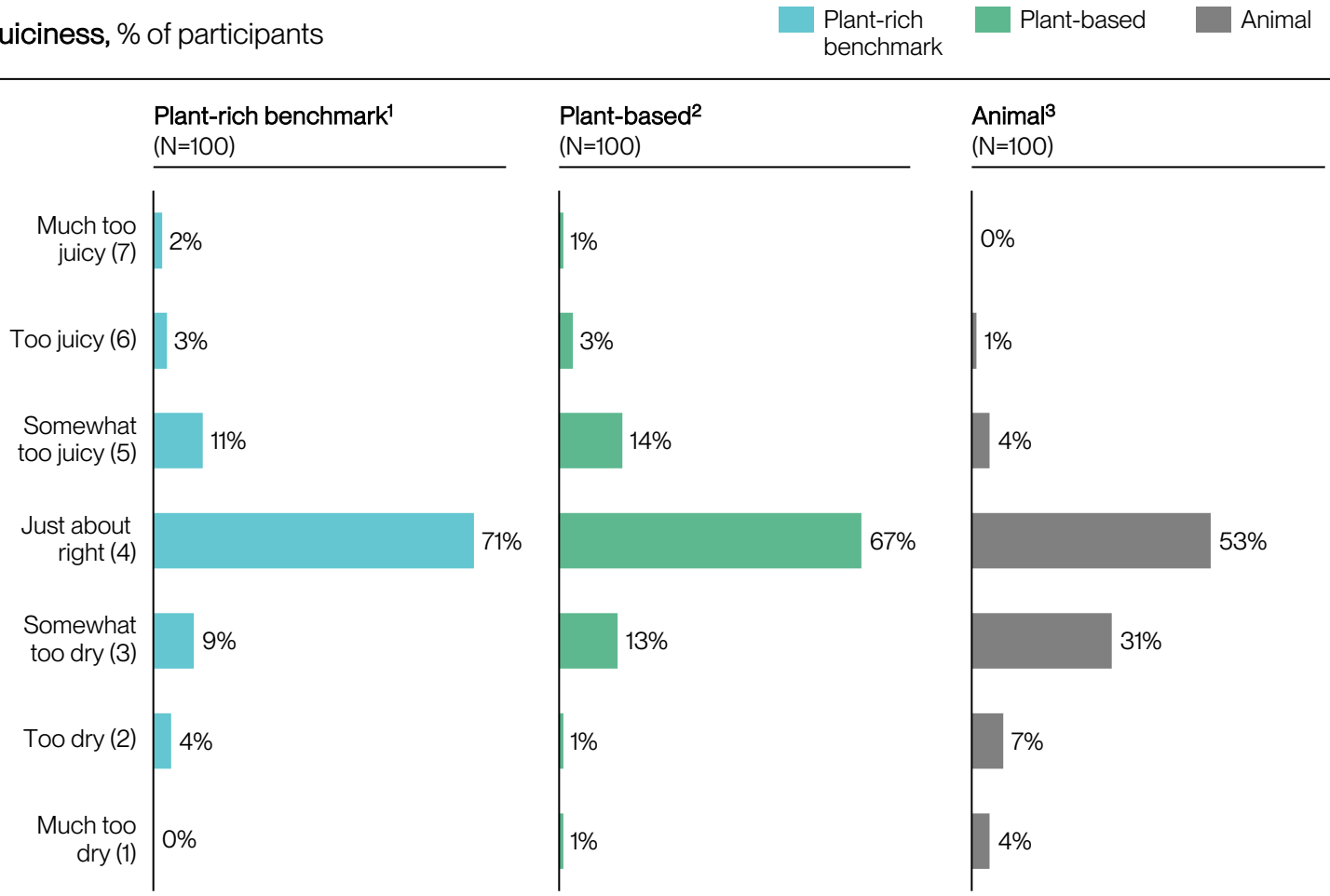
- Though plant-rich products are more likely to be considered 'too soft', both 'too soft' and 'too firm' were associated with a 1.0pt drop in liking.

1. 1 commercially available plant-rich product.
2. Based on brand-level performance in previous rounds of sensory testing.
3. The highest retail sales volume animal steak selected for its representativeness of the animal steak category.

# **Steak:** Juiciness

How would you rate your JUICINESS of steak XXX?

**Juiciness,** % of participants




## Takeaways

### Plant-rich steak excels in juiciness

- 71% of participants found plant-rich steak to be 'just about right' in juiciness (compared to only 53% for animal).

### Plant-rich product less likely to be dry

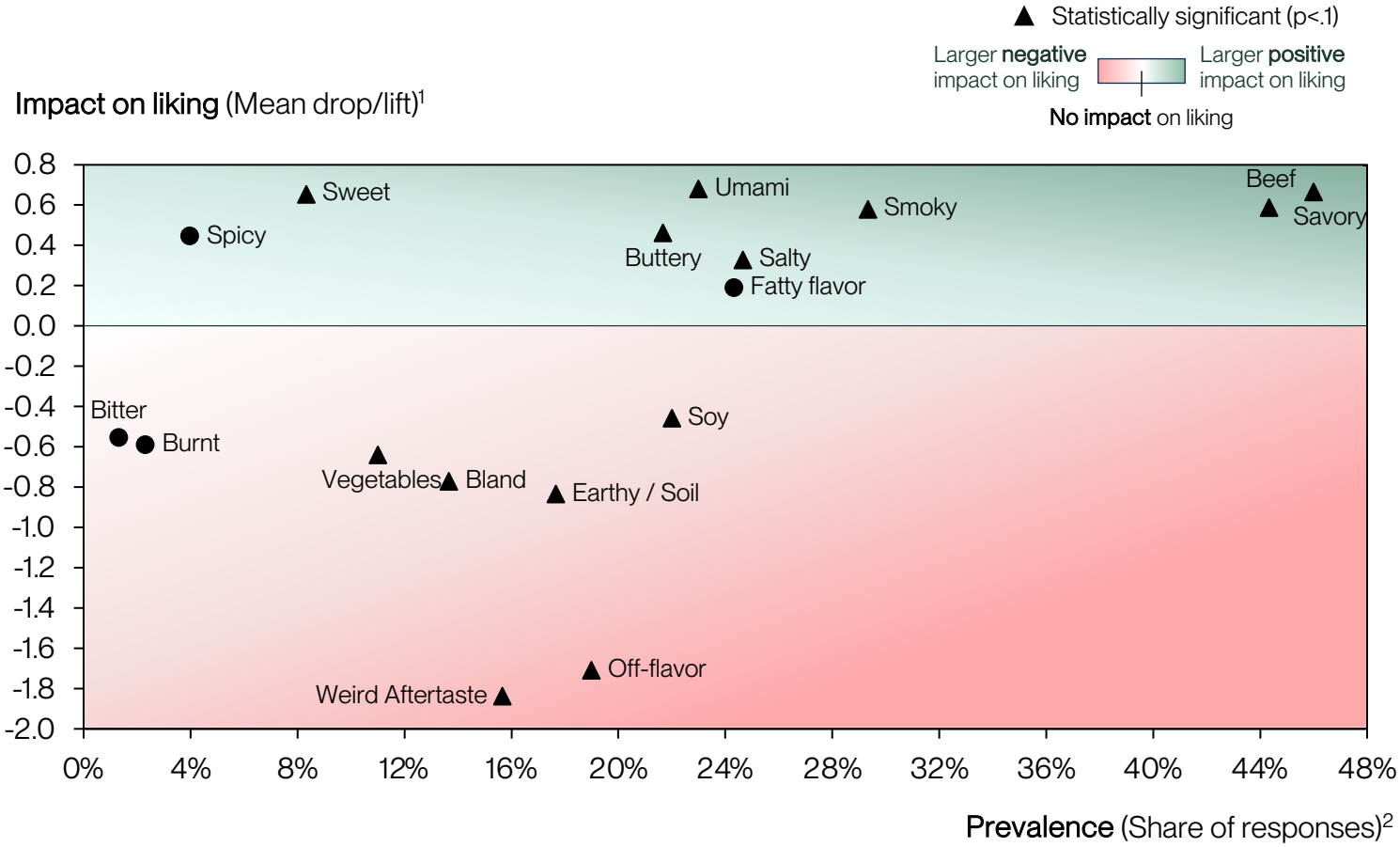
- Only 13% of participants rated the plant-rich product 'somewhat,' 'too,' or 'much too dry,' (compared to 42% for the animal).

1. 1 commercially available plant-rich product.
2. Based on brand-level performance in previous rounds of sensory testing.
3. The highest retail sales volume animal steak selected for its representativeness of the animal steak category.

# **Steak:** Top Flavor R&D Opportunities

Prioritization framework for identifying attributes with large impacts on liking

**Penalty analysis on flavor using check-all-that-apply responses,** Mean drop/lift and Prevalence




## Takeaways

### Prioritize beef and savory flavors

- 'Beef' and 'savory' have high positive impact on liking as well as high prevalence.

### Off-flavor and weird aftertaste are major deterrents

- 'Off-flavor' and 'weird aftertaste' cause the largest drops in liking, ~1.8pts each.

### Opportunity to differentiate with a sweeter flavor

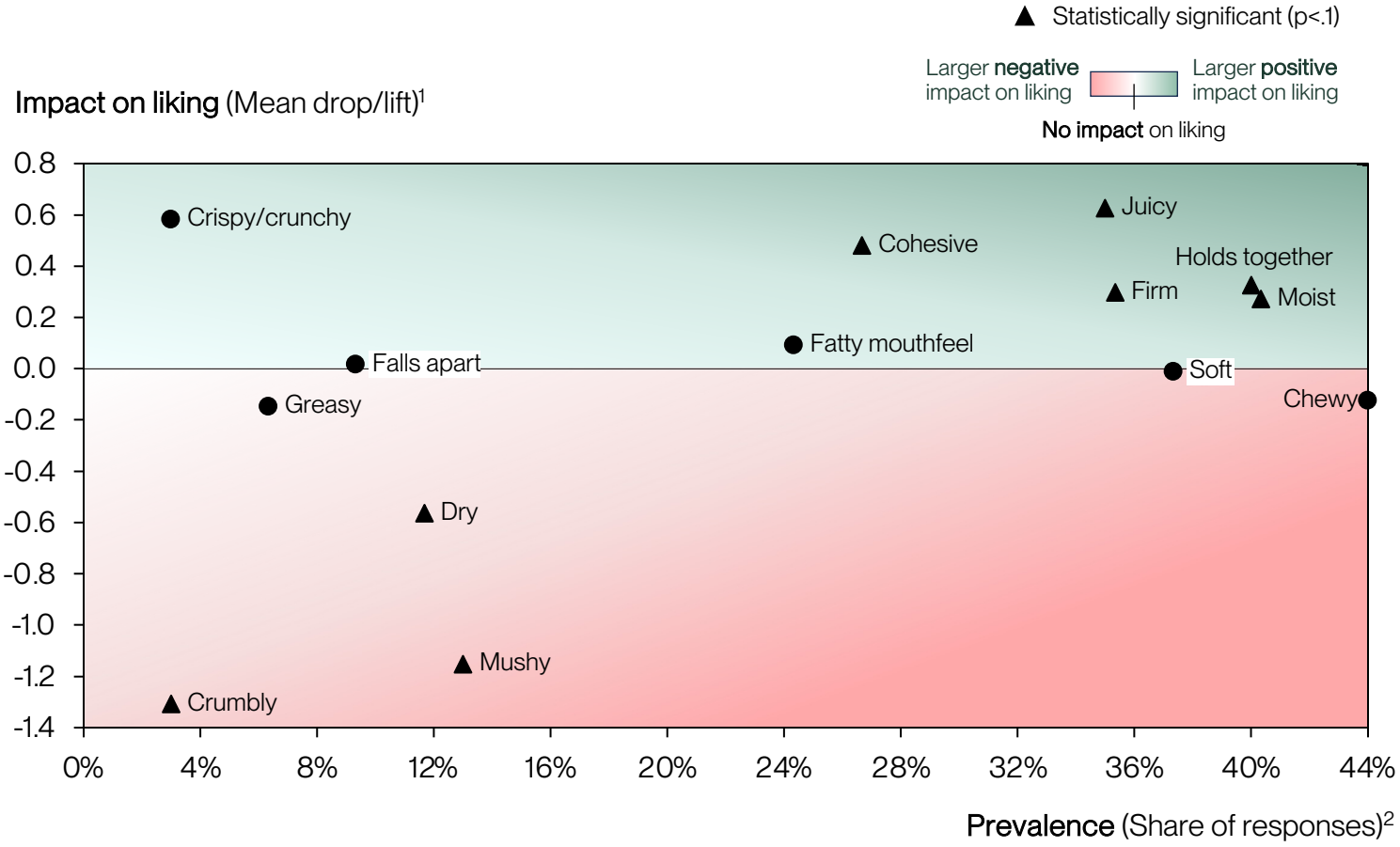
- 'Sweet' had a similar lift to liking as 'beef' and 'savory,' around 0.7pts, but was much less common (reported by 8% of participants versus 46% for 'beef' and 'savory').

1. The average change in overall liking on 7pt scale for products for all responses using the relevant attribute as a descriptor compared to the mean liking for all products rated 'just about right' on that attribute. Calculated as Mean Liking (JAR) minus Mean Liking (descriptor used).
2. Share of responses for all products in this category (including animal, plant-rich, and plant) in each direction for each attribute.

# **Steak:** Top Texture R&D Opportunities

Prioritization framework for identifying attributes with large impacts on liking

**Penalty analysis on texture using check-all-that-apply responses,** Mean drop/lift and Prevalence




## Takeaways

### Dry, crumbly, and mushy textures significantly reduce liking

- Dryness associated with -0.6pt drop in liking, with 'crumbly' and 'mushy' around -1.2pts.

### Juiciness has the largest positive impact to liking

- Juiciness was associated with a 0.6pt increase in liking.

### Consumers preferred steak that held together

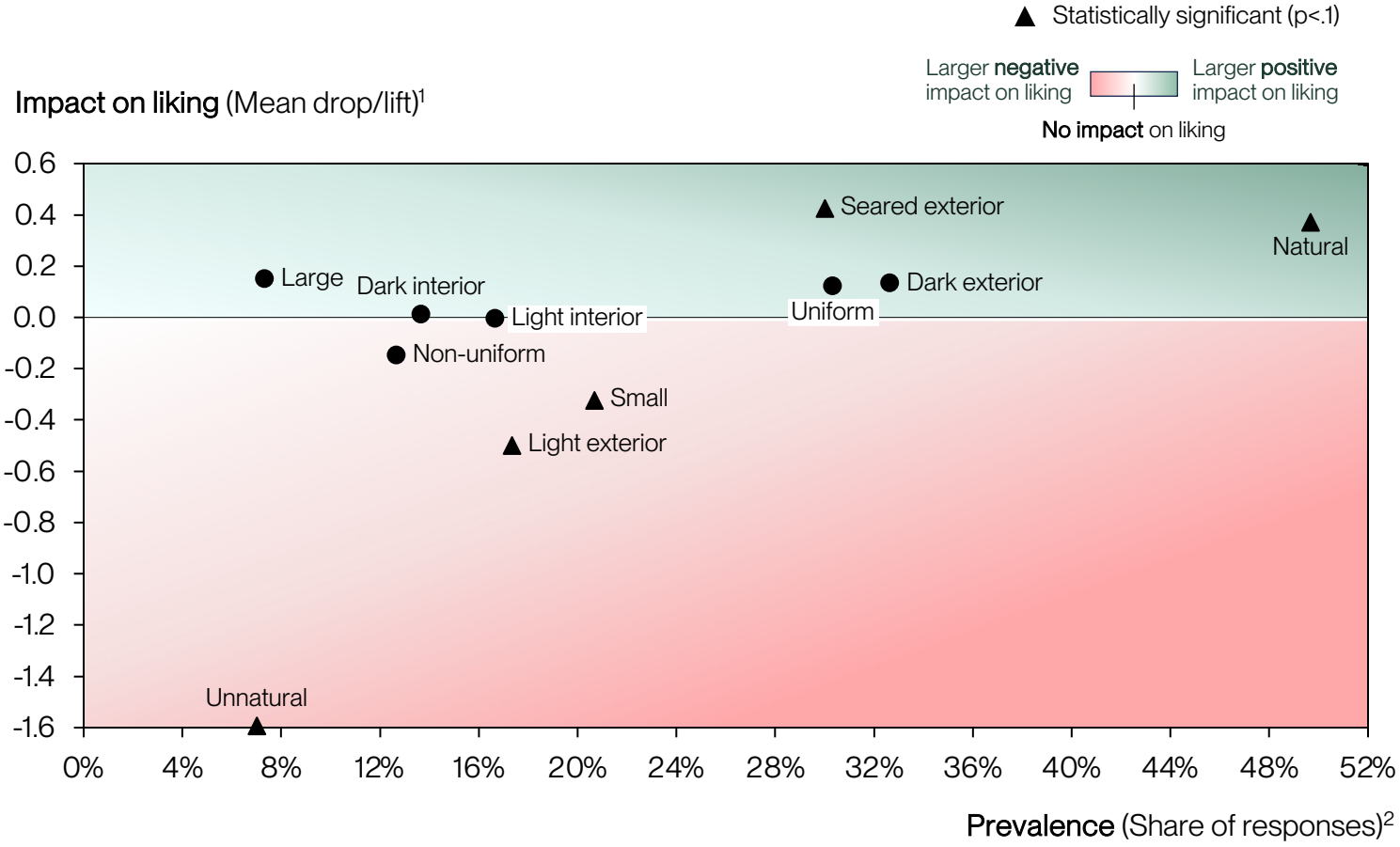
- 'Holds together' had a 0.4pt increase in liking, compared to neutral impact for 'falls apart.'

1. The average change in overall liking on 7pt scale for products for all responses using the relevant attribute as a descriptor compared to the mean liking for all products rated 'just about right' on that attribute. Calculated as Mean Liking (JAR) minus Mean Liking (descriptor used).
2. Share of responses for all products in this category (including animal, plant-rich, and plant) in each direction for each attribute.

# **Steak:** Top Appearance R&D Opportunities

Prioritization framework for identifying attributes with large impacts on liking

**Penalty analysis on appearance using check-all-that-apply responses,** Mean drop/lift and Prevalence




# Takeaways

## Target a seared exterior and natural appearance

- 'Natural' appearance boosts liking 0.4pts, while 'unnatural' appearance reduces it by 1.6pts.
- 'Seared exterior' was associated with a 0.4pt increase in liking.

## Opportunity to increase size

- Consumers showed slight preference for 'large' products (0.2pt lift versus -0.4pt for 'small').

## Participants enjoyed a seared exterior

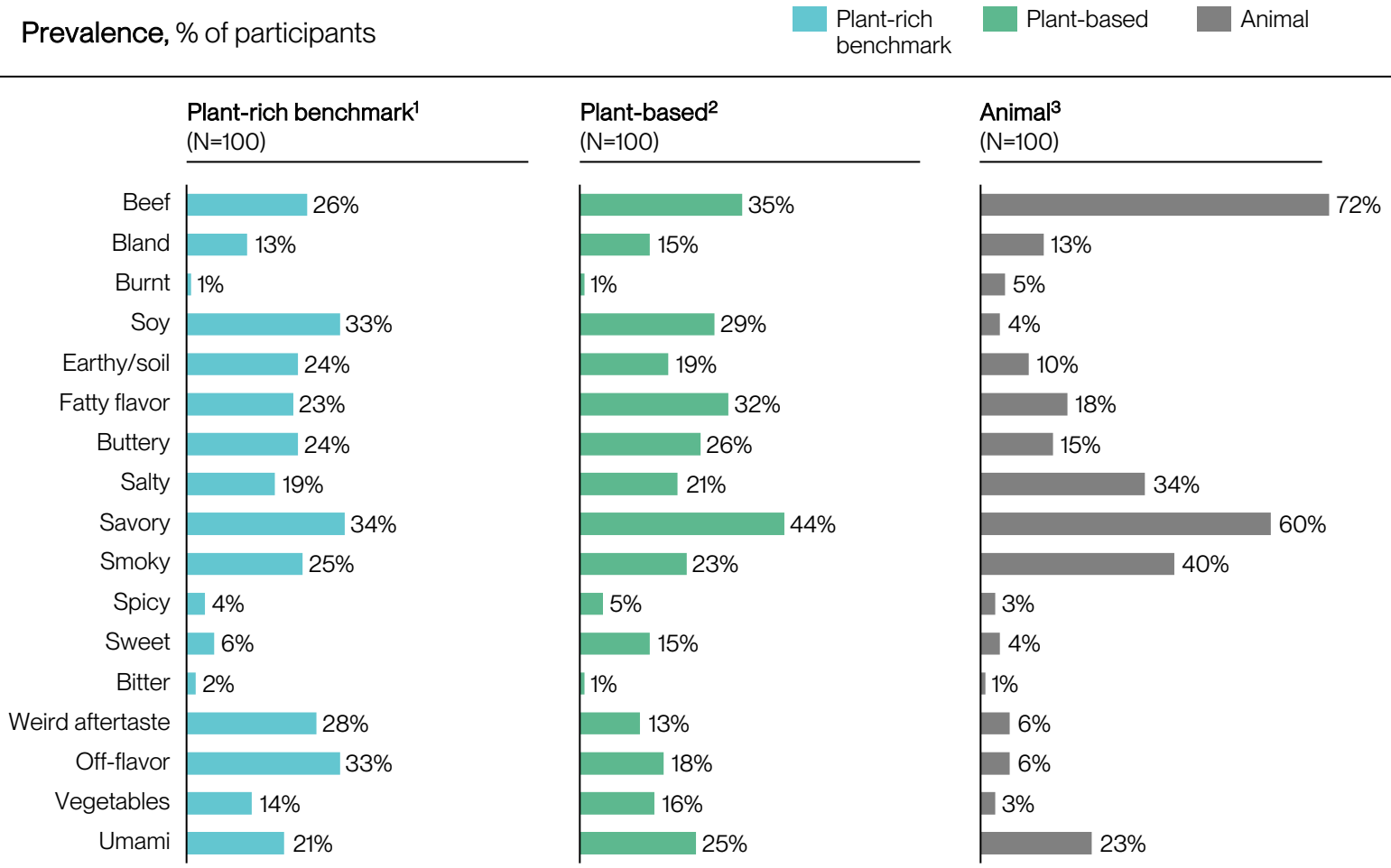
- 'Seared exterior' was associated with a 0.4pt increase in liking.

1. The average change in overall liking on 7pt scale for products for all responses using the relevant attribute as a descriptor compared to the mean liking for all products rated 'just about right' on that attribute. Calculated as Mean Liking (JAR) minus Mean Liking (descriptor used).
2. Share of responses for all products in this category (including animal, plant-rich, and plant) in each direction for each attribute.

# **Steak:** Flavor Profile

Please check all words or phrases that describe the flavor of XXX.

**Prevalence,** % of participants




## Takeaways

### Opportunity for plant-rich steak to improve beef flavor

- Only 26% described plant-rich steak as having 'beef' flavor (compared to 72% for animal).

### Plant-rich steak more likely to have weird aftertaste or off-flavor

- Participants described plant-rich steak as having a 'weird aftertaste' or 'off-flavor' 28% and 33%, respectively (compared to only 6% each for animal).

### Plant-rich steak behind plant-based and animal on savory flavor

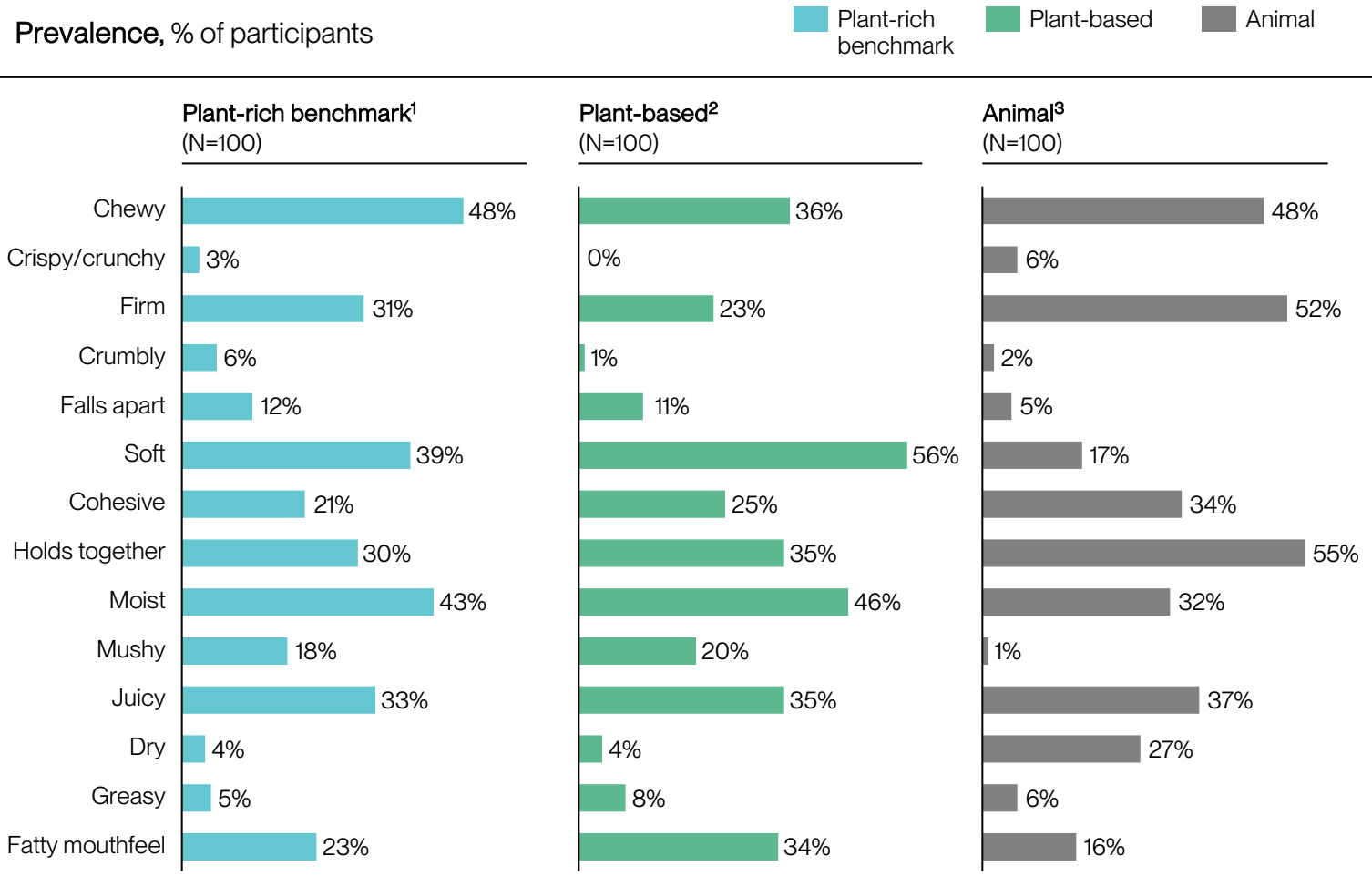
- Only 34% described plant-rich steak has having 'savory' flavor (compared to 44% for | plant-based and 60% for animal).

1. 1 commercially available plant-rich product.
2. Based on brand-level performance in previous rounds of sensory testing.
3. The highest retail sales volume animal steak selected for its representativeness of the animal steak category.

# **Steak:** Texture Profile

Please check all words or phrases that describe the texture of XXX.

**Prevalence,** % of participants




## Takeaways

### Plant-rich steak is softer than animal but firmer than plant-based

- 39% of participants described the plant-rich steak as 'soft,' higher than the 17% for animal but lower than the 56% for plant-based steak.

### Plant-rich products have a relative strength in juiciness

- Juiciness has a big impact on liking, so plant-rich steak is on the right track as 33% of participants reported it 'juicy' (compared to 35% for plant based and 37% for animal).

### Plant-rich lacks on holding together compared to animal

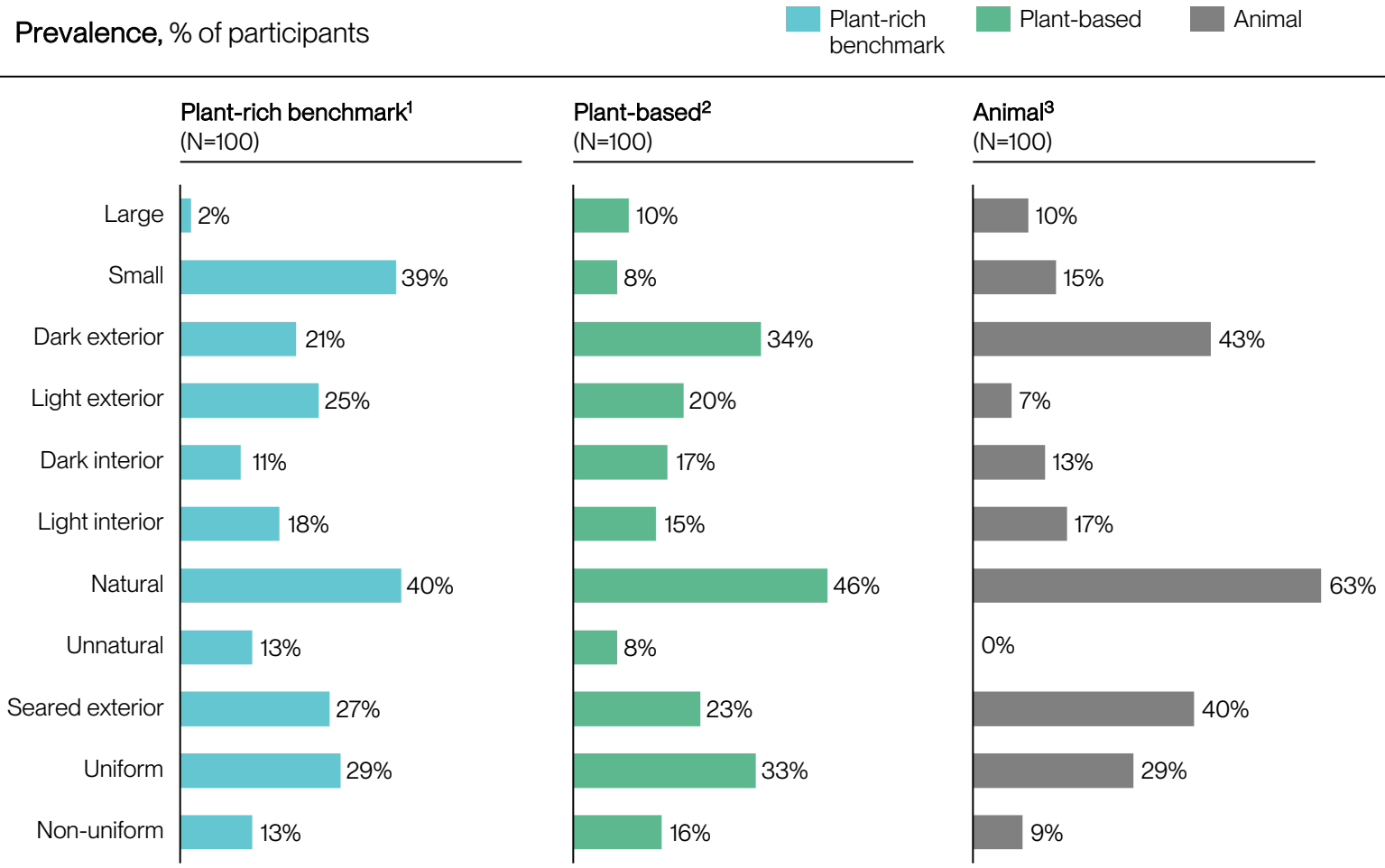
- Only 30% described plant-rich as 'holds together' (versus 55% for animal).

1. 1 commercially available plant-rich product.
2. Based on brand-level performance in previous rounds of sensory testing.
3. The highest retail sales volume animal steak selected for its representativeness of the animal steak category.

# **Steak:** Appearance Profile

Please check all words or phrases that describe the appearance of XXX.

**Prevalence,** % of participants




## Takeaways

### Plant-rich steak looks less natural than animal

- Only 40% described plant-rich steak as 'natural' (versus 63% for animal).

### Opportunity to improve seared exterior of plant-rich product

- 'Seared exterior' showed a large positive impact to liking, and only 27% reported the plant-rich product as having a 'seared exterior' (versus 40% for animal).

### Plant-rich is perceived as smaller than animal

- 39% found plant-rich 'small' versus 15% for animal, with 'small' perception causing a modest drop in liking.

1. 1 commercially available plant-rich product.
2. Based on brand-level performance in previous rounds of sensory testing.
3. The highest retail sales volume animal steak selected for its representativeness of the animal steak category.

Category-Specific Deep Dive

# Pork Sausage

# Pork Sausage

## Executive summary of R&D opportunities

### Performance Overview

Plant-rich pork sausages are not yet as good as plant-based or animal equivalents.

- **Plant-rich pork sausage were not liked as much as animal or plant-based** – Only 30% indicated they 'like' or 'like very much' the plant-rich average (versus 60% for animal and 41% for plant-based).
- **Plant-rich products performed well in juiciness** – 61% of participants found the plant-rich leader to be the right level of juiciness (versus 43% for plant-based and 60% for animal).
- **Plant-rich not considered very 'similar' to typical pork sausage** – Only 31% rated the plant-rich leader as 'similar' or 'very similar' to a typical pork sausage (versus 69% for animal benchmark).

### Top Sensory Opportunities

Plant-rich pork sausage brands should focus on avoiding negative flavor attributes, developing a more natural appearance, and increasing firmness to reach performance parity.

- **Plant-rich products need to reduce negative flavor attributes like weird aftertaste and off-flavors** – Participants found plant-rich average 3x more likely to have a 'weird aftertaste' or 'off-flavor' compared to the animal product.
- **Consumers prefer a more natural appearance** – 'Natural' appearance associated with a 0.8pt increase in liking, and only 22% found the plant-rich average to appear 'natural.'
- **Increase firmness of sausage** – Only 63% rated plant-rich average 'just about right' firmness (versus 78% for animal).

# Pork Sausages Tested

Pork sausages from two commercially available plant-rich pork sausage brands were prepared according to manufacturer instructions on a skillet and compared against animal and plant-based pork sausages.

Participants were screened to exclude consumers who do not eat animal-based meat and only include those who eat sausages at least every 1-2 months.

## Testing Environment

Participants tried the pork sausages at Haight St. Cafe in San Francisco, a restaurant environment, in order to achieve an authentic, natural experience.

## Preparation

All pork sausages were prepared by restaurant staff using a skillet according to manufacturer instructions. Participants were allowed to add condiments to keep the eating experience natural but were required to apply condiments consistently across all sausages.

## Dish Served

All participants were served four sausages with buns. While they ate, participants filled out a survey via mobile phone detailing their experience with each product. Products were evaluated in a randomized order.

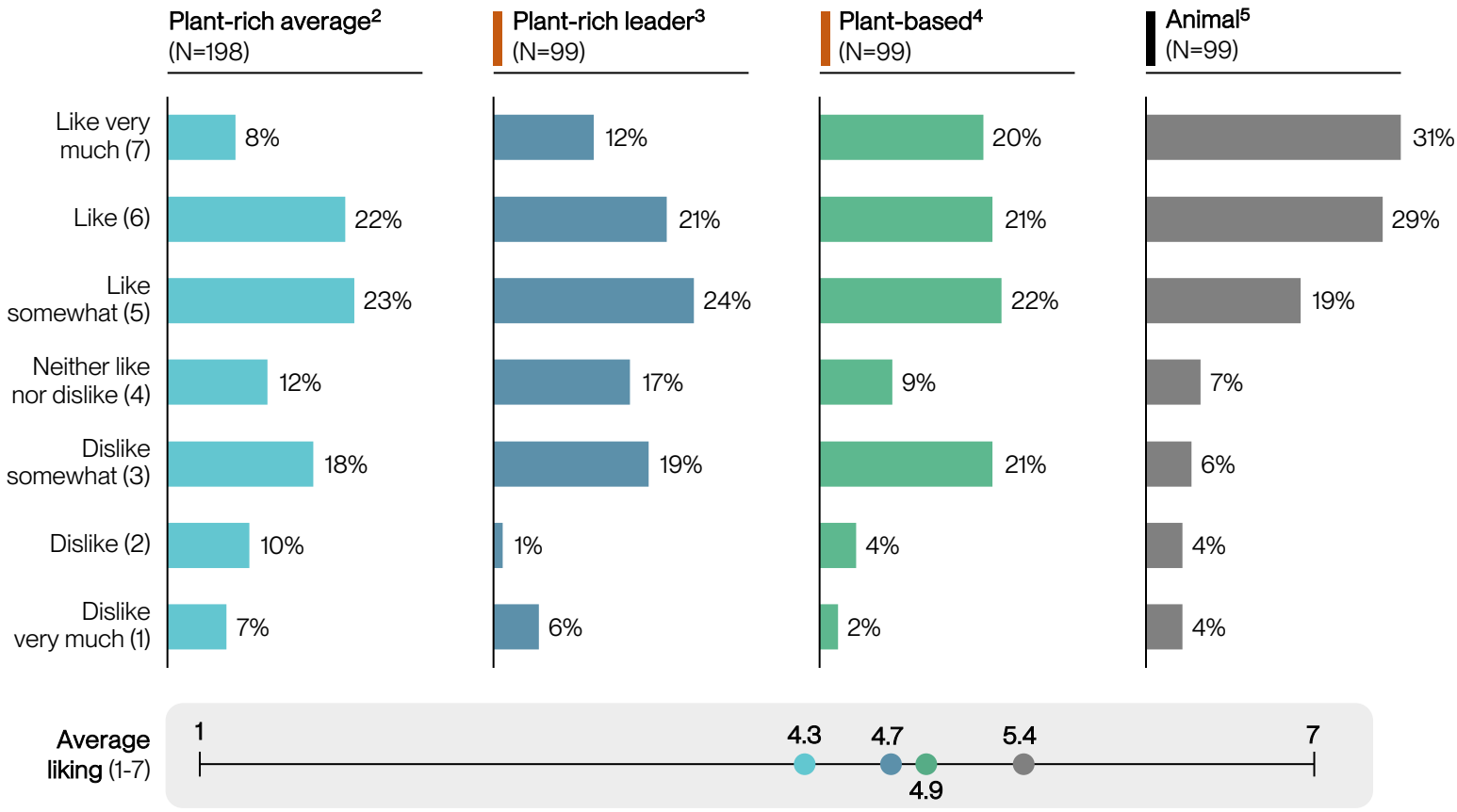
# **Pork Sausage:** Overall Liking

How would you rate your OVERALL LIKING of pork sausage XXX?

**Overall liking,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)




# Takeaways

## Participants prefer animal and plant-based to plant-rich

- Only 30% indicated they 'like' or 'like very much' the plant-rich average (versus 60% for animal and 41% for plant-based).

## Plant-rich average is not far behind plant-rich leader

- 33% of participants 'like' or 'like very much' the plant-rich leader, compared to 30% for the plant rich average.

1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. Aggregated across 2 commercially available plant-rich pork sausage products.
3. The plant-rich product with the highest mean liking of those included in this test.
4. Based on brand-level performance in previous rounds of sensory testing.
5. The highest retail sales volume animal pork sausage selected for its representativeness of the animal pork sausage category.

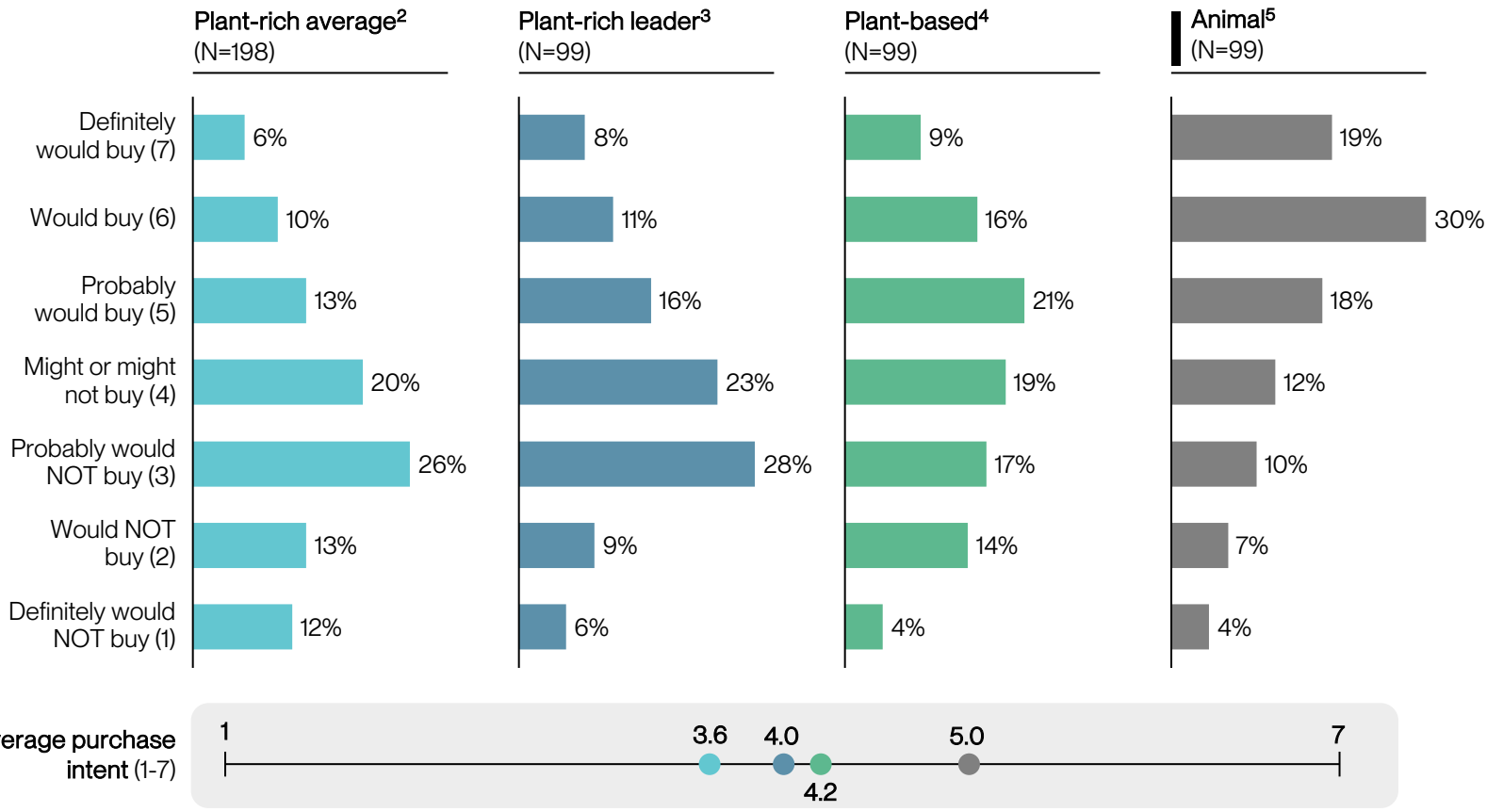
# **Pork Sausage:** Purchase Intent

How would you rate your PURCHASE INTENT of pork sausage XXX?

**Purchase intent,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)







# Takeaways

## Consumers have low purchase intent for plant-rich products

- 19% said they 'would buy' or 'definitely would buy' the plant-rich leader, versus 49% for animal.

## Plant-rich products are behind plant-based in purchase intent

- Plant-rich average had a 3.6pt purchase intent, 0.6pts behind plant-based.

## Plant-rich average performed similarly to plant-rich leader

- 16% said they 'would buy' or 'definitely would buy' the plant-rich average, versus 19% for the plant-rich leader, and the difference was not statistically significant.

1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. Aggregated across 2 commercially available plant-rich pork sausages products.
3. The plant-rich product with the highest mean liking of those included in this test.
4. Based on brand-level performance in previous rounds of sensory testing.
5. The highest retail sales volume animal pork sausage selected for its representativeness of the animal pork sausage category.

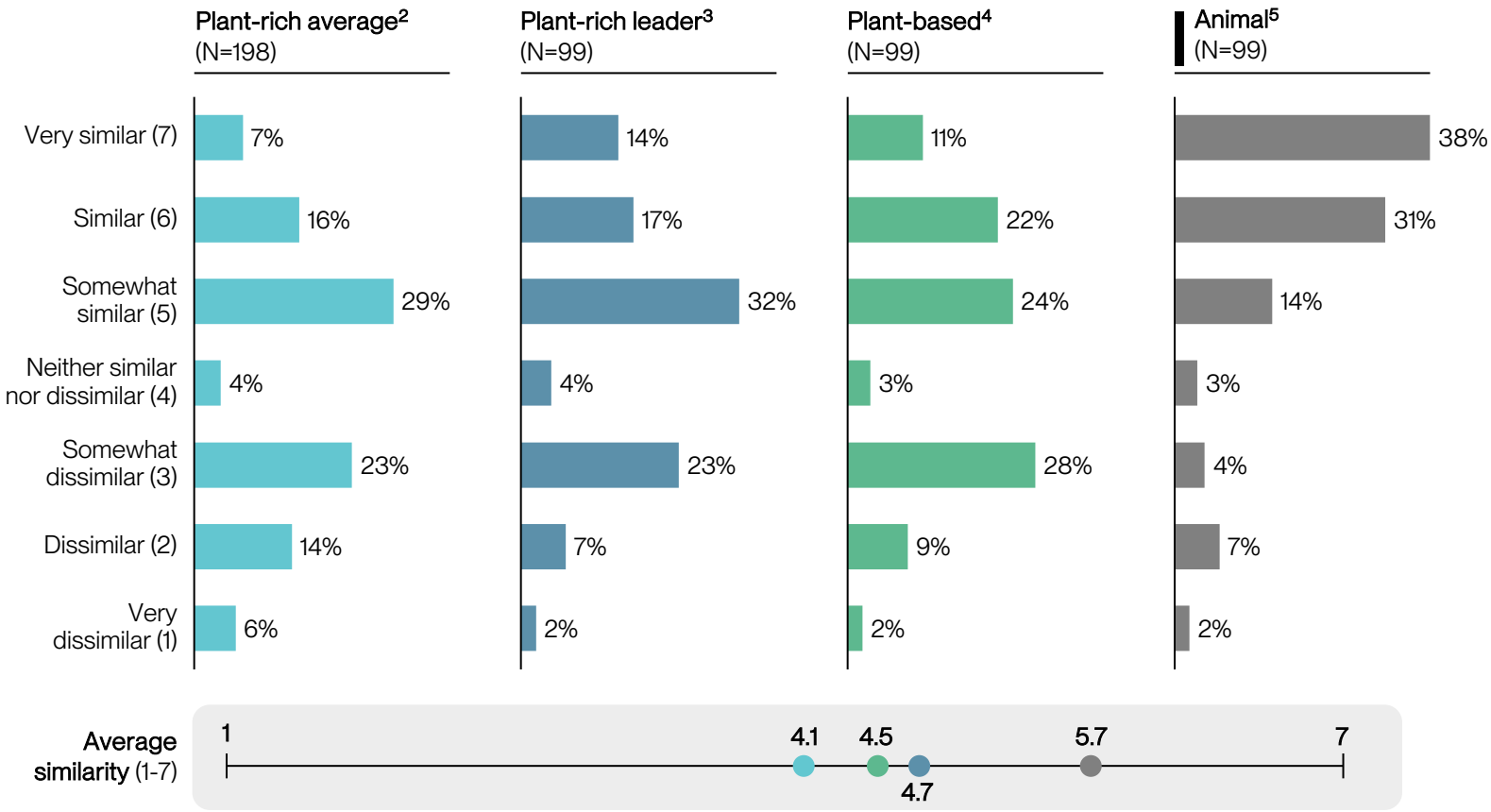
# **Pork Sausage:** Similarity

How would you rate your SIMILARITY of XXX to a typical pork sausage?

**Similarity,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)







# Takeaways

## Plant-rich products behind on similarity to typical pork sausage

- Only 31% rated the plant-rich leader as 'similar' or 'very similar' to a typical pork sausage, versus 69% for animal.

## Opportunity for plant-rich average to catch up to plant-rich leader

- Average similarity was 4.1 for plant-rich average compared to 4.7 for plant-rich leader.

## Plant-rich leader close to plant-based on similarity

- 0.2pt difference in average similarity between plant-rich leader and plant-based.

1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. Aggregated across 2 commercially available plant-rich pork sausages products.
3. The plant-rich product with the highest mean liking of those included in this test.
4. Based on brand-level performance in previous rounds of sensory testing.
5. The highest retail sales volume animal pork sausage selected for its representativeness of the animal pork sausage category.

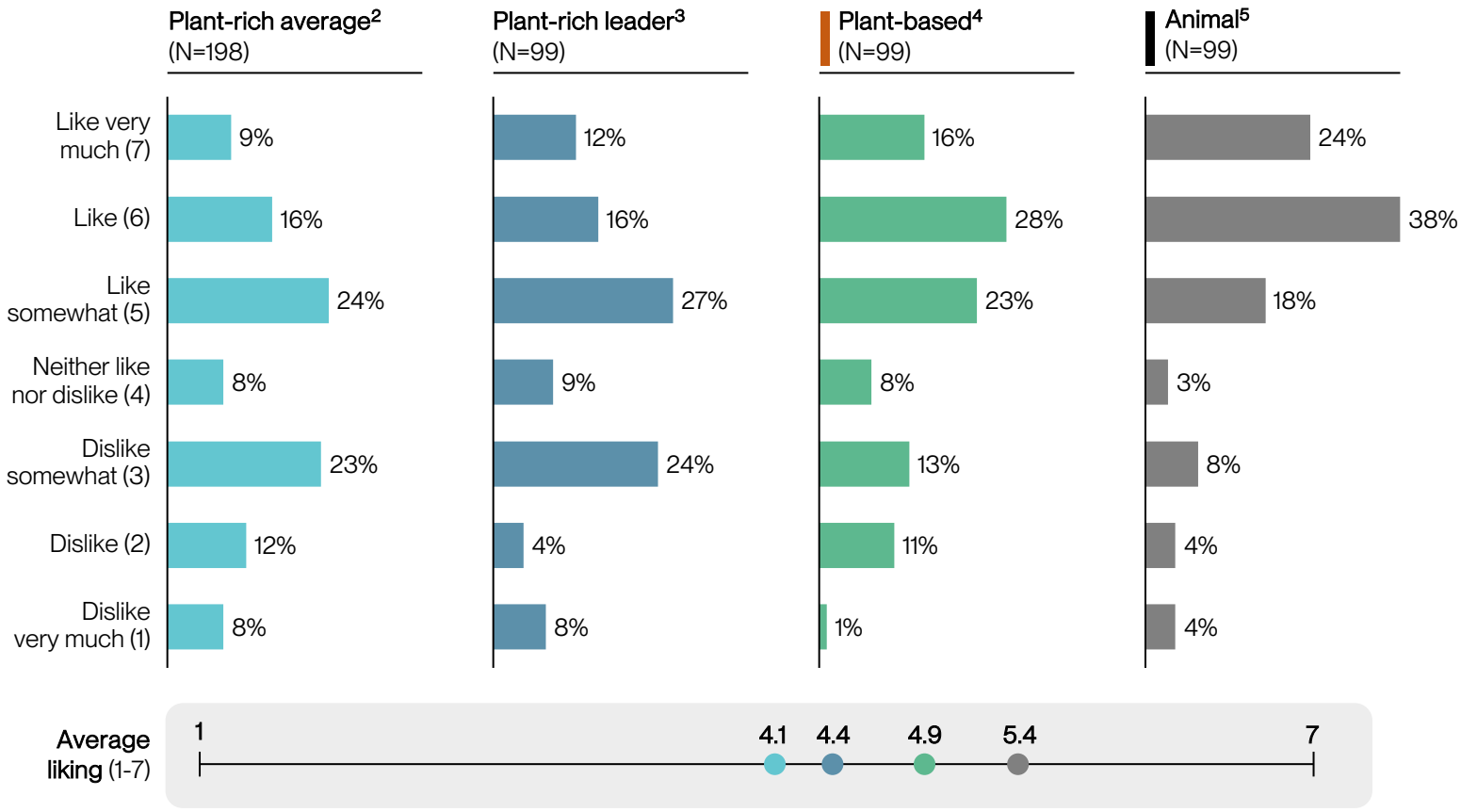
# **Pork Sausage:** Flavor

How would you rate your FLAVOR of pork sausage XXX?

**Flavor,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)




# Takeaways

## Big opportunity for plant-rich products to improve on flavor

- Only 25% of participants 'like' or 'like very much' the flavor of the plant-rich average versus 62% for the animal benchmark, and 44% for the plant-based.

## Flavor of plant-rich average is close to plant-rich leader

- No statistically significant difference between the plant-rich average and plant-rich leader.

1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. Aggregated across 2 commercially available plant-rich pork sausages products.
3. The plant-rich product with the highest mean liking of those included in this test.
4. Based on brand-level performance in previous rounds of sensory testing.
5. The highest retail sales volume animal pork sausage selected for its representativeness of the animal pork sausage category.

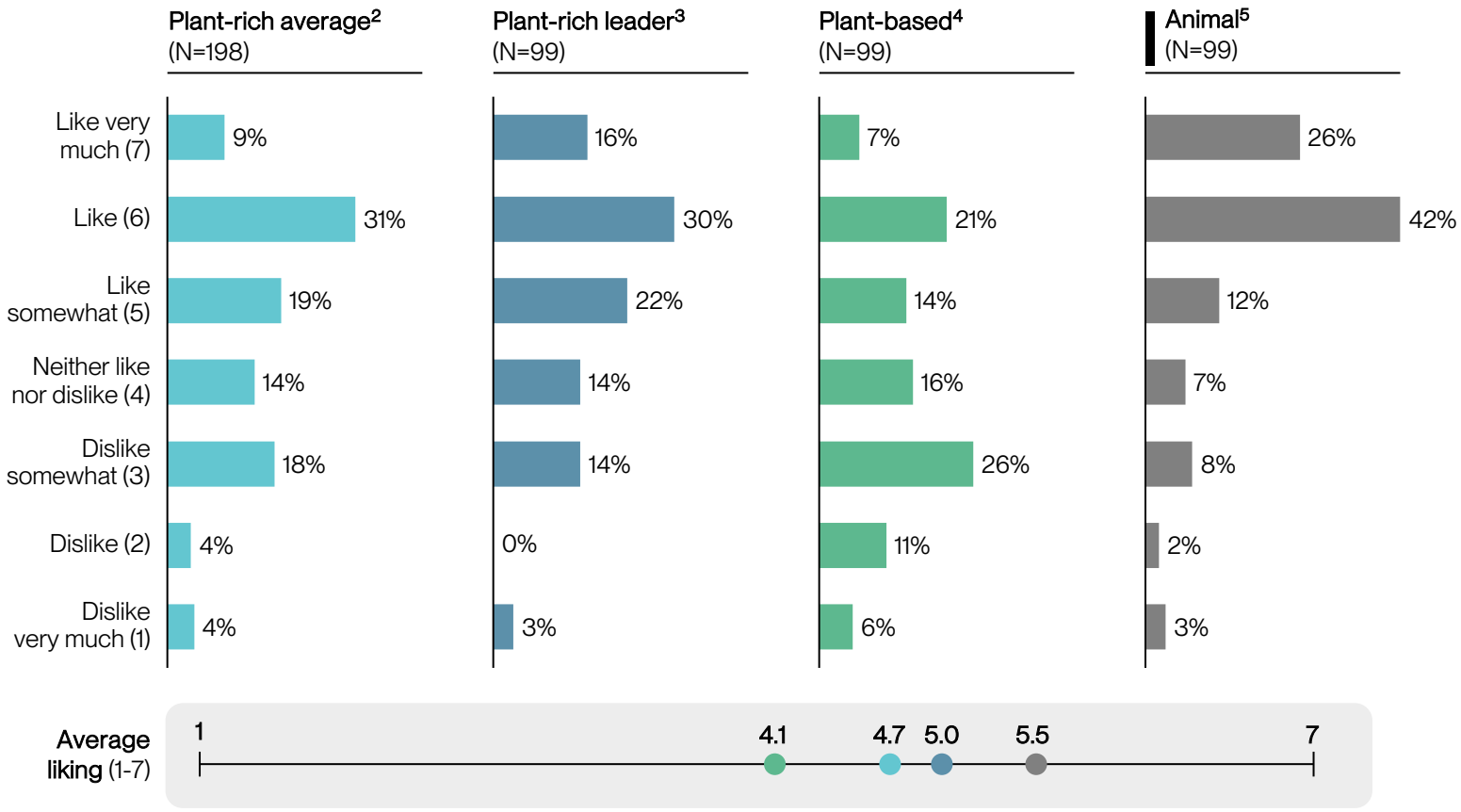
# **Pork Sausage:** Texture

How would you rate your TEXTURE of pork sausage XXX?

**Texture,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)







# Takeaways

## Plant-rich products have better texture than plant-based

- Plant-rich average liking was 4.7pts versus 4.1pts for plant-based.

## Plant-rich average close to plant-rich leader in texture

- 40% indicated they 'like' or 'like very much' the texture of the plant-rich average compared to 46% for plant-rich leader.

## Plant-rich lags behind animal on texture

- Average liking of animal benchmark was 5.5pts versus 5.0pts for plant-rich leader.

1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. Aggregated across 2 commercially available plant-rich pork sausages products.
3. The plant-rich product with the highest mean liking of those included in this test.
4. Based on brand-level performance in previous rounds of sensory testing.
5. The highest retail sales volume animal pork sausage selected for its representativeness of the animal pork sausage category.

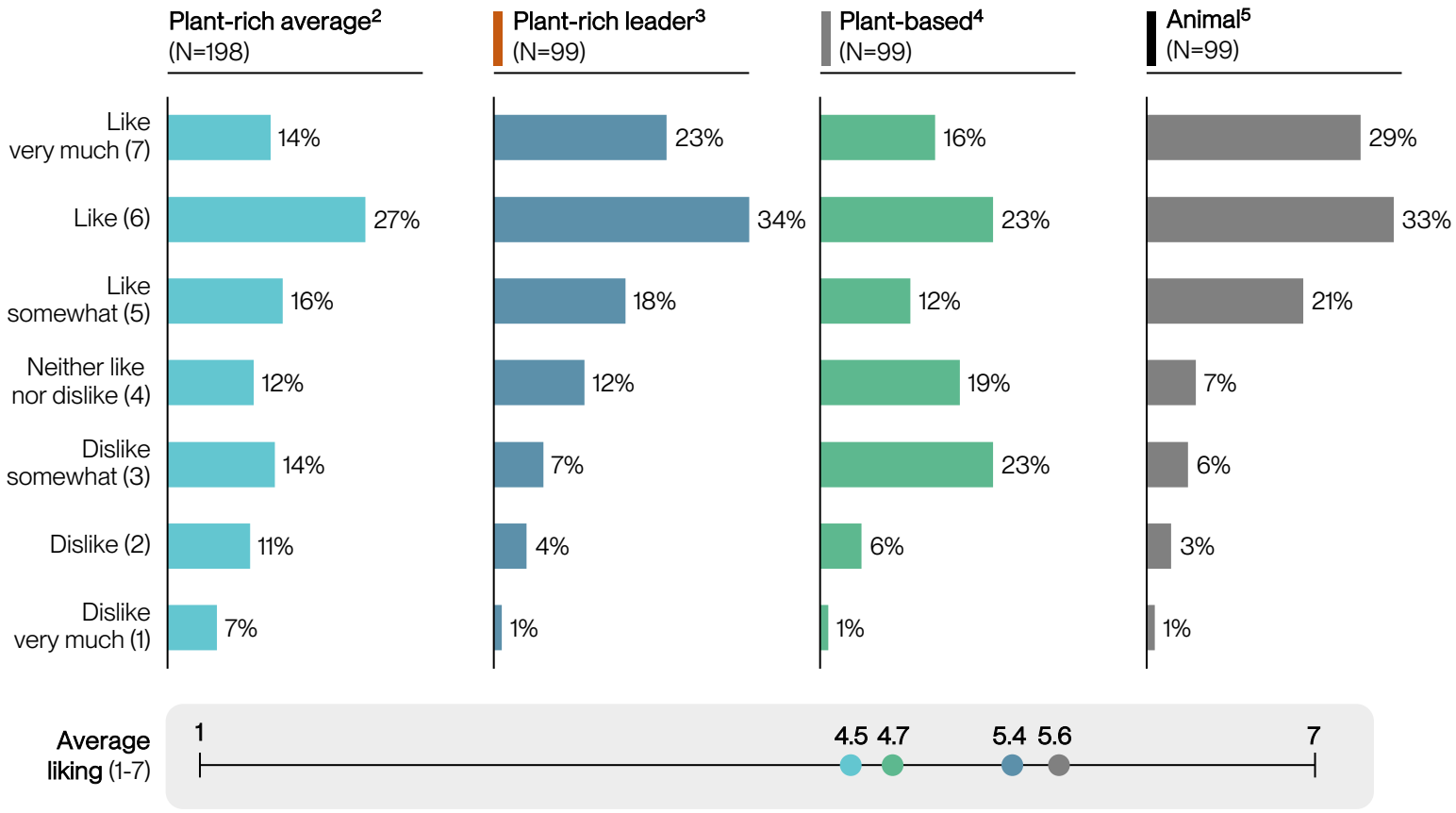
# **Pork Sausage:** Appearance

How would you rate your APPEARANCE of pork sausage XXX?

**Appearance,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)




# Takeaways

## Plant-rich leader excels in appearance

- Plant-rich leader closest in performance to animal on appearance ratings, compared to scores on flavor, texture, and overall liking.

## Opportunity for plant-rich average to close the gap with plant-rich leader in appearance

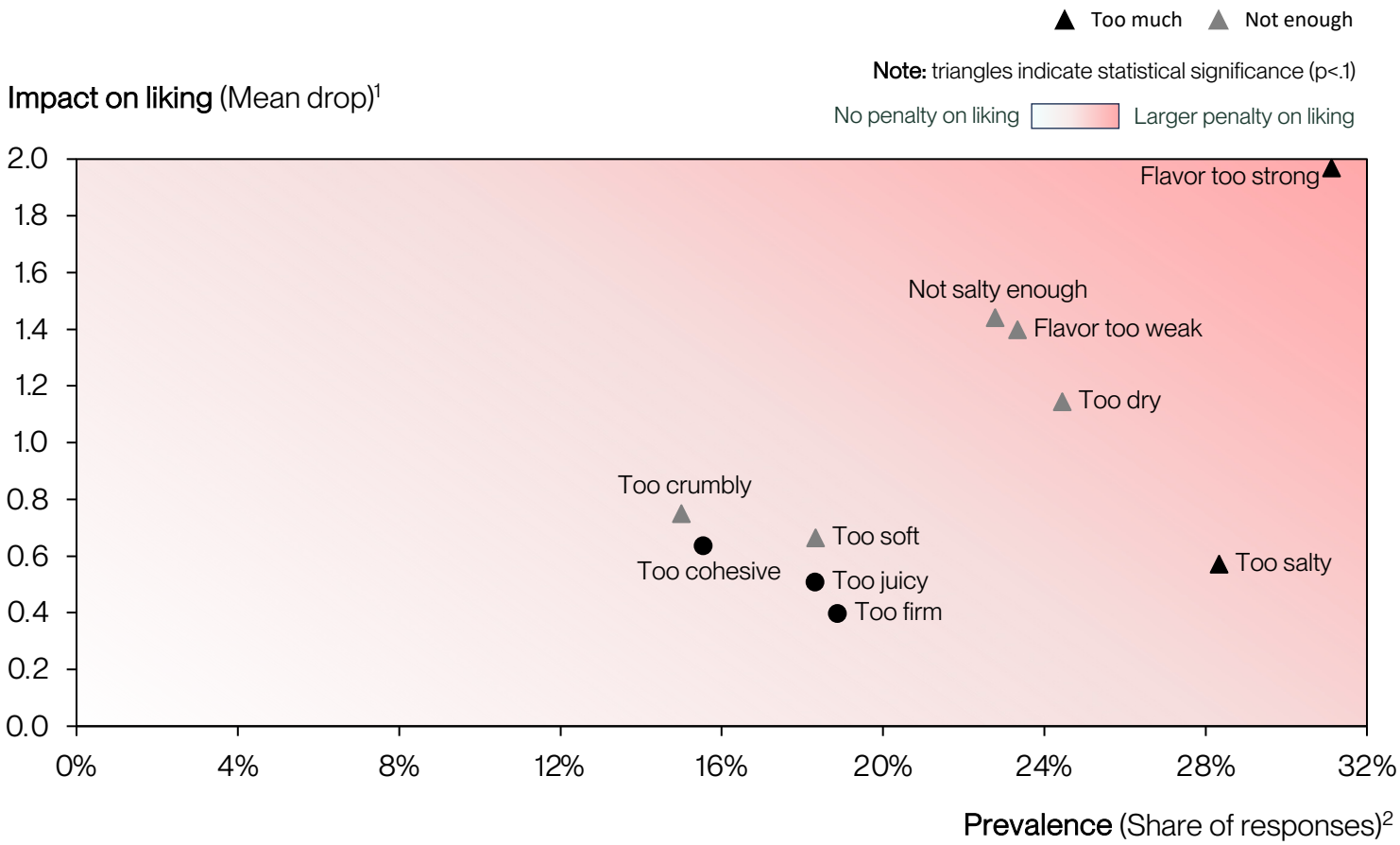
- Only 41% said they 'like' or 'like very much' the appearance of the plant-rich average versus 57% for the plant-rich leader.
- Difference between plant-rich average and leader was very statistically significant.

1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. Aggregated across 2 commercially available plant-rich pork sausage products.
3. The plant-rich product with the highest mean liking of those included in this test.
4. The top-performing plant-based pork sausage identified by NECTAR during previous testing of plant-based pork sausage (*Taste of Industry 2024*).
5. The highest retail sales volume animal pork sausage selected for its representativeness of the animal pork sausage category.

# **Pork Sausage:** Top R&D Opportunities

Prioritization framework for identifying attributes with large impacts on liking

Penalty analysis using responses on 'just-about-right' questions, Mean drop and Prevalence




## Takeaways

### Consumers are sensitive to saltiness, but lack of saltiness has a much larger impact than excessive saltiness

- 'Not salty enough' was associated with a 1.6pt drop in liking, versus 0.6pt for 'too salty.'

### Avoid overpowering flavors

- Almost a third of participants reported 'flavor too strong', which has a 2pt drop on liking.

### Lean towards creating a juicier product

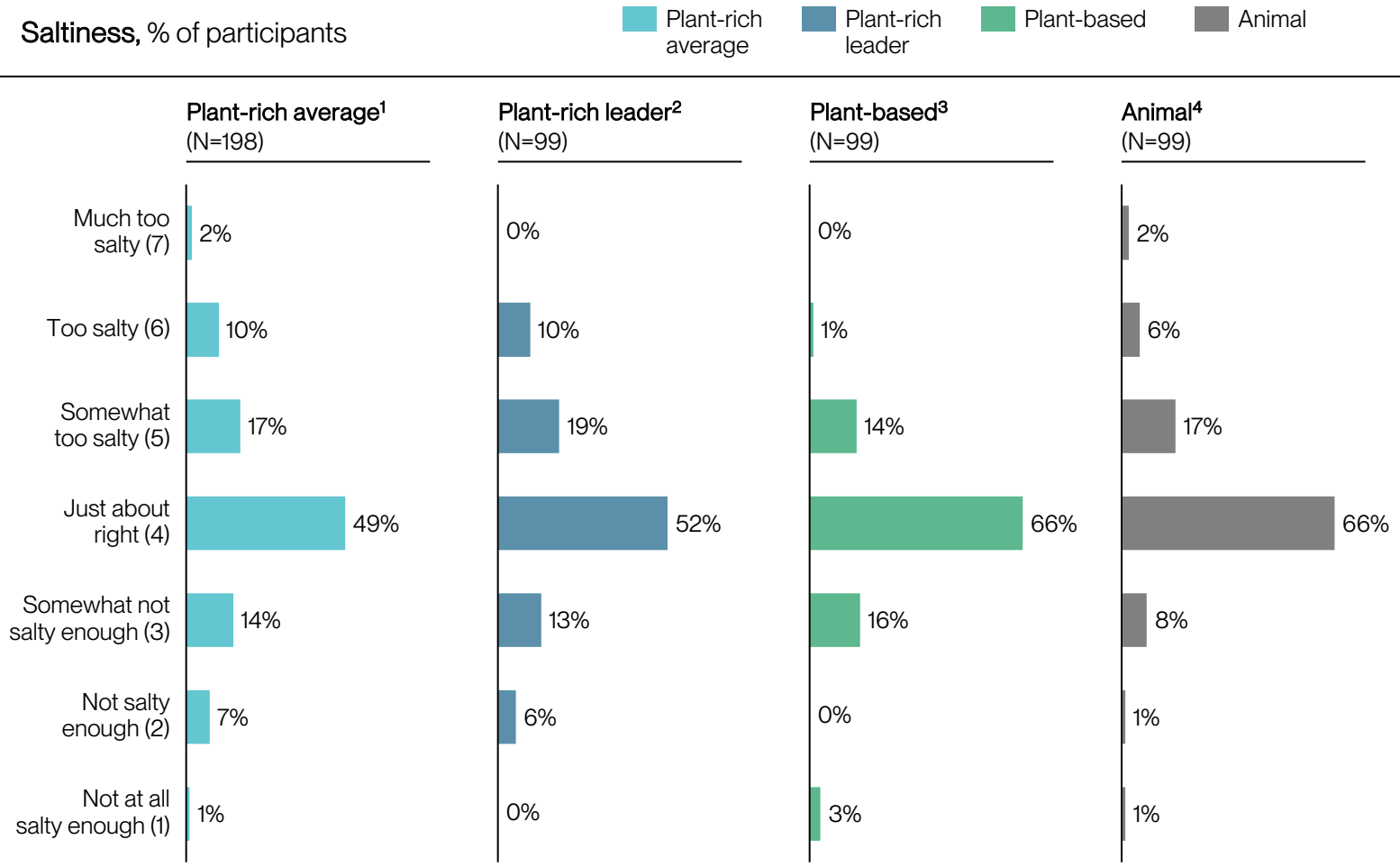
- 'Too dry' had a 1.2pt drop in liking versus 0.5pt for 'too juicy.'

1. The average change in overall liking on 7pt scale for products for all responses using the relevant attribute as a descriptor compared to the mean liking for all products rated 'just about right' on that attribute. Calculated as Mean Liking (JAR) minus Mean Liking (descriptor used).
2. Share of responses for all plant-rich products in this category in each direction for each attribute.

# **Pork Sausage:** Saltiness

How would you rate your SALTINESS of pork sausage XXX?

**Saltiness,** % of participants




# Takeaways

## Plant-rich products behind in saltiness

- Only 52% rated the plant-rich leader 'just about right' in saltiness, versus 66% for plant-based and animal.

## Plant-rich are too salty

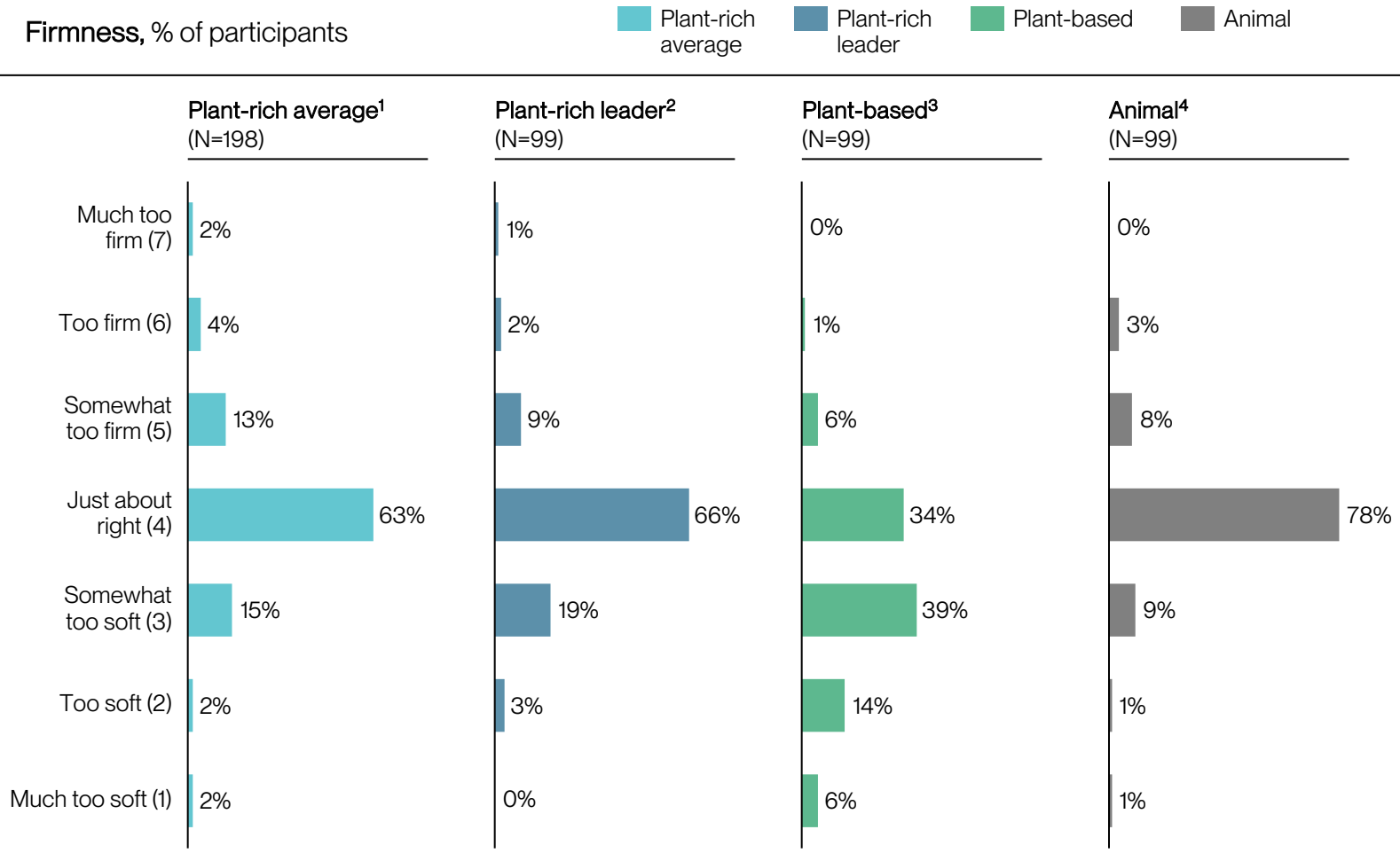
- 29% of participants voted the plant-rich average 'too salty' versus 22% 'not salty enough,' 'too salty' associated with a 0.6pt drop in liking.

1. Aggregated across 2 commercially available plant-rich pork sausages products.
2. The plant-rich product with the highest mean liking of those included in this test.
3. Based on brand-level performance in previous rounds of sensory testing.
4. The highest retail sales volume animal pork sausage selected for its representativeness of the animal pork sausage category.

# **Pork Sausage:** Firmness

How would you rate your FIRMNESS of pork sausage XXX?

**Firmness,** % of participants




# Takeaways

## Majority of participants enjoyed the firmness of plant-rich products

- 63% rated the plant-rich average 'just about right' firmness.

## Plant-rich leader not differentiated on firmness

- 66% rated the plant-rich leader 'just about right,' compared to 63% for plant-rich average.

## Plant-rich beats plant-based on firmness, but worse than animal

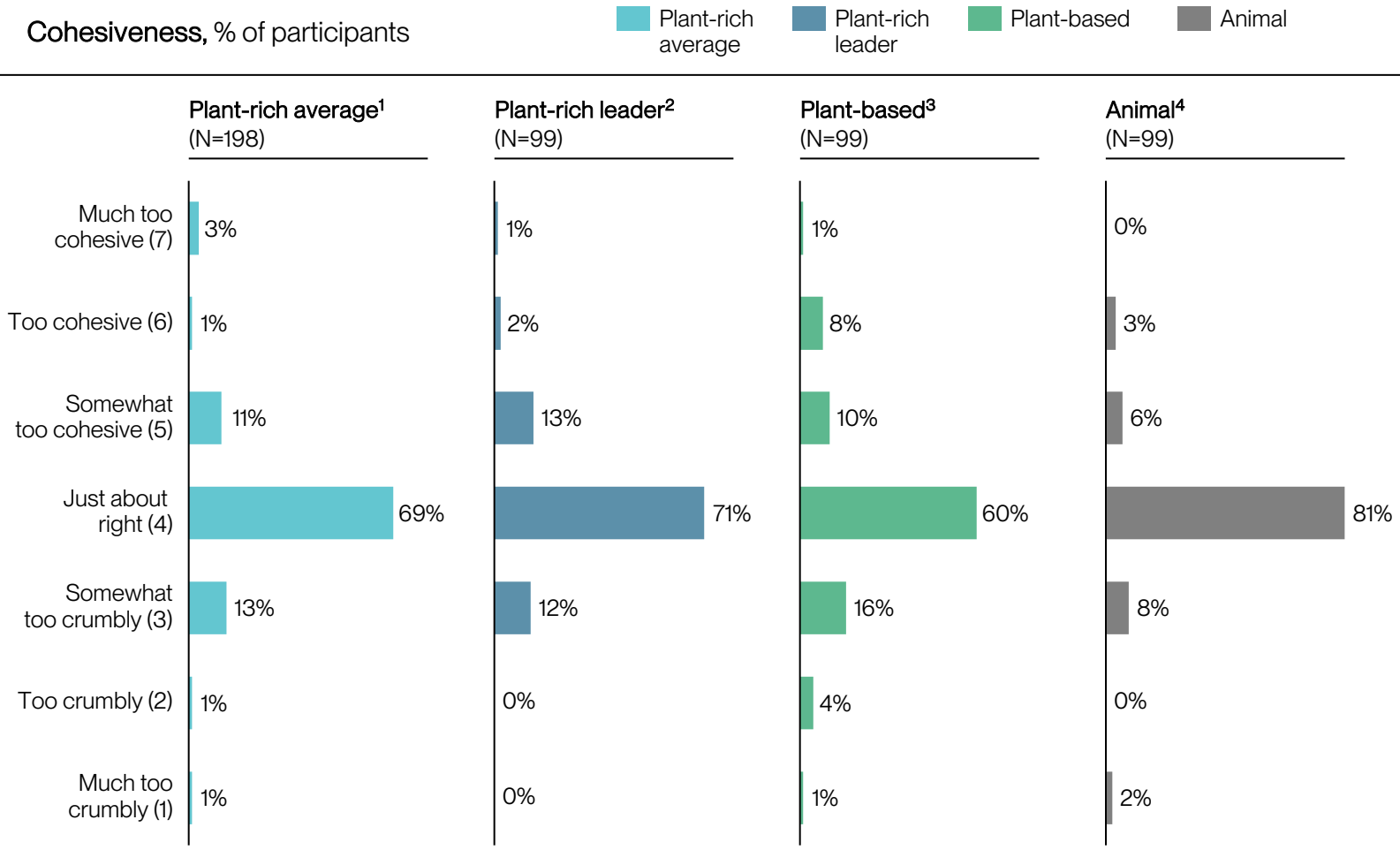
- 63% rated plant-rich average 'just about right' firmness (versus 34% for plant-based and 78% for animal).

1. Aggregated across 2 commercially available plant-rich pork sausages products.
2. The plant-rich product with the highest mean liking of those included in this test.
3. Based on brand-level performance in previous rounds of sensory testing.
4. The highest retail sales volume animal pork sausage selected for its representativeness of the animal pork sausage category.

# **Pork Sausage:** Cohesiveness

How would you rate your COHESIVENESS of pork sausage XXX?

**Cohesiveness,** % of participants




# Takeaways

## Consumers enjoyed the cohesiveness of plant-rich products

- 69% of consumers rated the cohesiveness of plant-rich average 'just about right.'

## Plant-rich cohesiveness in between plant-based and animal ratings

- 71% of participants found the cohesiveness of plant-rich leader 'just about right,' versus 60% for plant-based and 81% for animal.

## Plant-rich average close to leader on cohesiveness

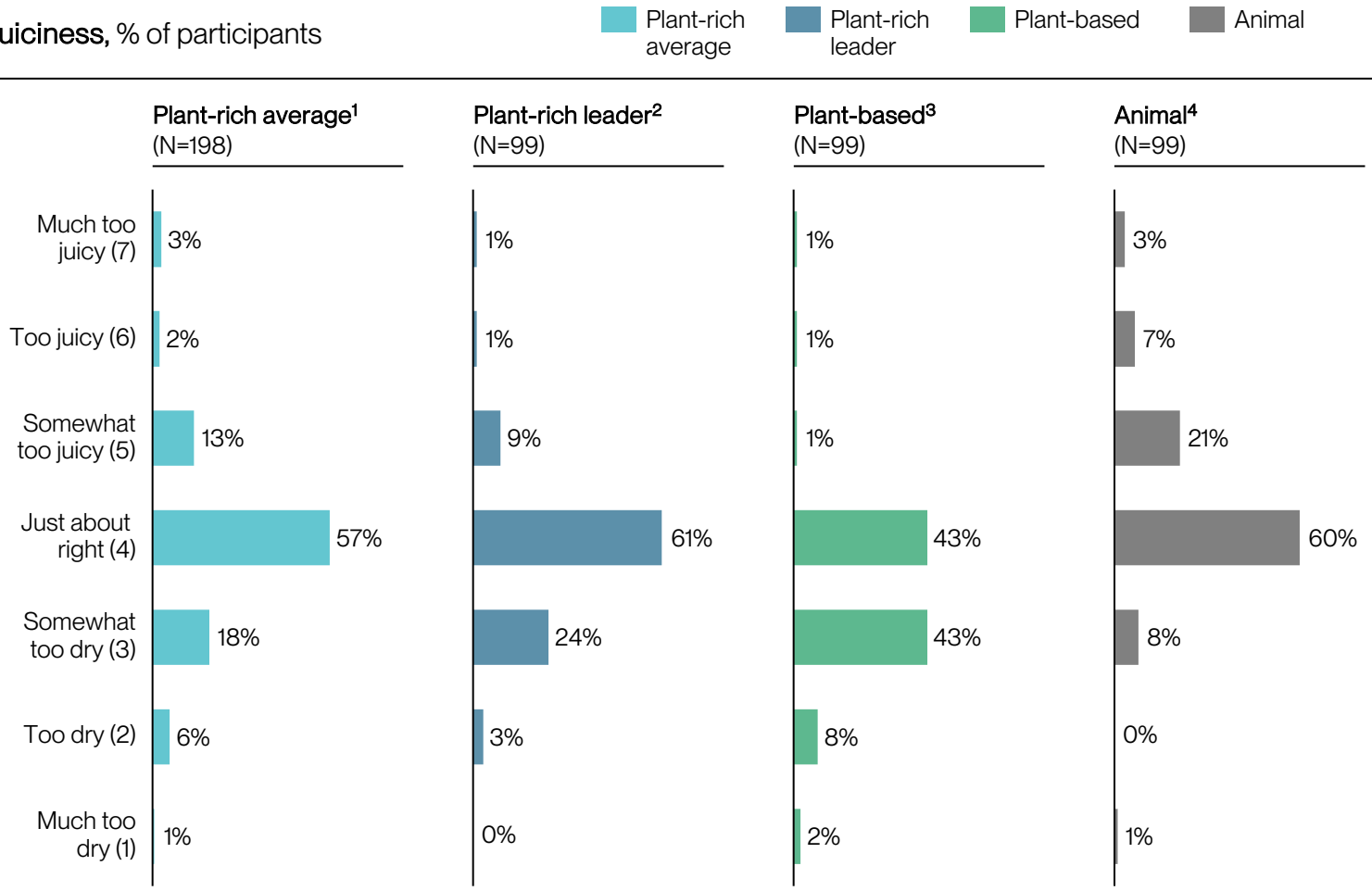
- 69% of consumers rated cohesiveness of plant-rich average 'just about right' versus 71% for plant-rich leader.

1. Aggregated across 2 commercially available plant-rich pork sausages products.
2. The plant-rich product with the highest mean liking of those included in this test.
3. Based on brand-level performance in previous rounds of sensory testing.
4. The highest retail sales volume animal pork sausage selected for its representativeness of the animal pork sausage category.

# **Pork Sausage:** Juiciness

How would you rate your JUICINESS of pork sausage XXX?

**Juiciness,** % of participants




# Takeaways

## Plant-rich products excel in juiciness

- 61% of participants found the plant-rich leader to be the 'just about right' level of juiciness, versus 43% for plant-based and 60% for animal.

## Plant-rich products tended to be too dry

- 25% found the plant-rich average to be 'too dry' versus 18% 'too juicy.' 'too dry' had a 1.6pt impact to liking versus 'too juicy' only 0.6pt drop.

## Plant-rich leader not differentiated on juiciness

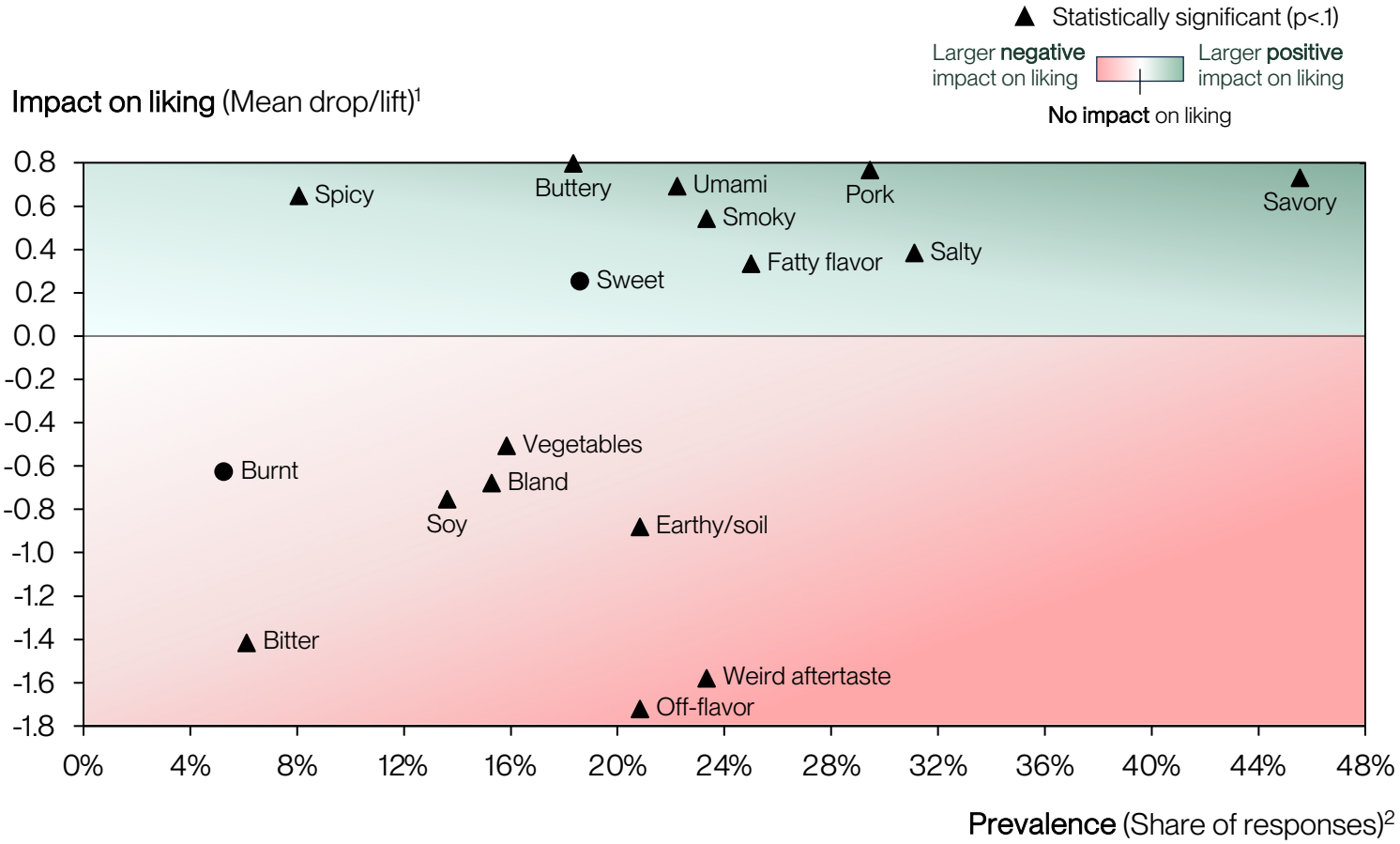
- Plant-rich average and leader only differ by 4% in 'just about right' juiciness ratings.

1. Aggregated across 2 commercially available plant-rich pork sausages products.
2. The plant-rich product with the highest mean liking of those included in this test.
3. Based on brand-level performance in previous rounds of sensory testing.
4. The highest retail sales volume animal pork sausage selected for its representativeness of the animal pork sausage category.

# **Pork Sausage:** Top Flavor R&D Opportunities

Prioritization framework for identifying attributes with large impacts on liking

**Penalty analysis on flavor using check-all-that-apply responses,** Mean drop/lift and Prevalence




# Takeaways

## Weird aftertaste and off-flavor have the worst impact on liking

- Each was associated with a ~1.7pt drop in liking.

## Participants noticed and appreciated a savory flavor

- 46% of participants described flavor as 'savory,' which had a 0.7pt lift to liking.

## Consumers prefer stronger, meatier flavors

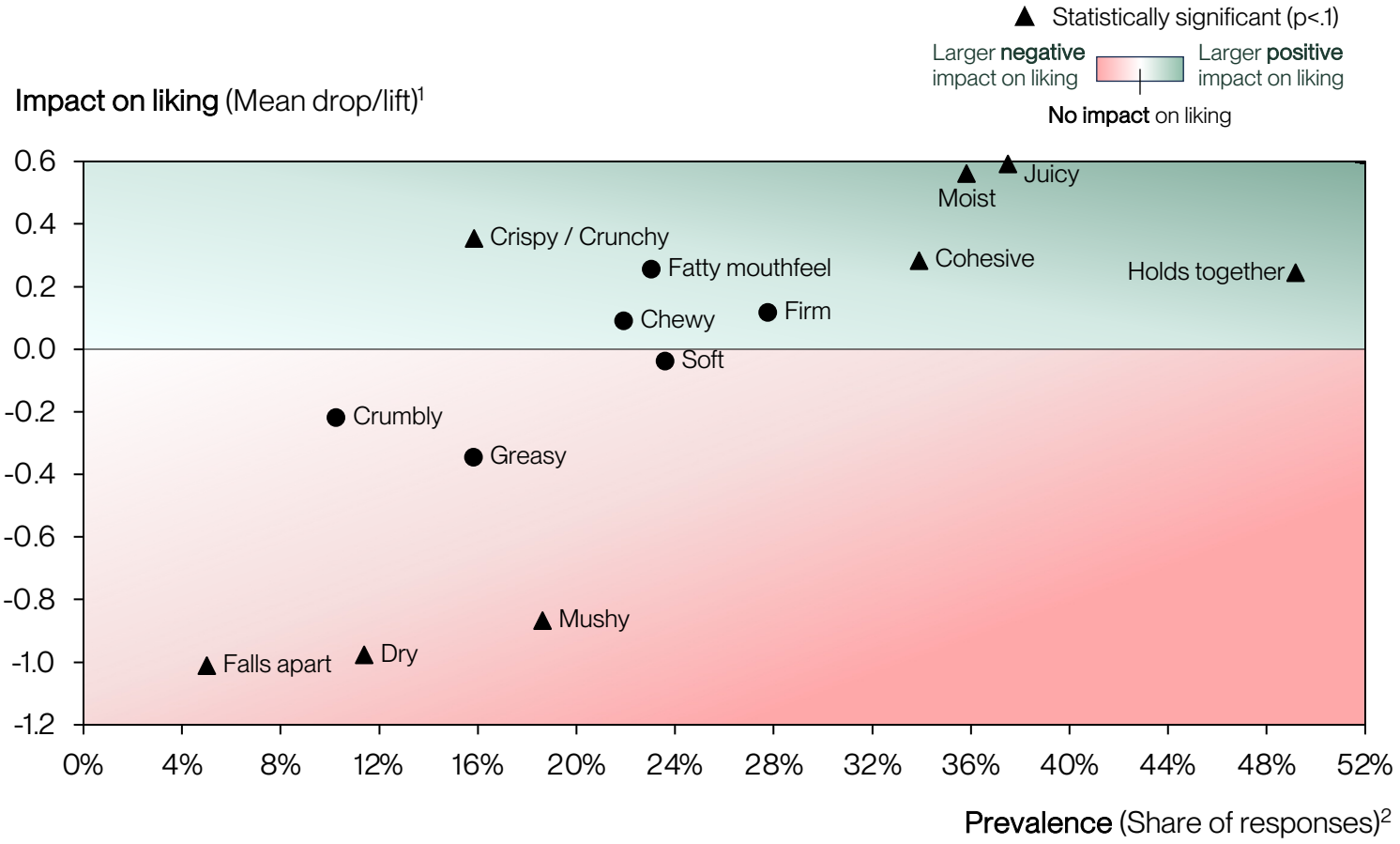
- 'Umami,' 'buttery,' 'pork,' 'smoky,' and 'spicy' flavors were all associated with positive impact to liking, while 'vegetable,' 'bland,' 'soy,' and 'earthy' flavors had negative impacts.

1. The average change in overall liking on 7pt scale for products for all responses using the relevant attribute as a descriptor compared to the mean liking for all products rated 'just about right' on that attribute. Calculated as Mean Liking (JAR) minus Mean Liking (descriptor used).
2. Share of responses for all products in this category (including animal, plant-rich, and plant) in each direction for each attribute.

# **Pork Sausage:** Top Texture R&D Opportunities

Prioritization framework for identifying attributes with large impacts on liking

**Penalty analysis on texture using check-all-that-apply responses,** Mean drop/lift and Prevalence




# Takeaways

## Moistness and juiciness had the largest positive impact on liking

- Each was associated with a 0.6pt increase.

## Dryness, mushiness, and falling apart were the strongest negative attributes

- Each was associated with a ~1.0pt drop in liking.

## Holding together was prevalent but did not have a big impact on liking

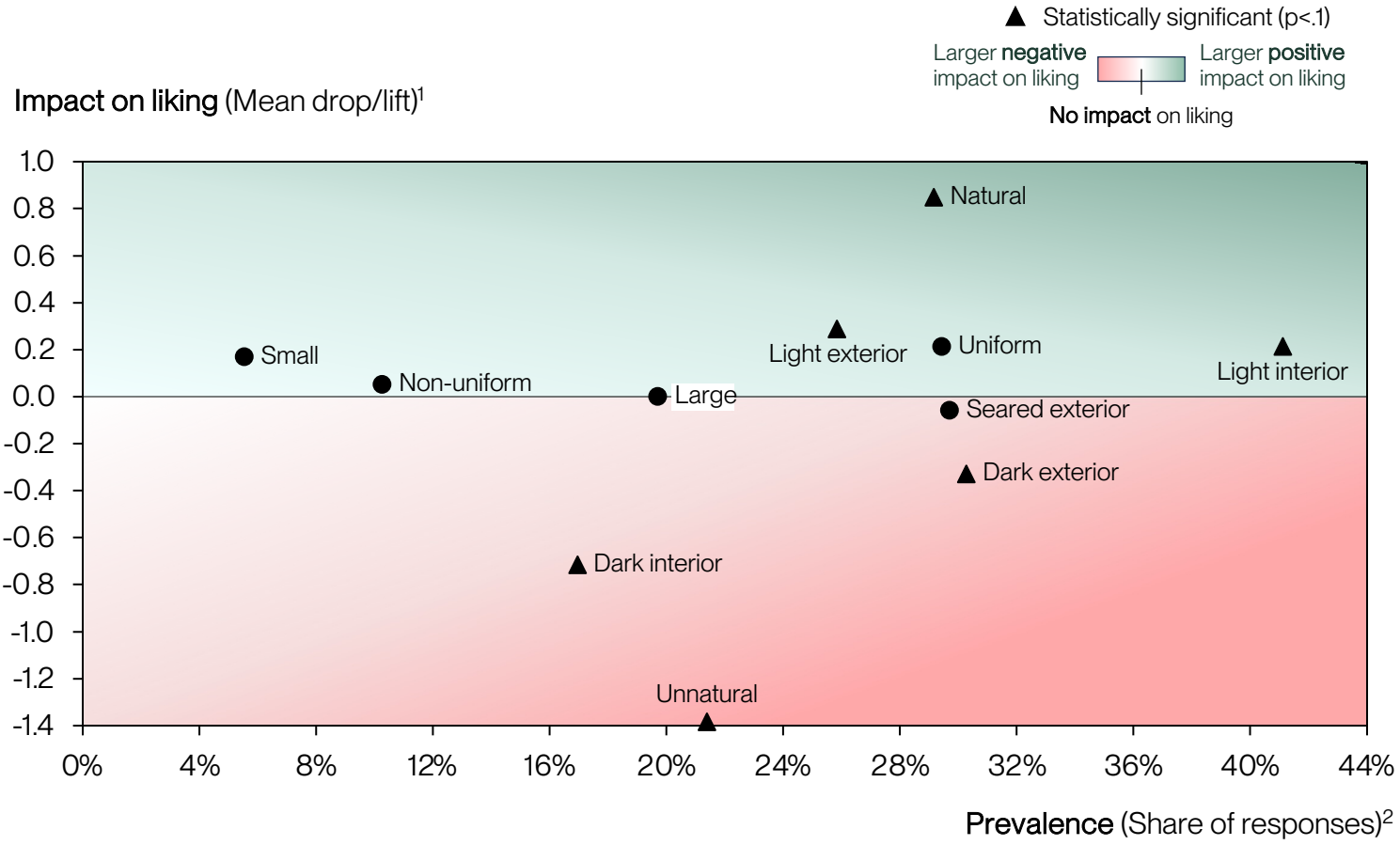
- Almost half of participants described sausage as 'holds together,' but it was only associated with a 0.2pt increase in liking.

1. The average change in overall liking on 7pt scale for products for all responses using the relevant attribute as a descriptor compared to the mean liking for all products rated 'just about right' on that attribute. Calculated as Mean Liking (JAR) minus Mean Liking (descriptor used).
2. Share of responses for all products in this category (including animal, plant-rich, and plant) in each direction for each attribute.

# **Pork Sausage:** Top Appearance R&D Opportunities

Prioritization framework for identifying attributes with large impacts on liking

**Penalty analysis on appearance using check-all-that-apply responses,** Mean drop/lift and Prevalence




# Takeaways

## Natural-appearing products significantly preferred to unnatural

- 'Natural' appearance associated with a 0.8pt increase in liking, versus -1.4pt for 'unnatural.'

## Size and shape don't have a big impact on liking

- 'Small'/'large 'and 'uniform'/'non-uniform' associated with minimal, non-statistically significant impacts.

## Dark interior and exteriors hurt liking

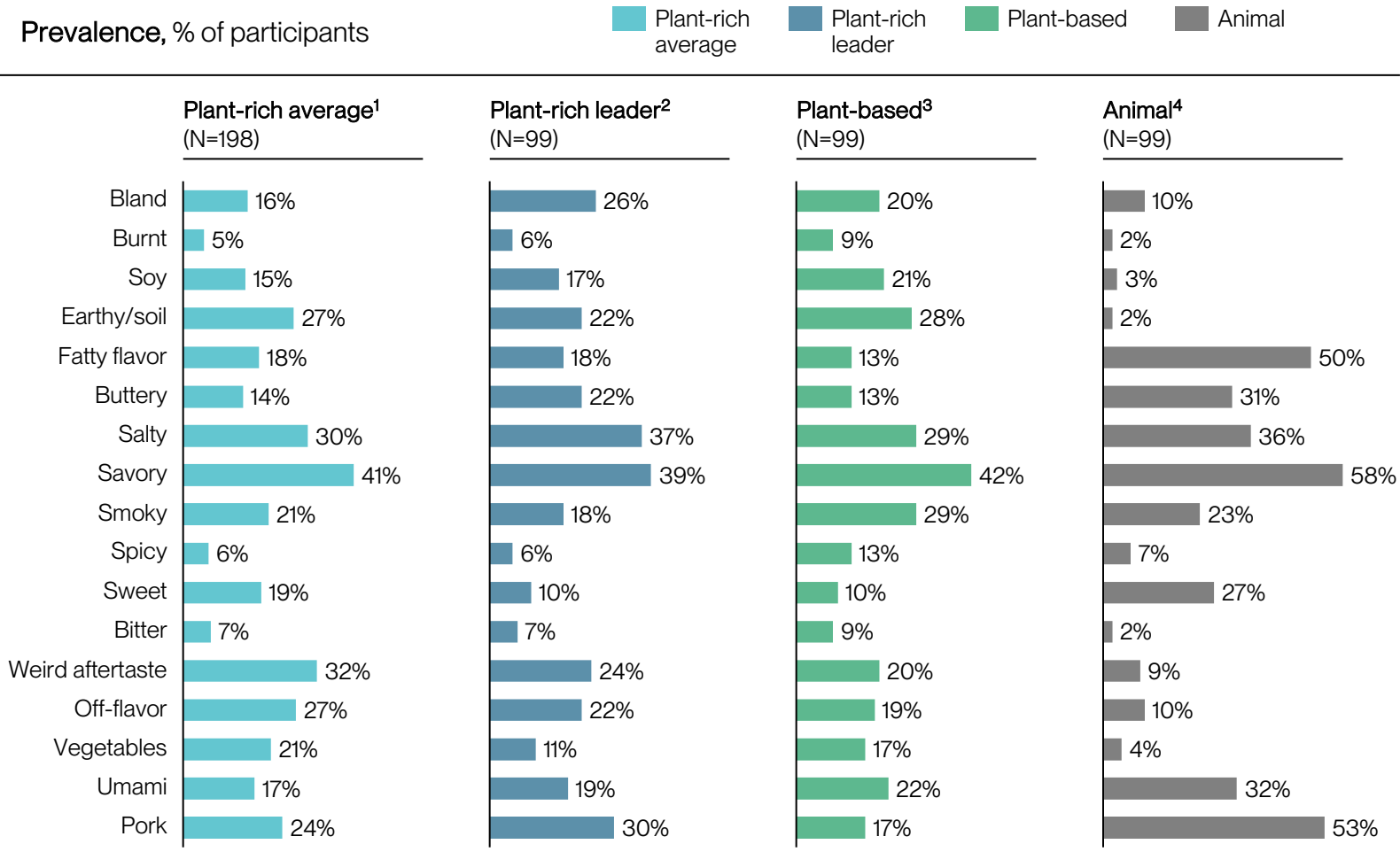
- Associated with -0.8pt and -0.4pt decreases, respectively, though 'light interior' and exteriors showed minimal uplift.

1. The average change in overall liking on 7pt scale for products for all responses using the relevant attribute as a descriptor compared to the mean liking for all products rated 'just about right' on that attribute. Calculated as Mean Liking (JAR) minus Mean Liking (descriptor used).
2. Share of responses for all products in this category (including animal, plant-rich, and plant) in each direction for each attribute.

# **Pork Sausage:** Flavor Profile

Please check all words or phrases that describe the flavor of XXX.

**Prevalence,** % of participants




# Takeaways

## Plant-rich more likely to have strongly negative attributes like weird aftertaste and off-flavors than animal benchmark

- 32% described plant-rich average as having a 'weird aftertaste,' and 27% as having 'off-flavor,' compared to 9% and 10% for animal, respectively.

## Plant-rich lags behind animal on key flavor attributes

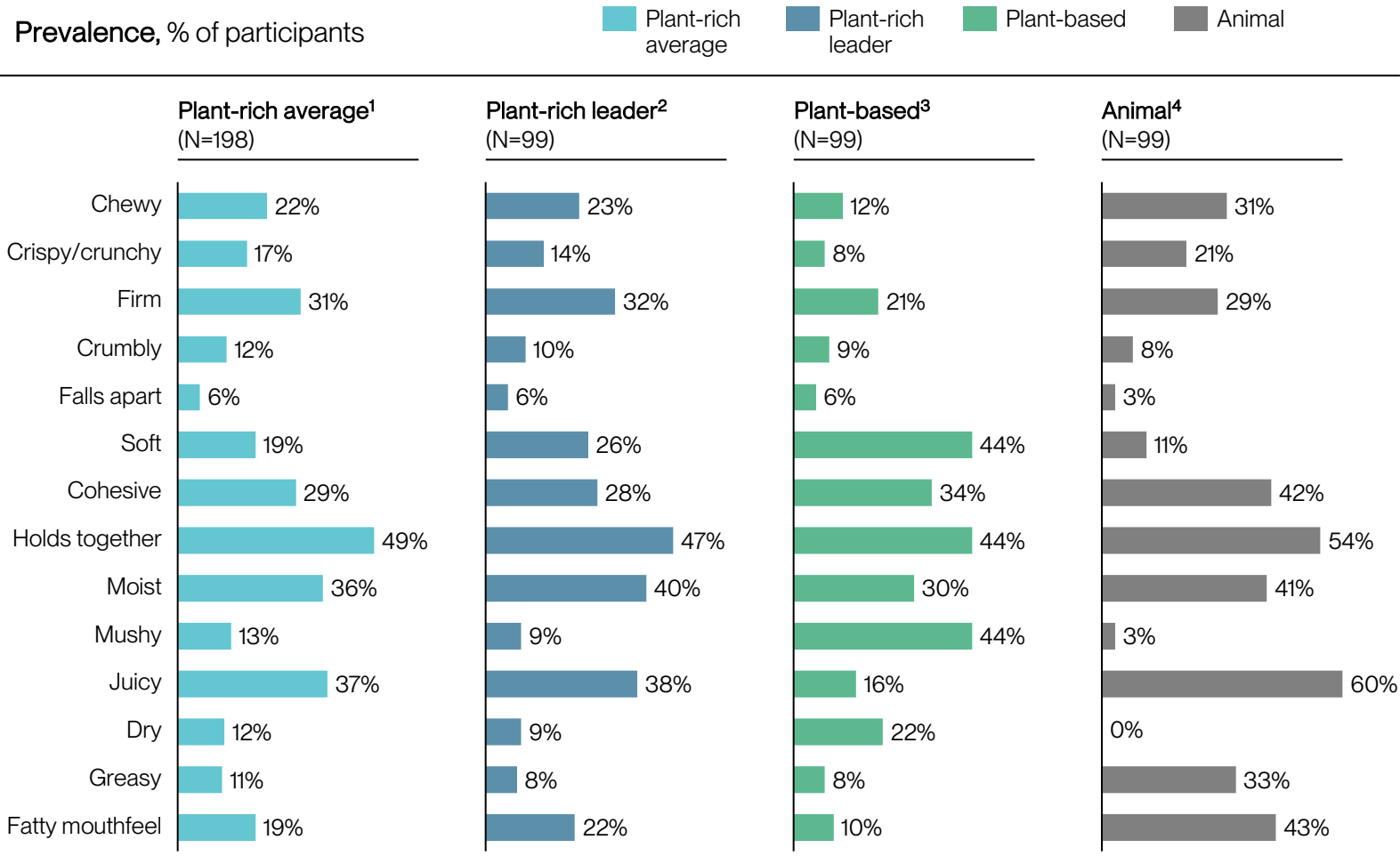
- Only 30% described plant-rich leader as having 'pork' flavor, compared to 53% for animal.
- 'Savory' and 'buttery' flavors had high impacts to liking, but plant-rich leader is behind animal by 19% and 9%, respectively.

1. Aggregated across 2 commercially available plant-rich pork sausages products.
2. The plant-rich product with the highest mean liking of those included in this test.
3. Based on brand-level performance in previous rounds of sensory testing.
4. The highest retail sales volume animal pork sausage selected for its representativeness of the animal pork sausage category.

# **Pork Sausage:** Texture Profile

Please check all words or phrases that describe the texture of XXX.

**Prevalence,** % of participants




# Takeaways

## Plant-rich behind animal in juiciness

- 37% found plant-rich average to be 'juicy' compared to 60% for animal.

## Mushiness is a strength for plant-rich compared to plant-based

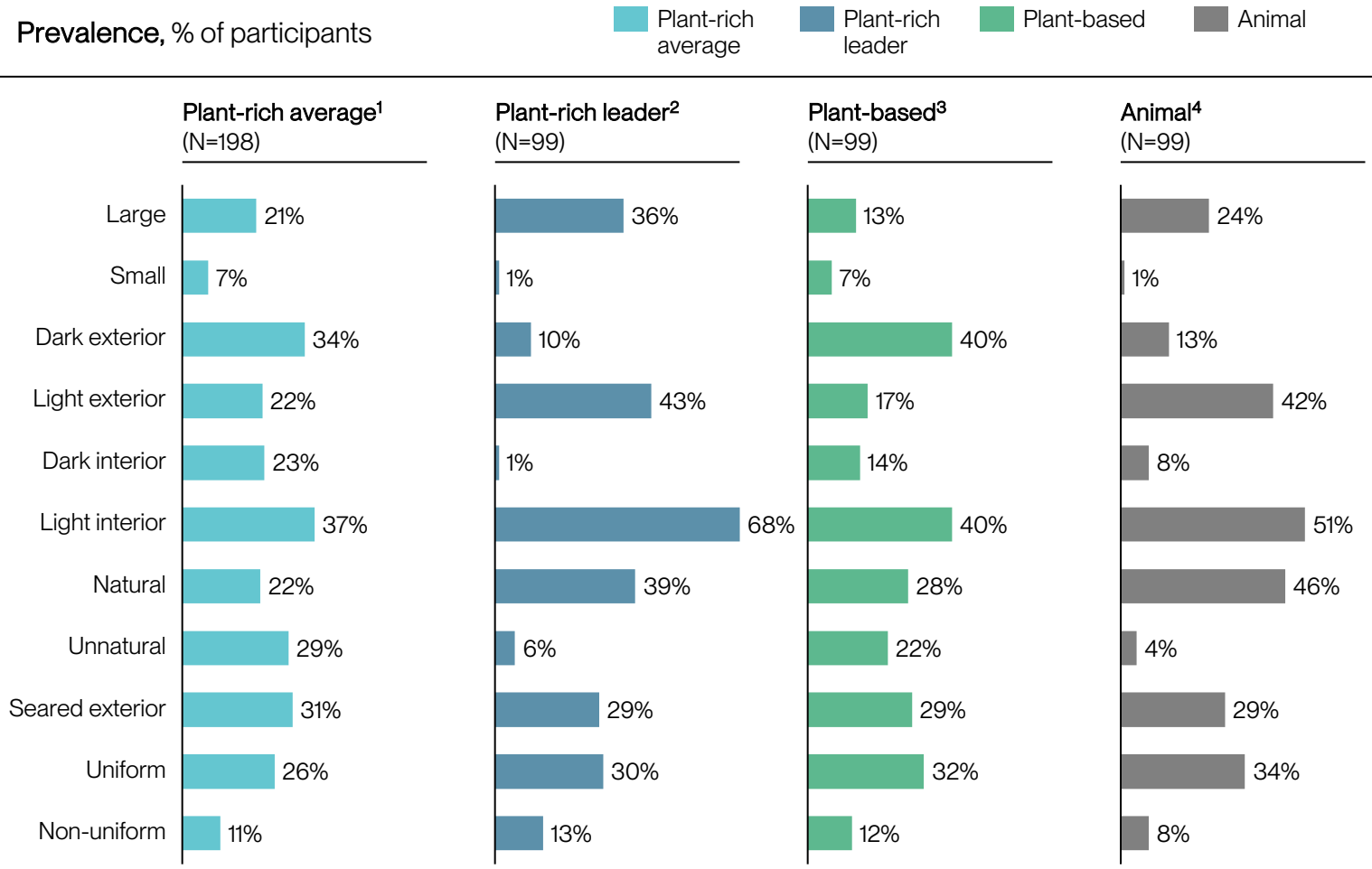
- Only 13% found plant-rich average to be 'mushy' versus 44% for plant-based. Mushiness had -0.8pt impact on liking.

1. Aggregated across 2 commercially available plant-rich pork sausages products.
2. The plant-rich product with the highest mean liking of those included in this test.
3. Based on brand-level performance in previous rounds of sensory testing.
4. The highest retail sales volume animal pork sausage selected for its representativeness of the animal pork sausage category.

# **Pork Sausage:** Appearance Profile

Please check all words or phrases that describe the appearance of XXX.

**Prevalence,** % of participants




## Takeaways

### Plant-rich products did not as appear as natural as animal

- Only 22% found the plant-rich average to appear ‘natural,’ versus 46% for animal.
- 6% found plant-rich leader ‘unnatural’ versus 29% for plant-rich average.

### Plant-rich average more likely to have a dark interior

- 23% described the plant-rich average as having a ‘dark interior,’ which was associated with a 0.8pt drop in liking.

1. Aggregated across 2 commercially available plant-rich pork sausages products.
2. The plant-rich product with the highest mean liking of those included in this test.
3. Based on brand-level performance in previous rounds of sensory testing.
4. The highest retail sales volume animal pork sausage selected for its representativeness of the animal pork sausage category.

Category-Specific Deep Dive

# Beef/Pork Meatball

# Beef/Pork Meatball

## Executive summary of R&D opportunities

### Performance Overview

While the plant-rich leader outperformed plant-based and is close behind animal, the average plant-rich beef/pork meatball falls short.

- **Plant-rich products outperform plant-based** – Plant-rich leader outperformed plant-based in similarity, flavor, texture, and appearance.
- **Plant-rich leader close behind animal in overall liking** – Plant-rich leader average liking was 5.4pts compared to 5.7pts for animal.
- **Plant-rich leader clearly ahead of plant-rich average** – Leader performed better than average across all sensory attributes.

### Top Sensory Opportunities

Top category-level improvements for plant-rich beef/pork meatballs include increasing firmness, cohesiveness, juiciness, and saltiness.

- **Opportunity to increase firmness** – Only 43% rated plant-rich average 'just about right' (versus 62% for plant-rich leader). Plant-rich average more likely to be 'too soft' than 'too firm.'
- **Plant-rich average not cohesive enough** – 57% rated plant-rich average 'just about right' (versus 68% for plant-rich leader).
- **Plant-rich products should increase juiciness** – 66% rated plant-rich leader 'just about right' juiciness (versus 76% for animal).
- **Consumers want a saltier product** – Only 70% rated the saltiness of the plant-rich average 'just about right' (versus 77% for plant-rich leader).

# Beef/Pork Meatballs Tested

Beef/pork meatballs from three commercially available plant-rich beef/pork meatballs brands were prepared according to manufacturer instructions on a skillet and compared against animal and plant-based beef/pork meatballs.

Participants were screened to exclude consumers who do not eat animal-based meat and only include those who eat meatballs at least every 1-2 months.

## Testing Environment

Participants tried the beef/pork meatballs at the Haight Street Cafe in San Francisco, a restaurant environment, in order to achieve an authentic, natural experience.

## Preparation

All meatballs were prepared by restaurant staff using a skillet according to manufacturer instructions.

## Dish Served

All participants were served four dishes of spaghetti and meatballs. While they ate, participants filled out a survey via mobile phone detailing their experience with each product. Products were evaluated in a randomized order.

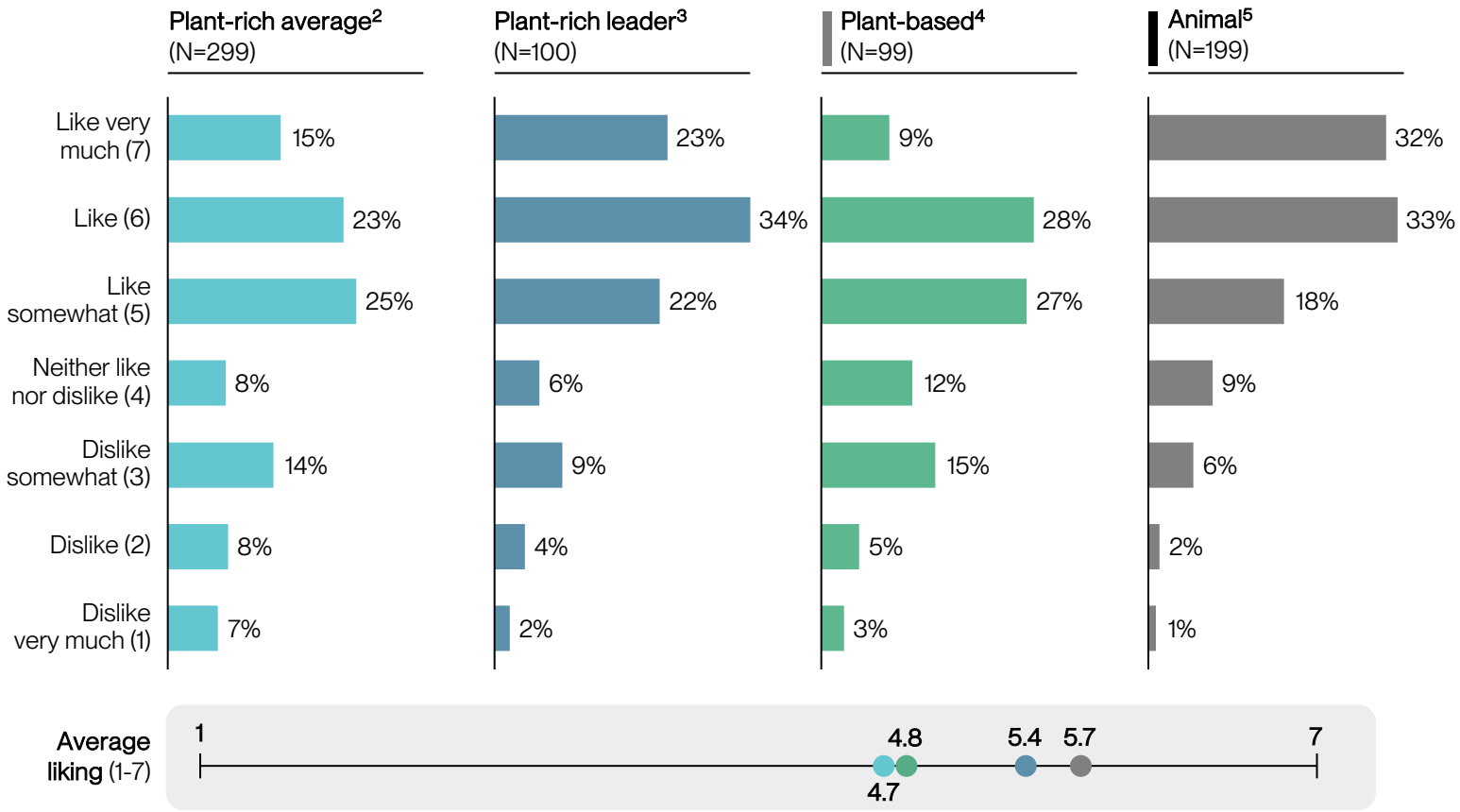
# **Beef/Pork Meatball:** Overall Liking

How would you rate your OVERALL LIKING of beef/pork meatball XXX?

**Overall liking,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)







# Takeaways

## Plant-rich leader close behind animal in overall liking

- Plant-rich leader average liking was 5.4pts compared to 5.7pts for animal.

## Opportunity for plant-rich average to catch up to leader

- Only 38% rated plant-rich average 'like' or 'like very much' (versus 57% for plant-rich leader).

## Plant-rich products perform similarly to plant-based

- 38% rated the plant-based meatball 'like' or 'like very much' (versus 37% for plant-rich average).

1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. Aggregated across 3 commercially available plant-rich beef/pork meatball products.
3. The plant-rich product with the highest mean liking of those included in this test.
4. Based on brand-level performance in previous rounds of sensory testing.
5. The highest retail sales volume animal beef/pork meatball selected for its representativeness of the animal beef/pork meatball category.

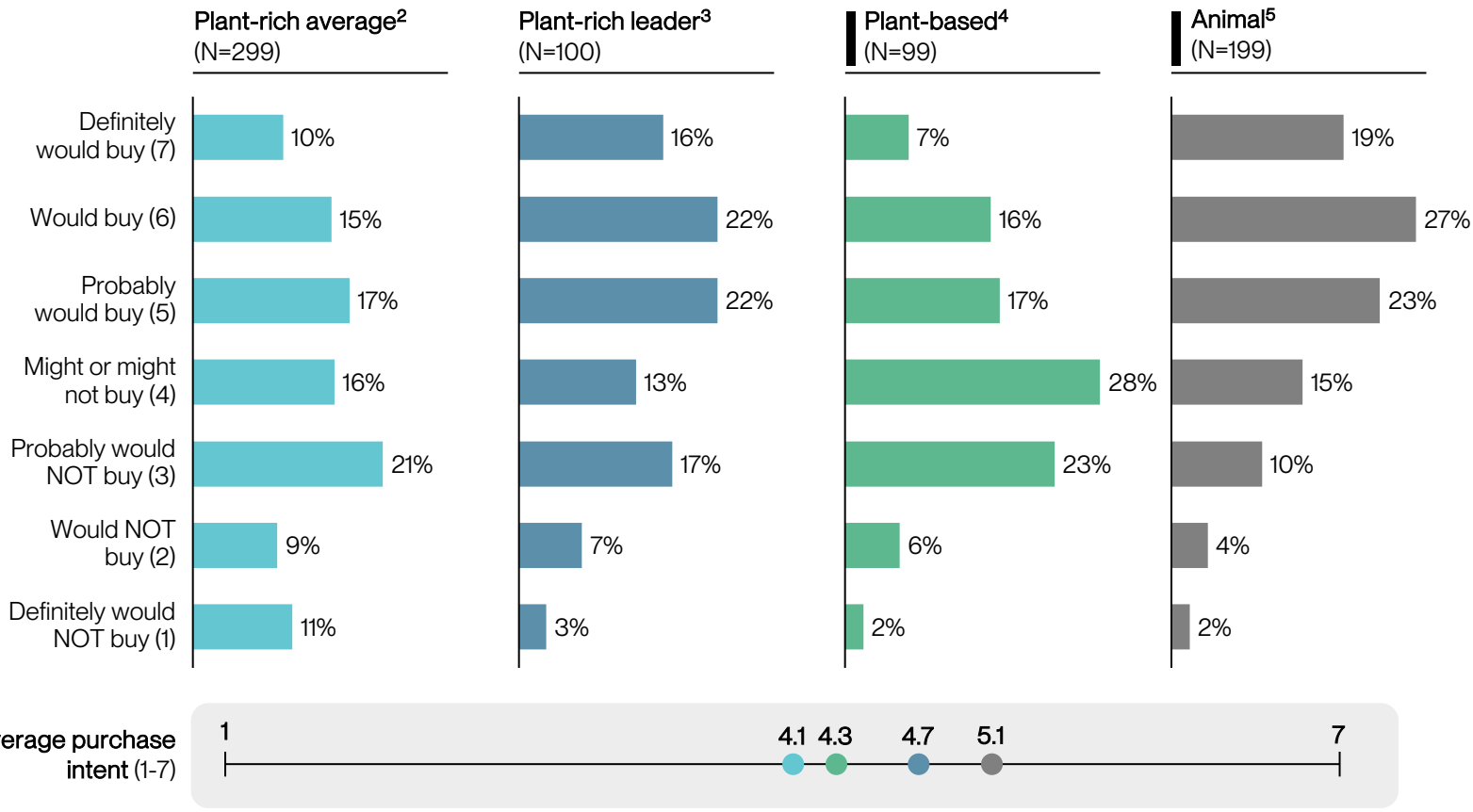
# **Beef/Pork Meatball:** Purchase Intent

How would you rate your PURCHASE INTENT of beef/pork meatball XXX?

**Purchase intent,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)







# Takeaways

## Plant-rich leader behind animal on purchase intent

- Average purchase intent was 4.7pts for plant-rich leader (versus 5.1 for animal).

## Higher overall liking of plant-rich average versus plant-based did not translate to purchase intent

- Plant-rich average purchase intent was 4.1 (versus 4.3 for plant-based).

1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. Aggregated across 3 commercially available plant-rich beef/pork meatball products.
3. The plant-rich product with the highest mean liking of those included in this test.
4. Based on brand-level performance in previous rounds of sensory testing.
5. The highest retail sales volume animal beef/pork meatball selected for its representativeness of the animal beef/pork meatball category.

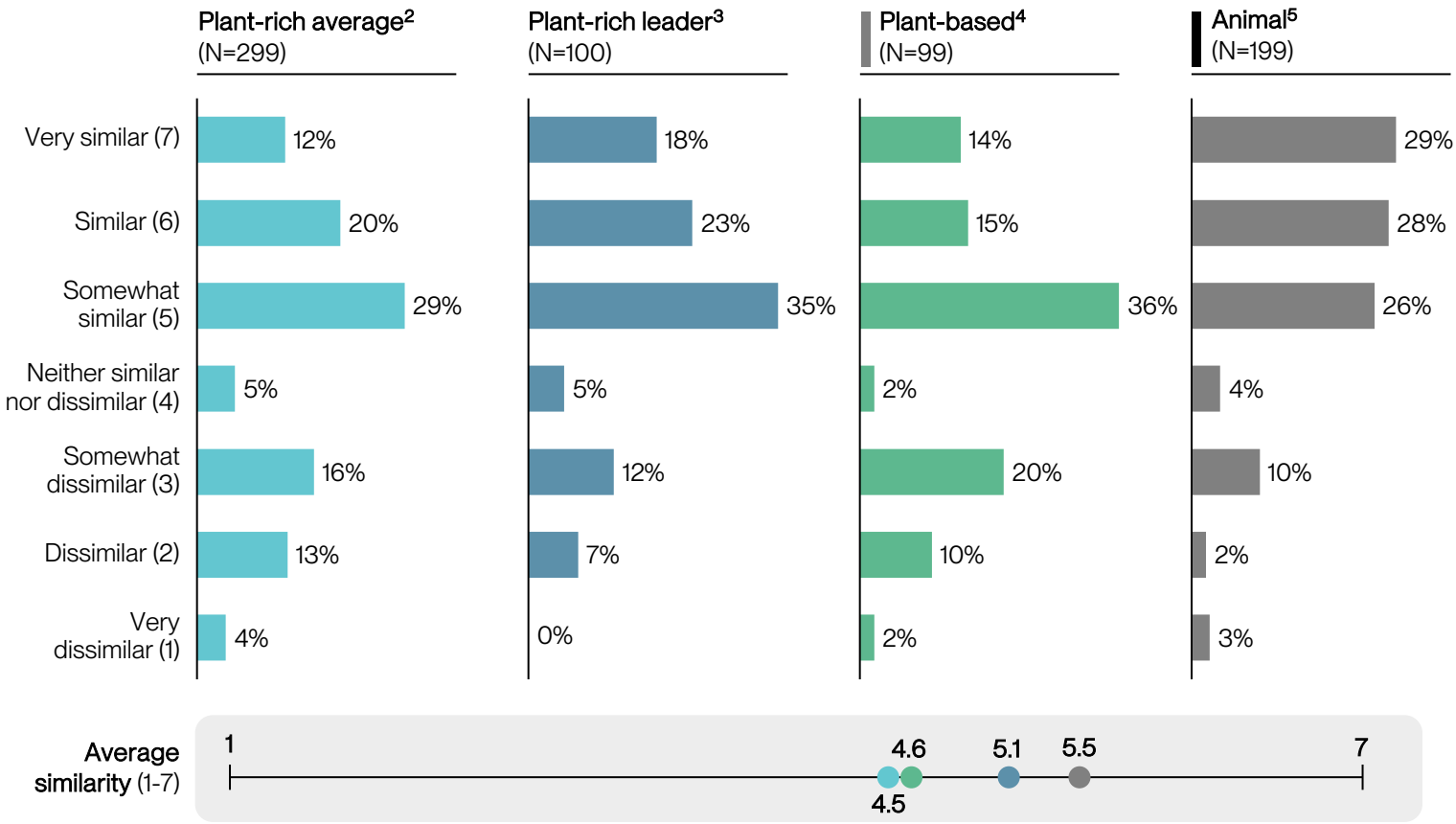
# **Beef/Pork Meatball:** Similarity

How would you rate your SIMILARITY of XXX to a typical beef/pork meatball?

**Similarity,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)







# Takeaways

## Plant-rich products ahead of plant-based but behind animal on similarity

- 32% considered plant-rich average 'similar' or 'very similar' to a typical beef/pork meatball (versus 29% for plant-based).
- Only 41% considered plant-rich leader 'similar' or 'very similar' to a typical beef/pork meatball (versus 57% for animal).

## Opportunity for plant-rich average to catch up to leader on similarity

- Plant-rich average scored 4.5pts on similarity (versus 5.1pts for plant-rich leader).

1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. Aggregated across 3 commercially available plant-rich beef/pork meatball products.
3. The plant-rich product with the highest mean liking of those included in this test.
4. Based on brand-level performance in previous rounds of sensory testing.
5. The highest retail sales volume animal beef/pork meatball selected for its representativeness of the animal beef/pork meatball category.

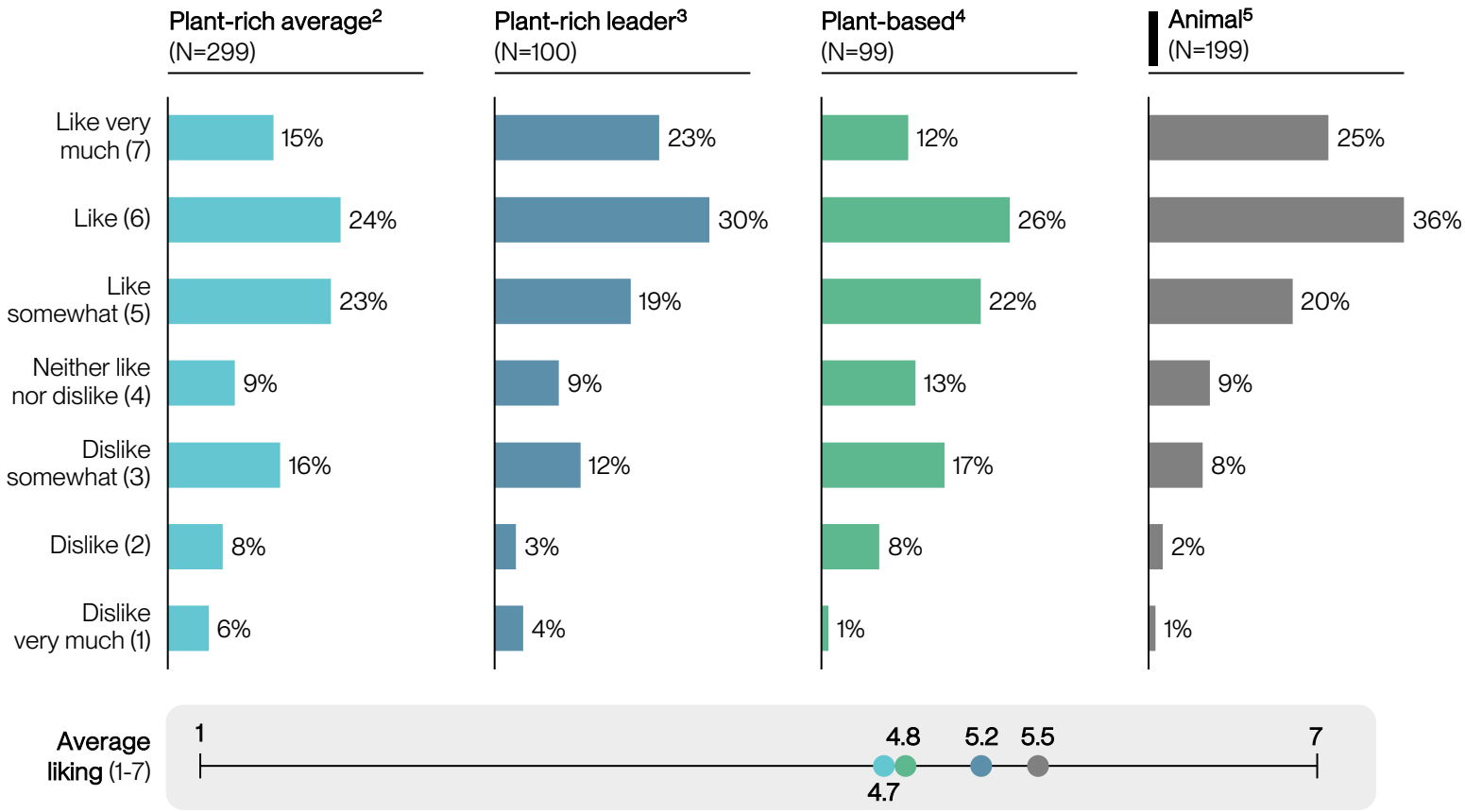
# **Beef/Pork Meatball:** Flavor

How would you rate your FLAVOR of beef/pork meatball XXX?

**Flavor,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)







# Takeaways

## Plant-rich leader needs to improve flavor

- Only 53% rated plant-rich leader 'like' or 'like very much' (versus 61% for animal).

## Plant-rich average scored similarly to plant-based on flavor

- They scored within 0.1pts of each other on average liking.

## Opportunity for plant-rich average to catch up to plant-rich leader on flavor

- 39% rated plant-rich average 'like' or 'like very much' (versus 53% for plant-rich leader).

1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. Aggregated across 3 commercially available plant-rich beef/pork meatball products.
3. The plant-rich product with the highest mean liking of those included in this test.
4. Based on brand-level performance in previous rounds of sensory testing.
5. The highest retail sales volume animal beef/pork meatball selected for its representativeness of the animal beef/pork meatball category.

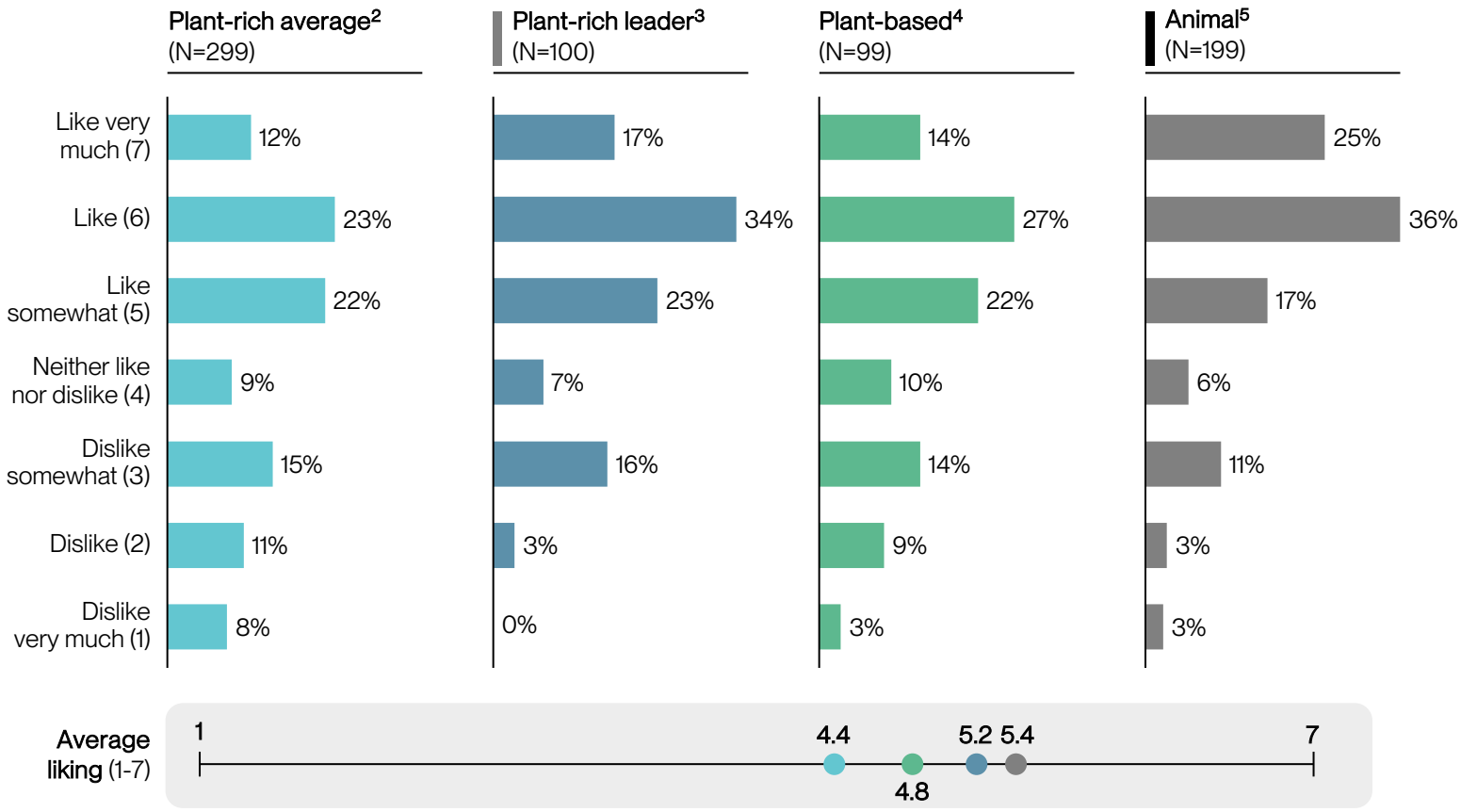
# **Beef/Pork Meatball:** Texture

How would you rate your TEXTURE of beef/pork meatball XXX?

**Texture,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)




# Takeaways

## Plant-rich leader close behind animal on texture

- Average liking 5.2pts (versus 5.4pts for animal).

## Plant-rich average can improve texture

- Only 35% rated plant-rich average 'like' or 'like very much' (versus 51% for plant-rich leader).

## Plant-rich average behind plant-based

- Average liking 4.4pts (versus 4.8pts for plant-based).

1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. Aggregated across 3 commercially available plant-rich beef/pork meatball products.
3. The plant-rich product with the highest mean liking of those included in this test.
4. Based on brand-level performance in previous rounds of sensory testing.
5. The highest retail sales volume animal beef/pork meatball selected for its representativeness of the animal beef/pork meatball category.

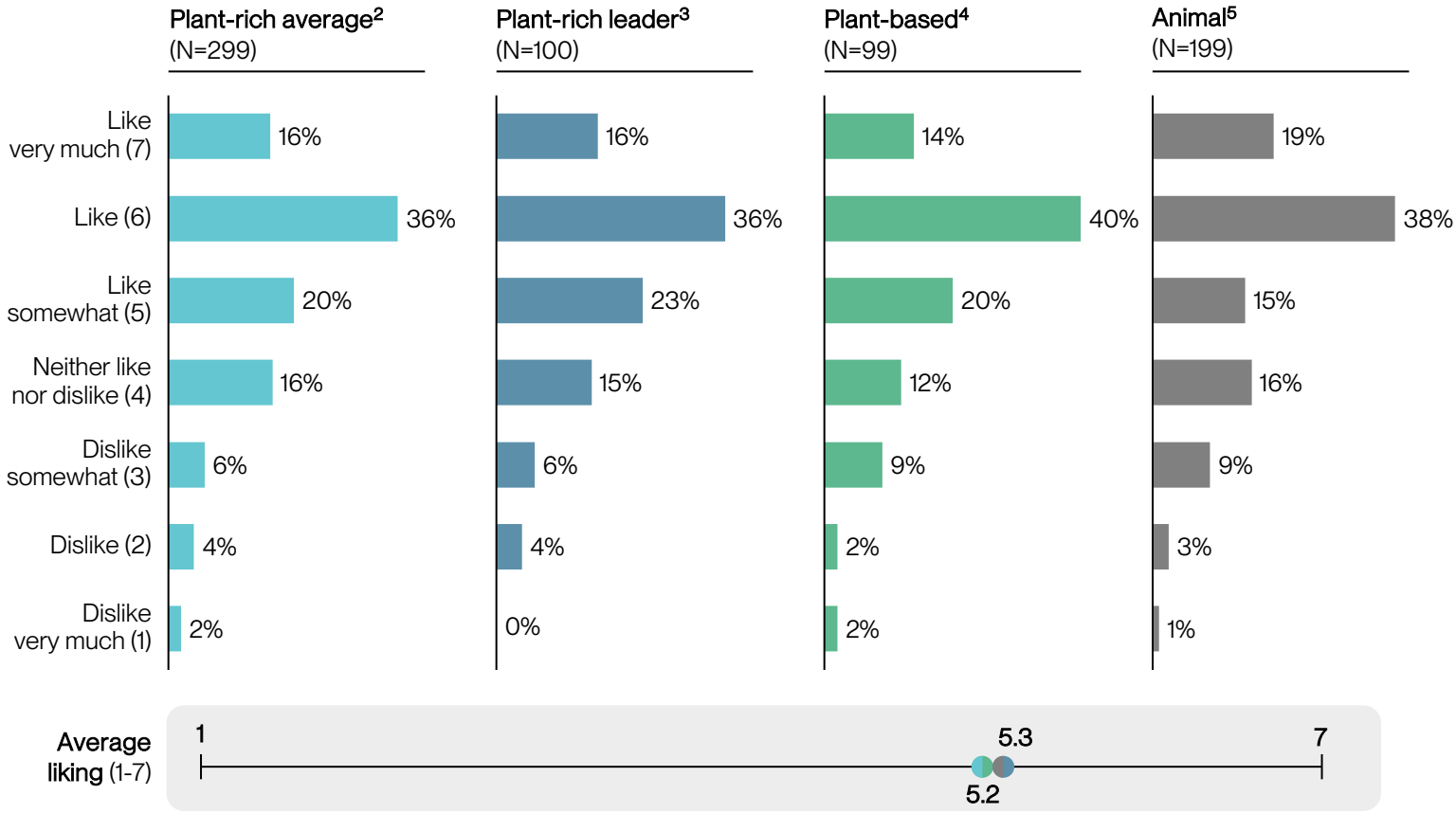
# **Beef/Pork Meatball:** Appearance

How would you rate your APPEARANCE of beef/pork meatball XXX?

**Appearance,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)







# Takeaways

## All products performed very similarly on appearance

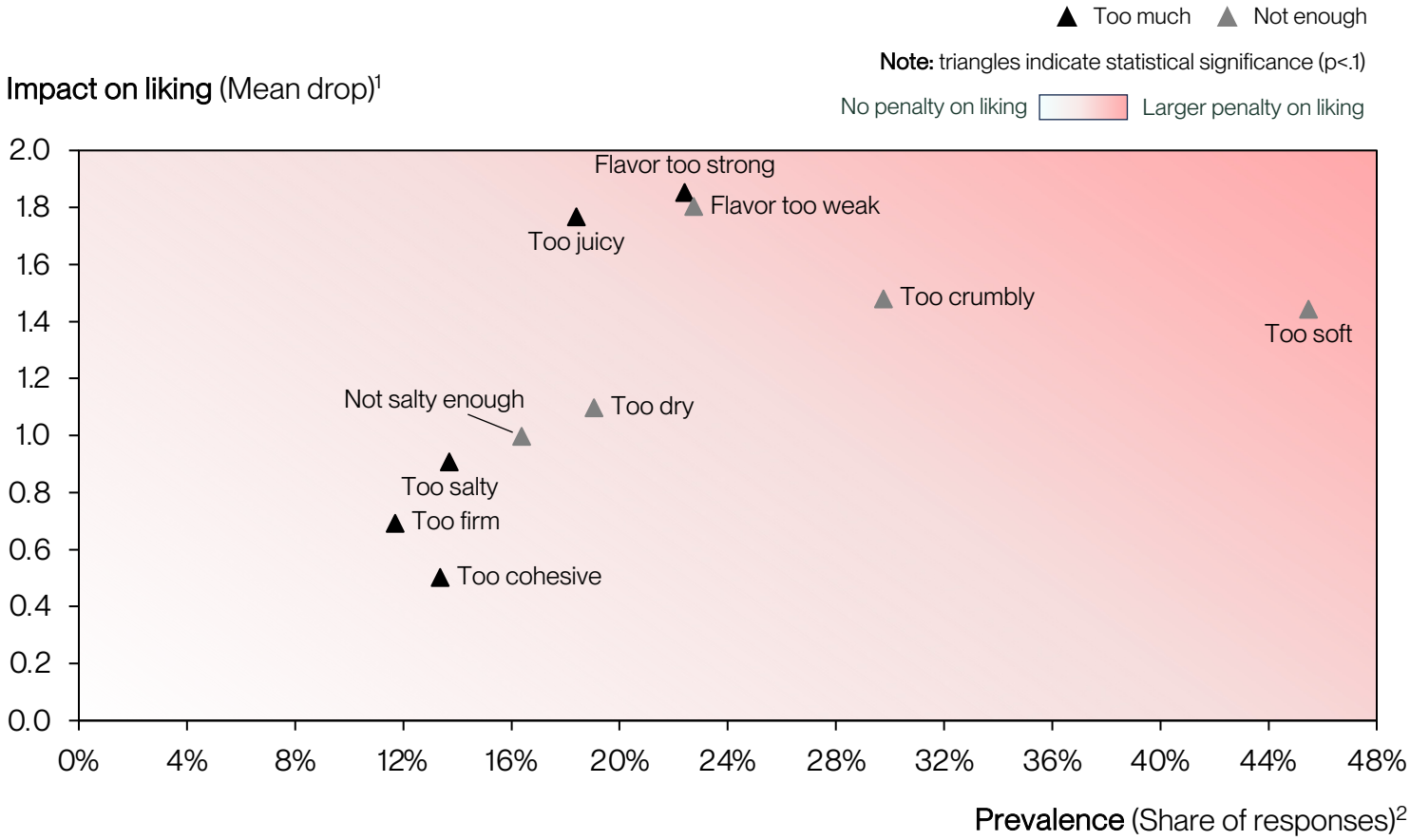
- Plant-rich average, leader, plant-based, and animal, all scored within 0.1pts of each other with no statistically significant differences.

1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. Aggregated across 3 commercially available plant-rich beef/pork meatball products.
3. The plant-rich product with the highest mean liking of those included in this test.
4. Based on brand-level performance in previous rounds of sensory testing.
5. The highest retail sales volume animal beef/pork meatball selected for its representativeness of the animal beef/pork meatball category.

# **Beef/Pork Meatball:** Top R&D Opportunities

Prioritization framework for identifying attributes with large impacts on liking

Penalty analysis using responses on 'just-about-right' questions, Mean drop and Prevalence




# Takeaways

## Prioritize balancing flavor profile

- 'Flavor too strong' and 'flavor too weak' each had the largest impacts to liking of any sensory attributes (1.8-1.9pts).

## Avoid textures that are too soft

- 45% described texture as 'too soft,' which was associated with a 1.4pt decrease in liking.

## Important to get saltiness levels right

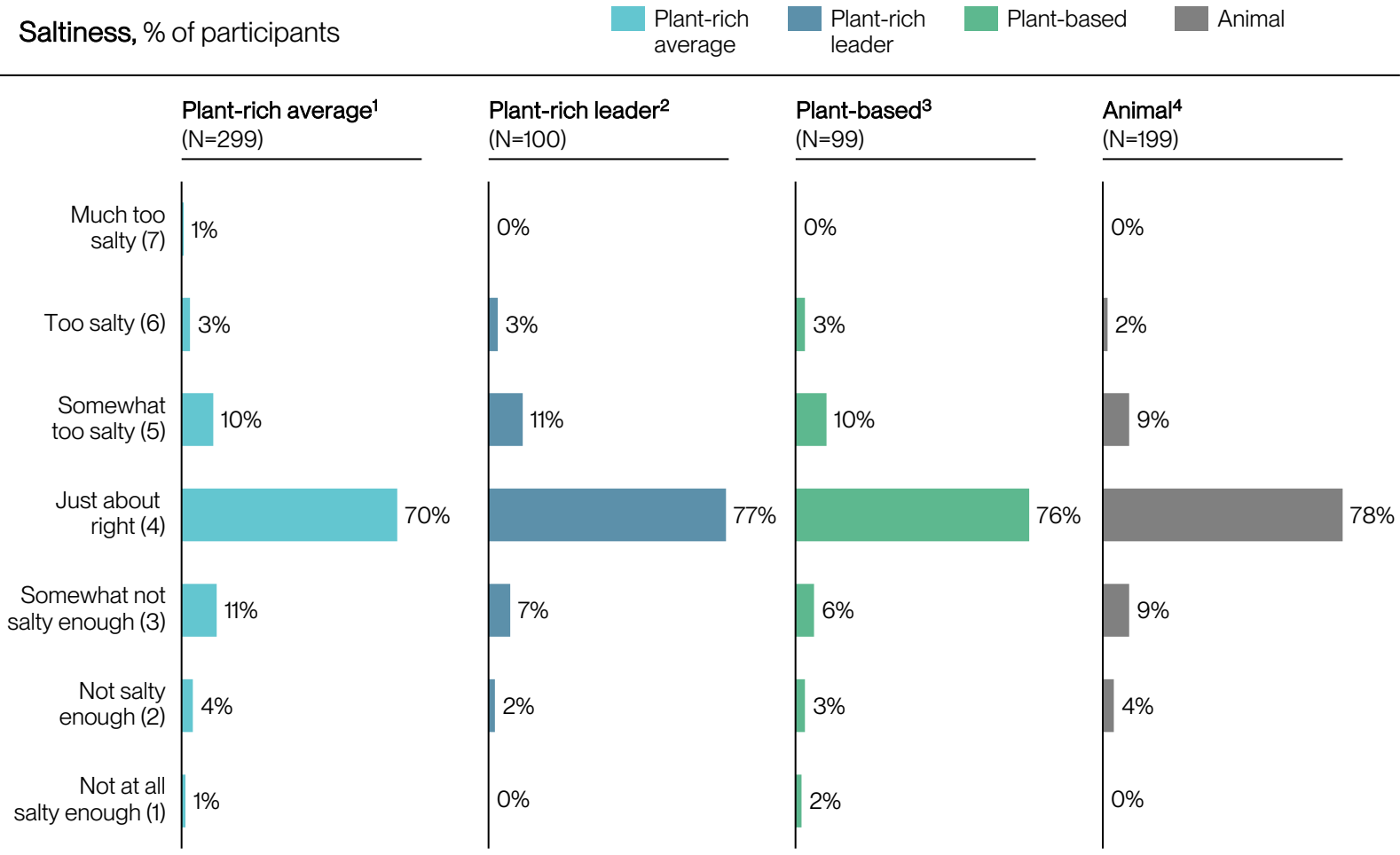
- 'Too salty' and 'not salty enough' were each associated with a similar 0.9-1.0pt impact to liking.

1. The average change in overall liking on 7pt scale for products for all responses using the relevant attribute as a descriptor compared to the mean liking for all products rated 'just about right' on that attribute. Calculated as Mean Liking (JAR) minus Mean Liking (descriptor used).
2. Share of responses for all plant-rich products in this category in each direction for each attribute.

# **Beef/Pork Meatball:** Saltiness

How would you rate your SALTINESS of beef/pork meatball XXX?

**Saltiness,** % of participants




# Takeaways

## Plant-rich leader excels in saltiness

- 77% rated the saltiness of the plant-based leader 'just about right' (versus 78% for animal).

## Plant-rich average slightly behind in saltiness

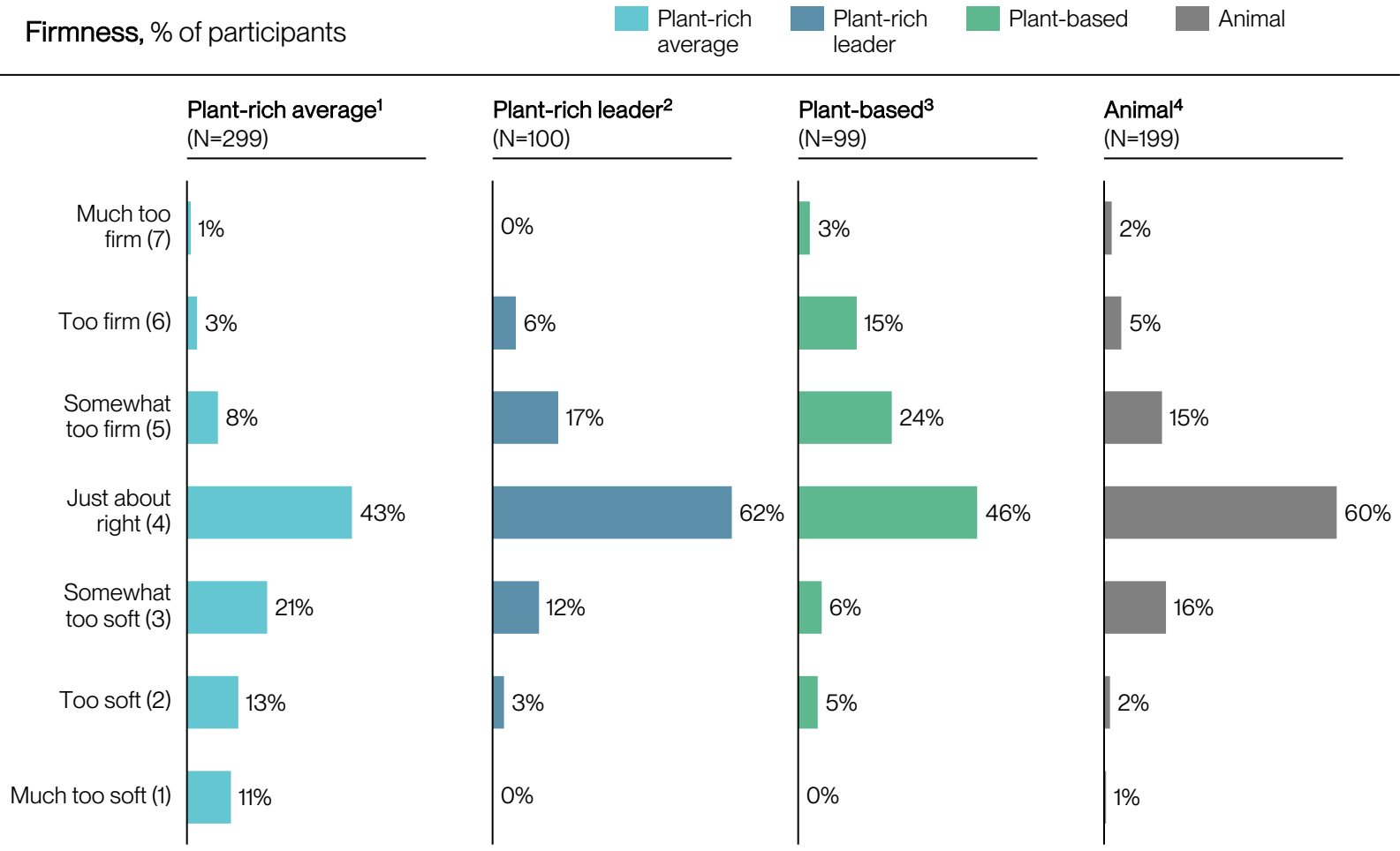
- Only 70% rated the saltiness of the plant-rich average 'just about right' (versus 77% for plant-rich leader).

1. Aggregated across 3 commercially available plant-rich beef/pork meatball products.
2. The plant-rich product with the highest mean liking of those included in this test.
3. Based on brand-level performance in previous rounds of sensory testing.
4. The highest retail sales volume animal beef/pork meatball selected for its representativeness of the animal beef/pork meatball category.

# **Beef/Pork Meatball:** Firmness

How would you rate your FIRMNESS of beef/pork meatball XXX?

**Firmness,** % of participants




# Takeaways

## Plant-rich leader slightly outperforms animal on firmness

- 62% rated plant-rich leader 'just about right' (versus 60% for animal).

## Opportunity for plant-rich average to increase firmness

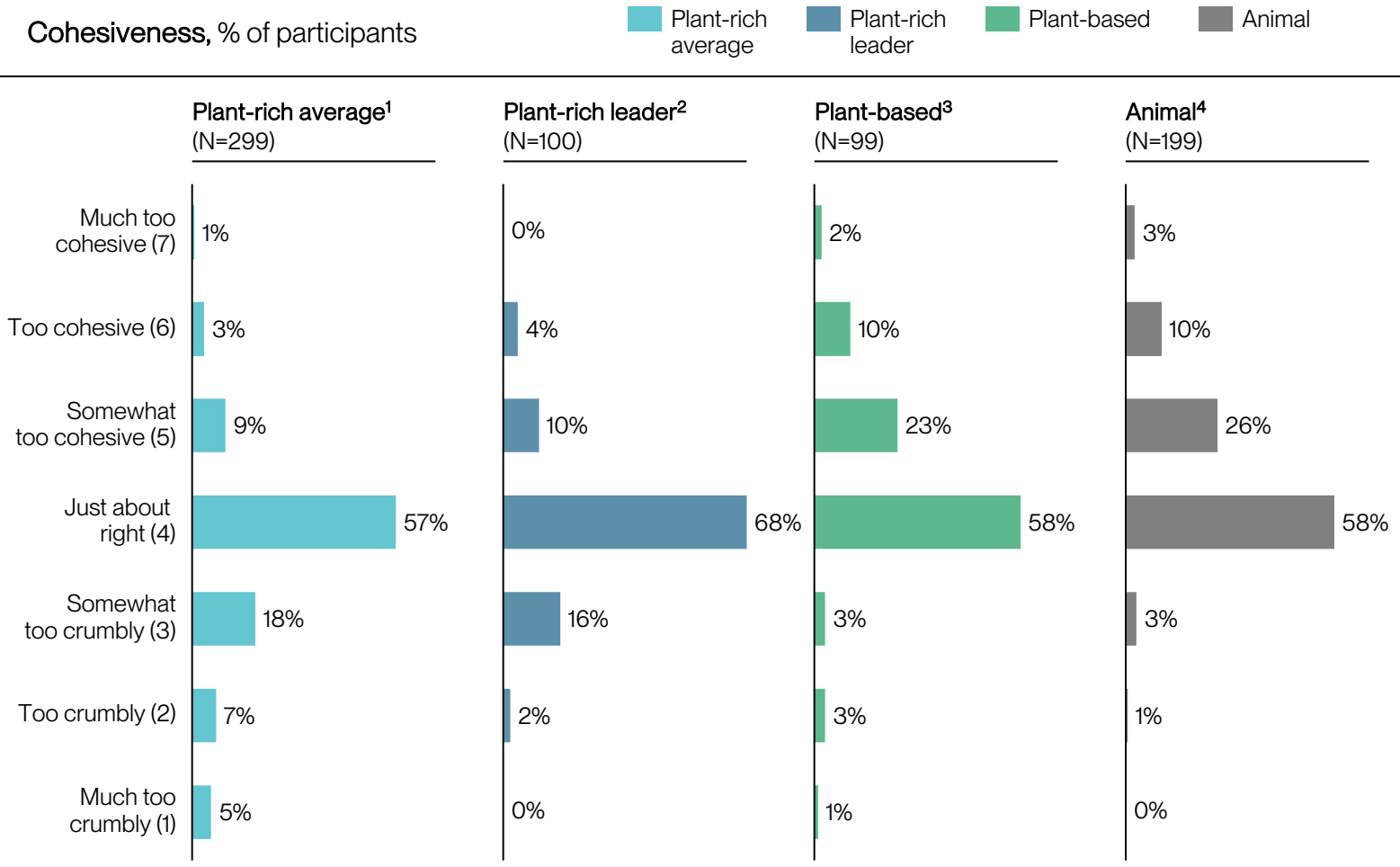
- Only 43% rated plant-rich average 'just about right' (versus 62% for plant-rich leader).
- Plant-rich average more likely to be 'too soft' than 'too firm.' 'Too soft' was associated with a larger impact to liking than 'too firm' (1.4pts versus 0.7pts).

1. Aggregated across 3 commercially available plant-rich beef/pork meatball products.
2. The plant-rich product with the highest mean liking of those included in this test.
3. Based on brand-level performance in previous rounds of sensory testing.
4. The highest retail sales volume animal beef/pork meatball selected for its representativeness of the animal beef/pork meatball category.

# **Beef/Pork Meatball:** Cohesiveness

How would you rate your COHESIVENESS of beef/pork meatball XXX?

**Cohesiveness,** % of participants




# Takeaways

## Plant-rich leader outperforms animal on cohesiveness

- 68% rated plant-rich leader 'just about right' cohesiveness (versus 58% for animal).

## Opportunity for plant-rich average to improve cohesiveness

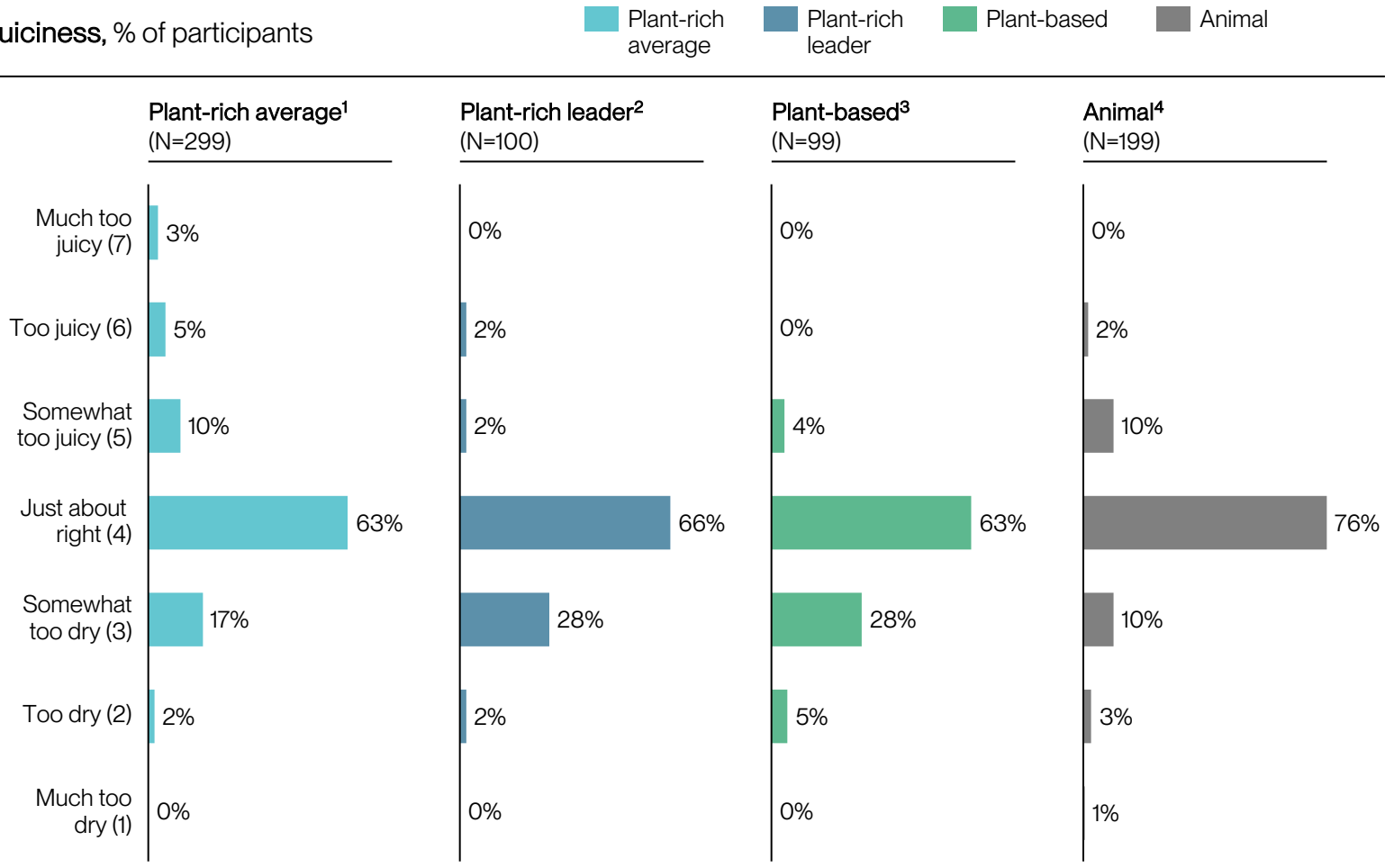
- 57% rated plant-rich average 'just about right' cohesiveness (versus 68% for leader).

1. Aggregated across 3 commercially available plant-rich beef/pork meatball products.
2. The plant-rich product with the highest mean liking of those included in this test.
3. Based on brand-level performance in previous rounds of sensory testing.
4. The highest retail sales volume animal beef/pork meatball selected for its representativeness of the animal beef/pork meatball category.

# **Beef/Pork Meatball:** Juiciness

How would you rate your JUICINESS of beef/pork meatball XXX?

**Juiciness,** % of participants




# Takeaways

## Plant-rich average should improve juiciness

- 63% rated plant-rich average 'just about right' juiciness (versus 76% for animal).

## Plant-rich leader does not differentiate itself on juiciness

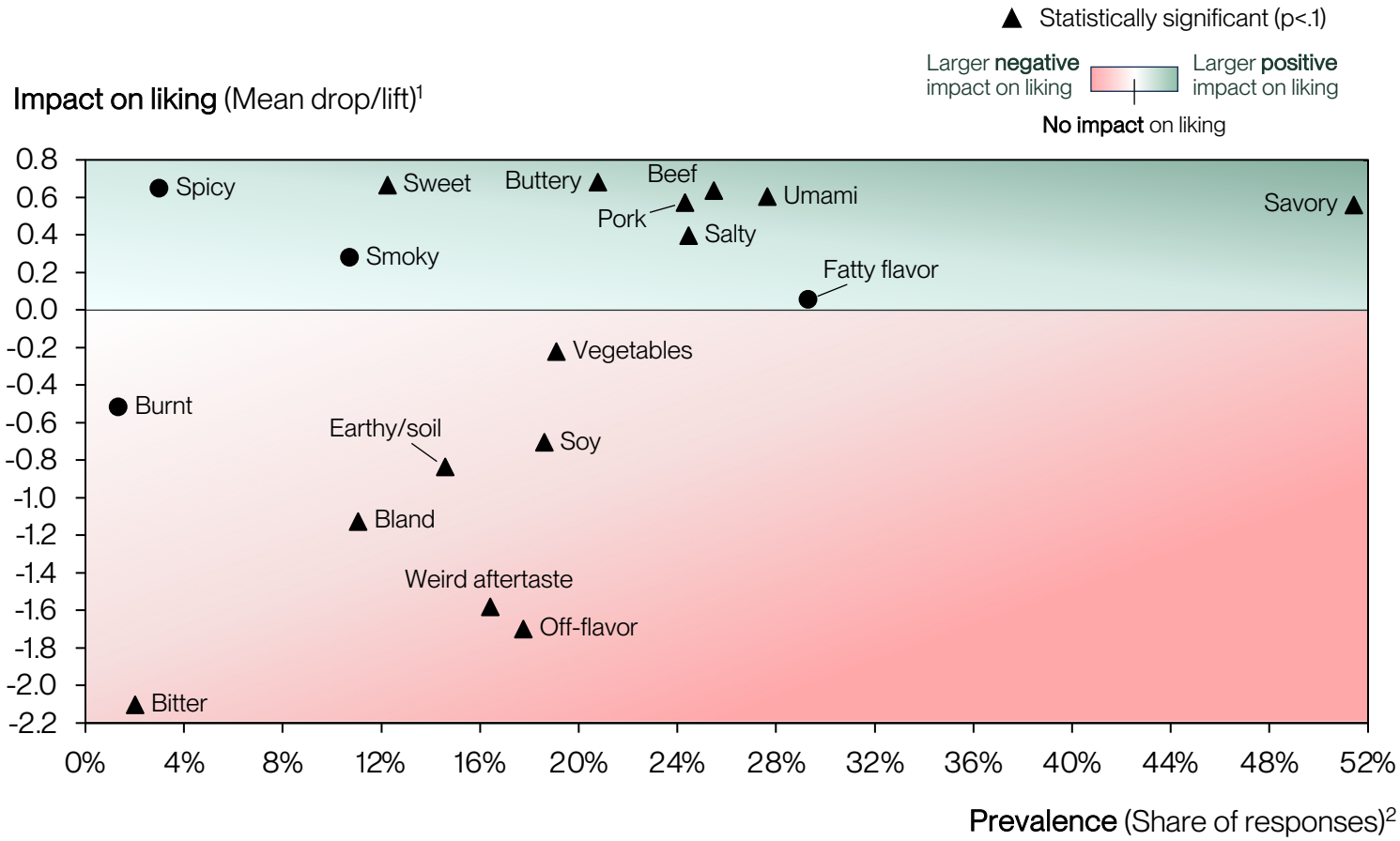
- About the same proportion of participants rated plant-rich average and plant-rich leader 'just about right' on juiciness, although the plant-rich leader was more likely to be 'too dry.'

1. Aggregated across 3 commercially available plant-rich beef/pork meatball products.
2. The plant-rich product with the highest mean liking of those included in this test.
3. Based on brand-level performance in previous rounds of sensory testing.
4. The highest retail sales volume animal beef/pork meatball selected for its representativeness of the animal beef/pork meatball category.

# **Beef/Pork Meatball:** Top Flavor R&D Opportunities

Prioritization framework for identifying attributes with large impacts on liking

**Penalty analysis on flavor using check-all-that-apply responses,** Mean drop/lift and Prevalence




## Takeaways

### Avoid weird aftertaste and off-flavors

- Each was associated with a ~1.7pts decrease in liking.

### Consumers enjoy buttery, pork, beef, and umami flavors

- Each was associated with a 0.6-0.8pt increase in liking.

### Prioritize savory flavors during product development

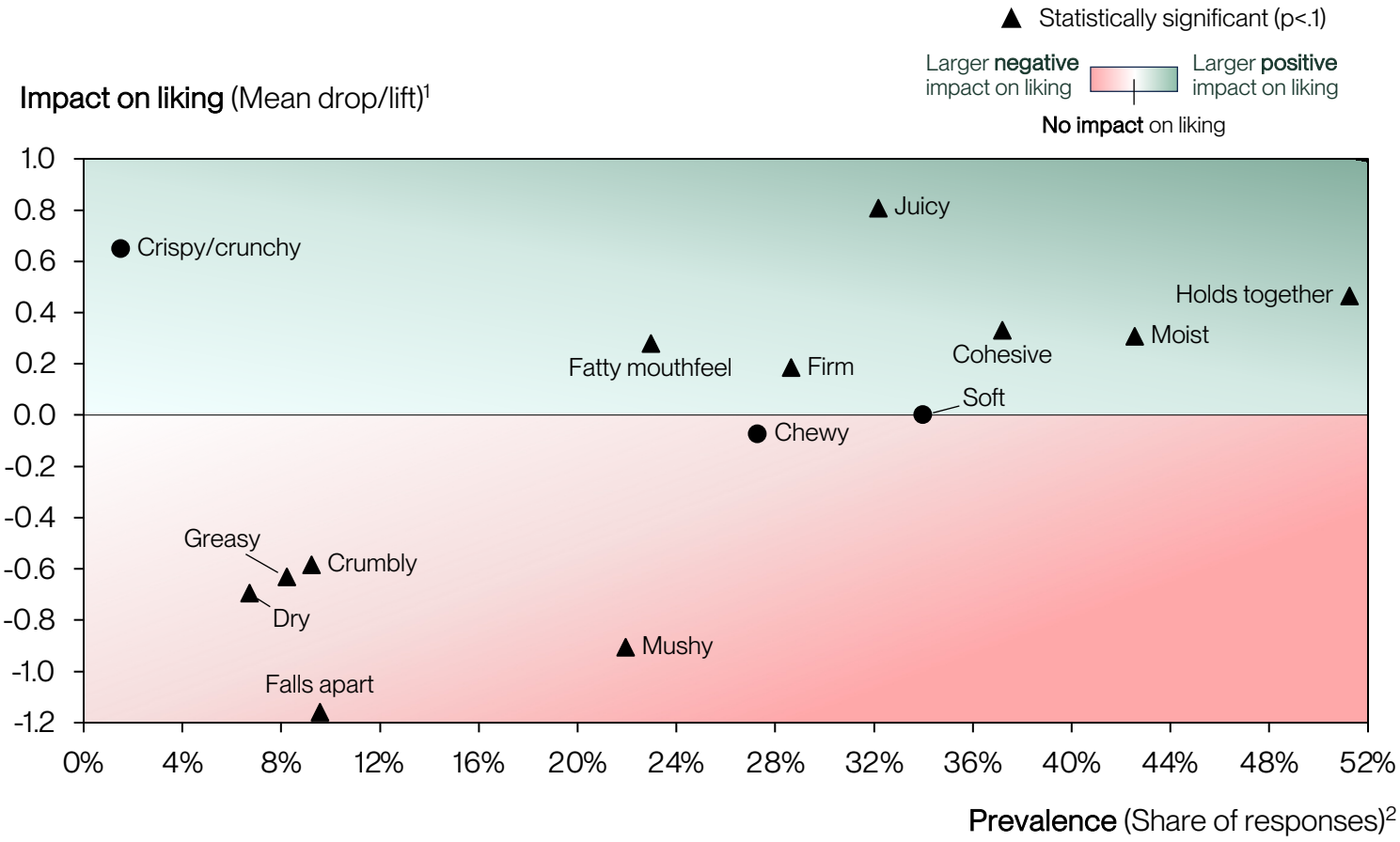
- 'Savory' was associated with a 0.6pt increase in liking and selected by 50% of respondents.

1. The average change in overall liking on 7pt scale for products for all responses using the relevant attribute as a descriptor compared to the mean liking for all products rated 'just about right' on that attribute. Calculated as Mean Liking (JAR) minus Mean Liking (descriptor used).
2. Share of responses for all products in this category (including animal, plant-rich, and plant) in each direction for each attribute.

# **Beef/Pork Meatball:** Top Texture R&D Opportunities

Prioritization framework for identifying attributes with large impacts on liking

**Penalty analysis on texture using check-all-that-apply responses,** Mean drop/lift and Prevalence




## Takeaways

### Prioritize juiciness

- 'Juicy' was the highest rated texture attribute (associated with a 0.8pt increase in liking).

### Avoid dry textures and those that fall apart

- 'Dry' and 'falls apart' were associated with a 0.7-1.2pt decrease in liking (while 'moist' and 'holds together' were associated with a ~0.4pt increase in liking).

### Ensure products are not mushy

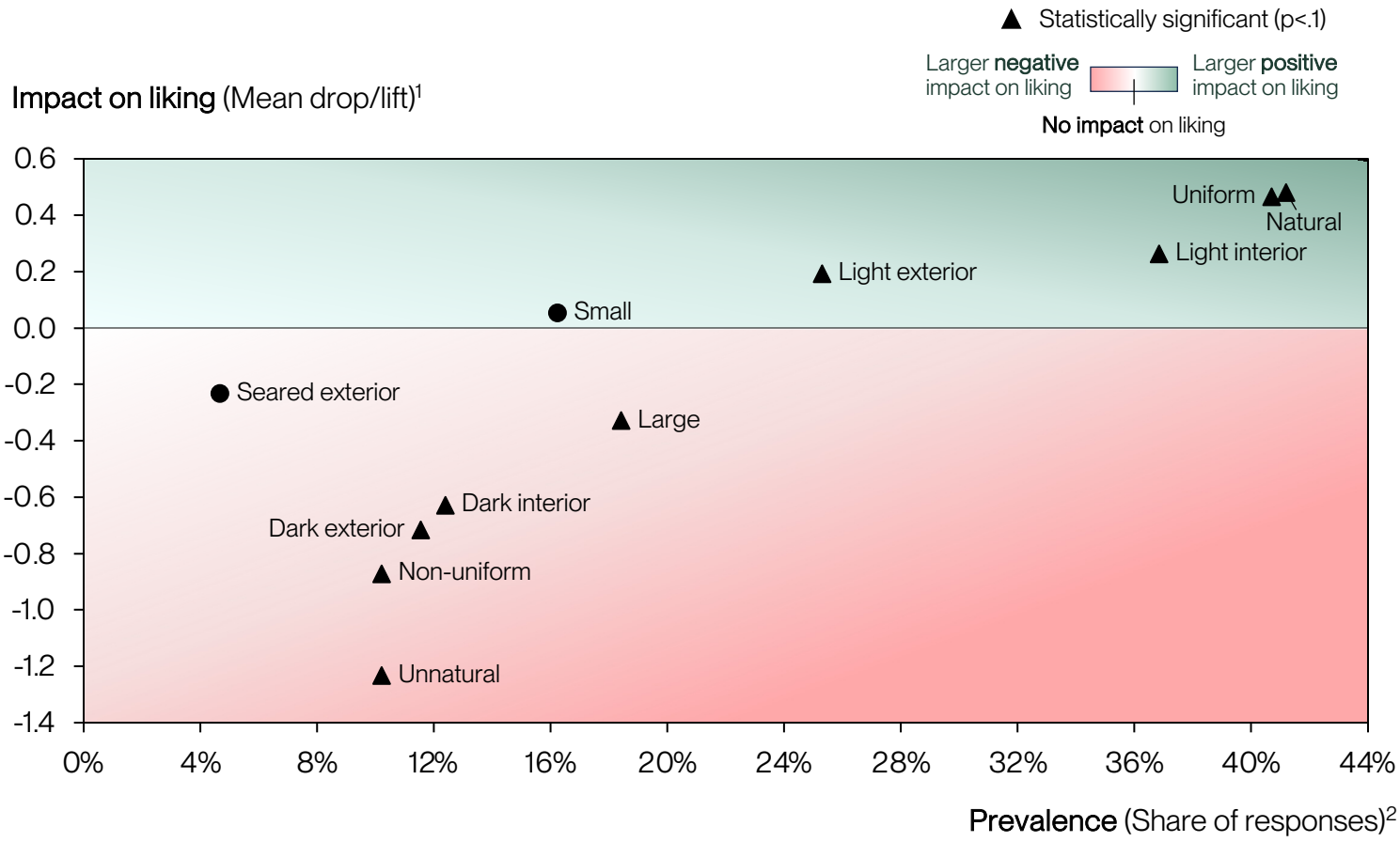
- Mushiness was associated with a 0.9pt decrease in liking (versus firmness with a 0.2pt increase in liking).

1. The average change in overall liking on 7pt scale for products for all responses using the relevant attribute as a descriptor compared to the mean liking for all products rated 'just about right' on that attribute. Calculated as Mean Liking (JAR) minus Mean Liking (descriptor used).
2. Share of responses for all products in this category (including animal, plant-rich, and plant) in each direction for each attribute.

# **Beef/Pork Meatball:** Top Appearance R&D Opportunities

Prioritization framework for identifying attributes with large impacts on liking

**Penalty analysis on appearance using check-all-that-apply responses,** Mean drop/lift and Prevalence




# Takeaways

## Consumers prefer natural appearance

- 'Natural' appearance was associated with a 0.5pt increase in liking (while 'unnatural' was associated with a 1.2pt decrease in liking).

## Ensure meatballs have a uniform appearance

- 'Uniform' appearance was associated with a 0.5pt increase in liking (versus 'non-uniform' associated with a 0.9pt decrease in liking).

## Lighter colors are preferred over darker

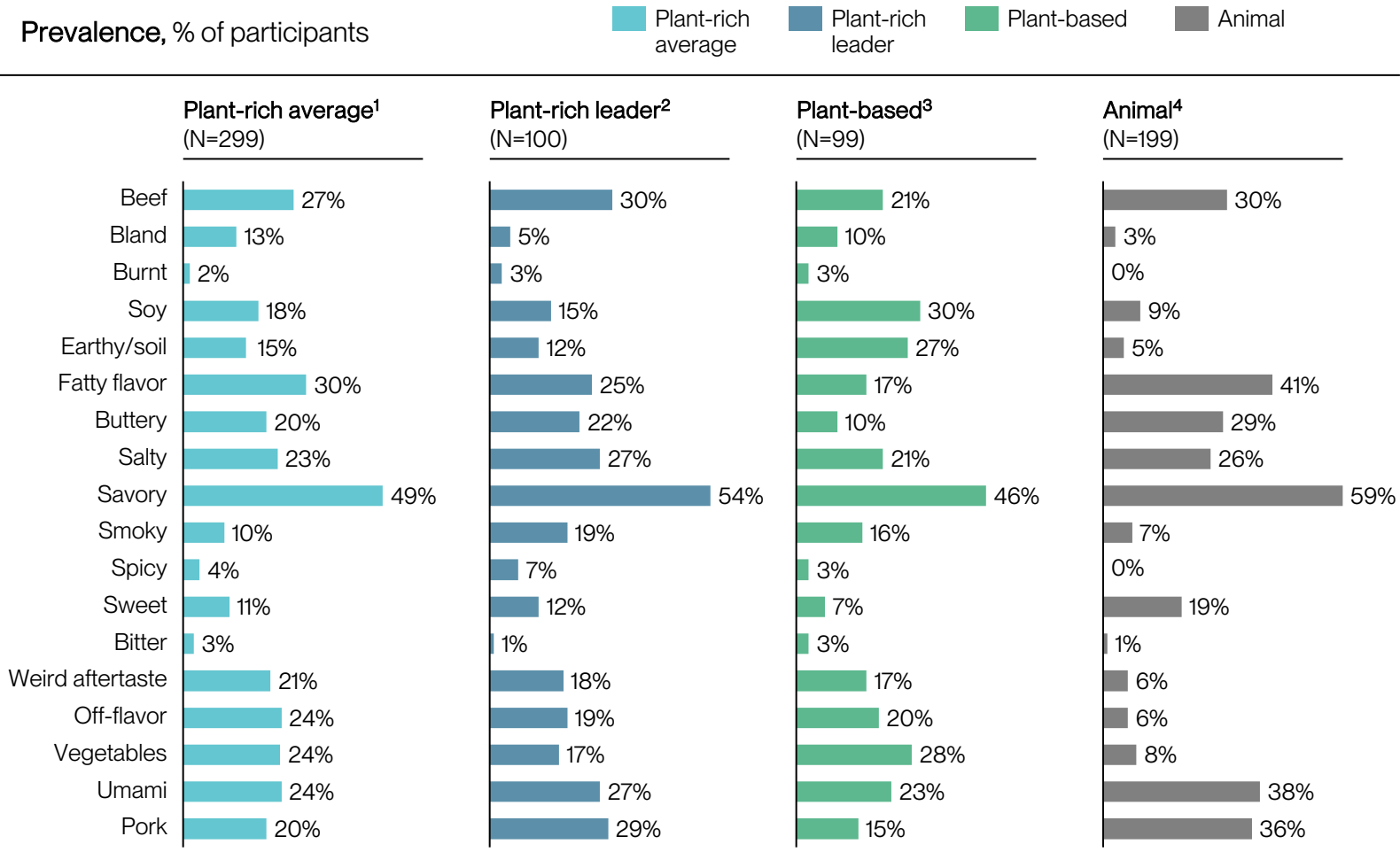
- 'Light interior' was associated with a 0.3pt increase in liking (while 'dark interior' was associated with a 0.7pt decrease in liking).

1. The average change in overall liking on 7pt scale for products for all responses using the relevant attribute as a descriptor compared to the mean liking for all products rated 'just about right' on that attribute. Calculated as Mean Liking (JAR) minus Mean Liking (descriptor used).
2. Share of responses for all products in this category (including animal, plant-rich, and plant) in each direction for each attribute.

# **Beef/Pork Meatball:** Flavor Profile

Please check all words or phrases that describe the flavor of XXX.

**Prevalence,** % of participants




## Takeaways

### Plant-rich leader close behind on savory flavor

- 54% described plant-rich leader as ‘savory’ (versus 59% for animal).

### Plant-rich products need to reduce weird aftertaste and off-flavor

- 21-24% described plant-rich average as having ‘weird aftertaste’ or ‘off-flavor’ (versus 6% for animal).

### Opportunity to increase buttery flavor

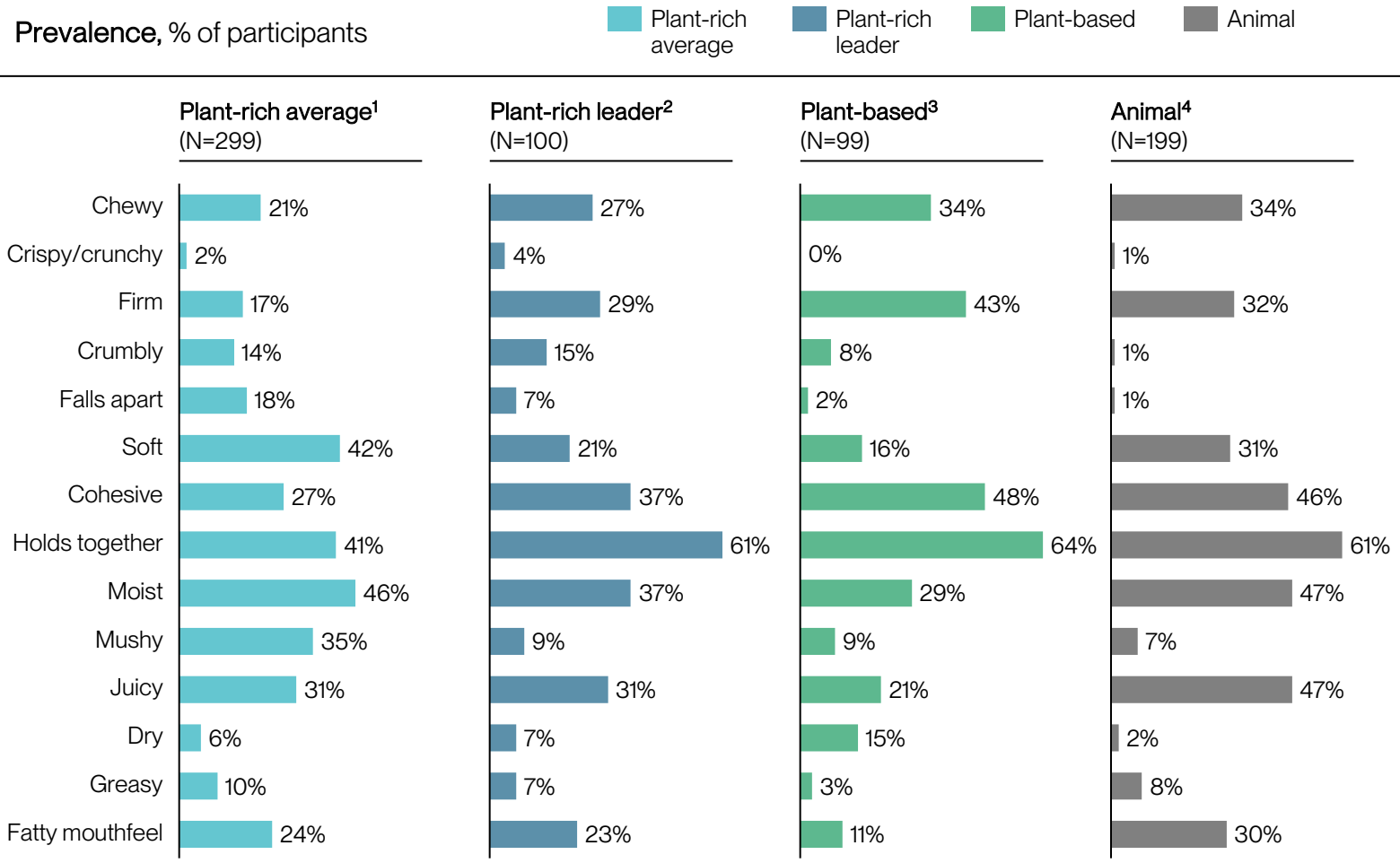
- Only 22% described plant-rich leader as having ‘fatty flavor’ (versus 29% for animal). ‘Buttery’ flavor was associated with a 0.8pt increase in liking.

1. Aggregated across 3 commercially available plant-rich beef/pork meatball products.
2. The plant-rich product with the highest mean liking of those included in this test.
3. Based on brand-level performance in previous rounds of sensory testing.
4. The highest retail sales volume animal beef/pork meatball selected for its representativeness of the animal beef/pork meatball category.

# **Beef/Pork Meatball:** Texture Profile

Please check all words or phrases that describe the texture of XXX.

**Prevalence,** % of participants




## Takeaways

### Plant-rich products should increase juiciness

- Only 31% described plant-rich leader as 'juicy' (versus 47% for animal).

### Plant-rich average is too mushy

- 35% described plant-rich average as 'mushy' (versus 7% for animal). Mushiness was associated with a 0.9pt decrease in liking.

### Plant-rich leader holds together well

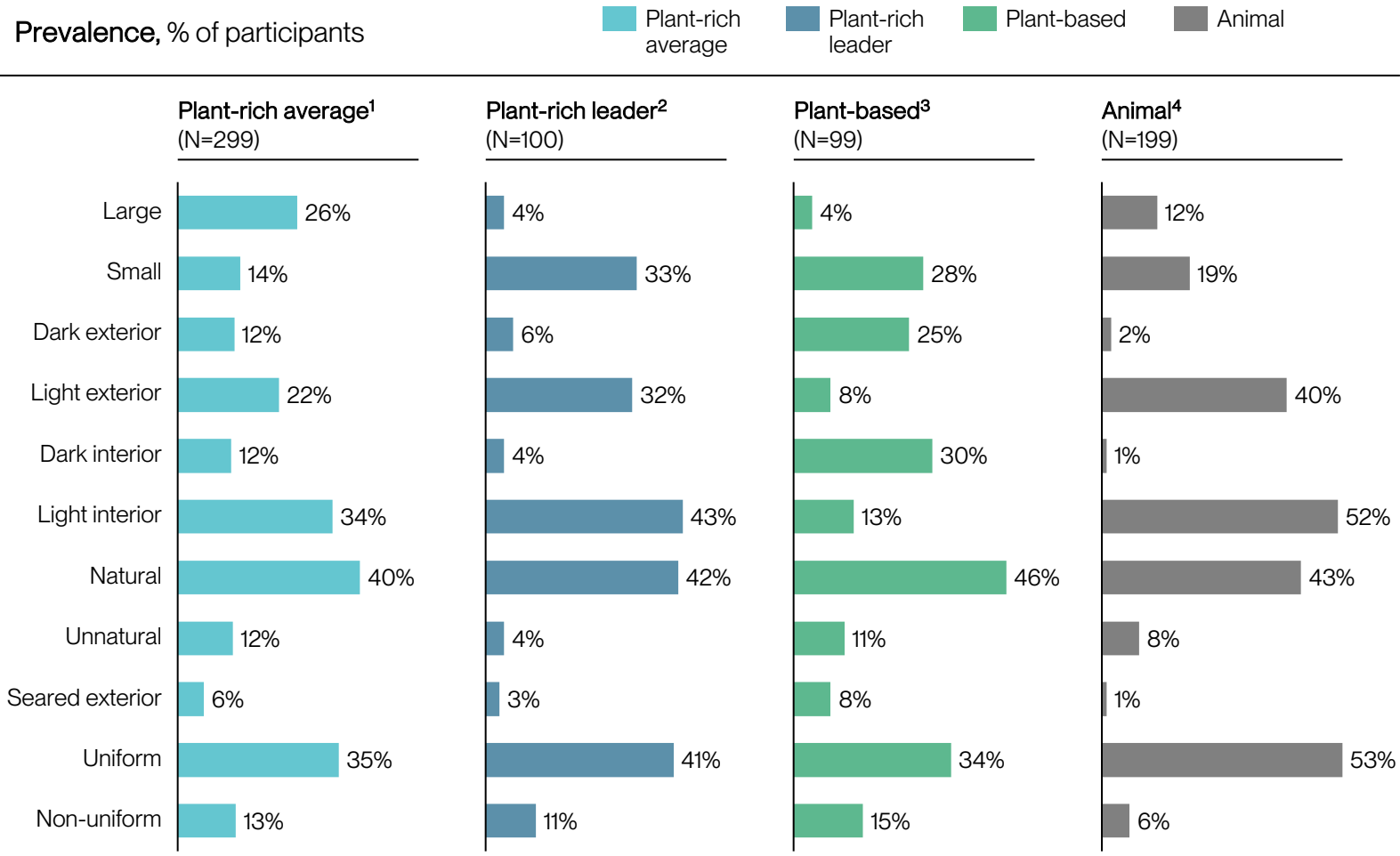
- 61% described both the plant-rich leader and animal as 'holds together.'

1. Aggregated across 3 commercially available plant-rich beef/pork meatball products.
2. The plant-rich product with the highest mean liking of those included in this test.
3. Based on brand-level performance in previous rounds of sensory testing.
4. The highest retail sales volume animal beef/pork meatball selected for its representativeness of the animal beef/pork meatball category.

# **Beef/Pork Meatball:** Appearance Profile

Please check all words or phrases that describe the appearance of XXX.

**Prevalence,** % of participants




## Takeaways

### Plant-rich leader has a natural appearance

- 42% described plant-rich leader as ‘natural’ (versus 43% for animal).

### Plant-rich products should improve uniformity

- Only 35% described plant-rich average as ‘uniform’ (versus 53% for animal).

### Opportunity for plant-rich average to catch up to leader on uniform appearance

- 35% rated plant-rich average ‘uniform’ (versus 41% for plant-rich leader).

1. Aggregated across 3 commercially available plant-rich beef/pork meatball products.
2. The plant-rich product with the highest mean liking of those included in this test.
3. Based on brand-level performance in previous rounds of sensory testing.
4. The highest retail sales volume animal beef/pork meatball selected for its representativeness of the animal beef/pork meatball category.

Category-Specific Deep Dive

# Chicken Sausage

# Chicken Sausage

## Executive summary of R&D opportunities

### Performance Overview

Plant-rich chicken sausages are behind the animal benchmark and undifferentiated as a category.

- **Consumers preferred animal chicken sausage to plant-rich** – Only 39% rated plant-rich leader as 'like' or 'like very much,' compared to 65% for animal.
- **Plant-rich leader was not very differentiated** – Average liking of plant-rich average was 4.7pts, similar to the plant-rich leader at 4.8pts.

### Top Sensory Opportunities

Plant-rich chicken sausage brands can improve and differentiate their product by increasing chicken and fatty flavors, creating a product the holds together better, and developing a more natural appearance.

- **Develop a more natural appearance** – 25% rated plant-rich average as natural (versus 56% for animal). Natural was associated with a 0.8pt increase in liking.
- **Increase chicken flavors** – Only 23% rated plant-rich average as having chicken flavor (versus 57% for animal). Chicken flavor was associated with a 0.9pt increase in liking.
- **Focus on textures that hold together** – Only 49% rated plant-rich average as 'holds together' (versus 71% for animal).
- **Plant-rich products should increase fatty flavor** – Only 20% rated plant-rich average as having fatty flavor (versus 40% for animal).

# Chicken Sausages Tested

Chicken sausages from two commercially available plant-rich chicken sausage brands were prepared according to manufacturer instructions on a skillet and compared against animal and plant-based chicken sausages.

Participants were screened to exclude consumers who do not eat animal-based meat and only include those who eat sausages at least every 1-2 months.

## Testing Environment

Participants tried the chicken sausages at the Haight St. Café in San Francisco, a restaurant environment, in order to achieve an authentic, natural experience.

## Preparation

All chicken sausages were prepared by restaurant staff using a skillet according to manufacturer instructions.

## Dish Served

All participants were served three chicken sausages with peppers and onions. While they ate, participants filled out a survey via mobile phone detailing their experience with each product. Products were evaluated in a randomized order.

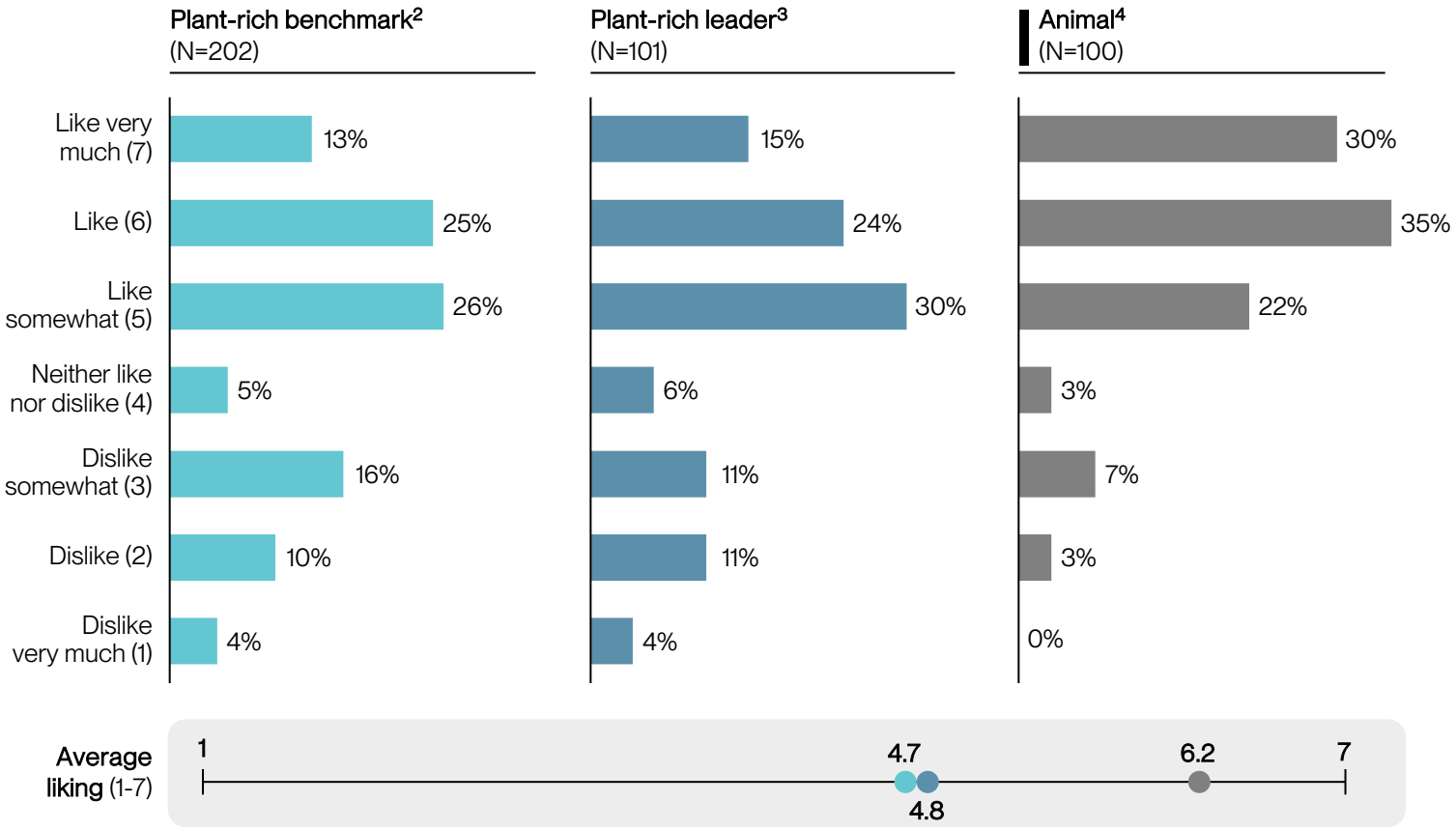
# **Chicken Sausage:** Overall Liking

How would you rate your OVERALL LIKING of chicken sausage XXX?

**Overall liking,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)




# Takeaways

## Plant-rich chicken sausage trails animal on overall liking

- Only 39% rated plant-rich leader as 'like' or 'like very much,' compared to 65% for animal.

## Plant-rich average performed comparably to plant-rich leader

- Average liking of plant-rich average was 4.7pts, similar to plant-rich leader at 4.8pts.

1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. Aggregated across 2 commercially available plant-rich chicken sausage products.
3. The plant-rich product with the highest mean liking of those included in this test.
4. The highest retail sales volume animal chicken sausage selected for its representativeness of the chicken sausage category.

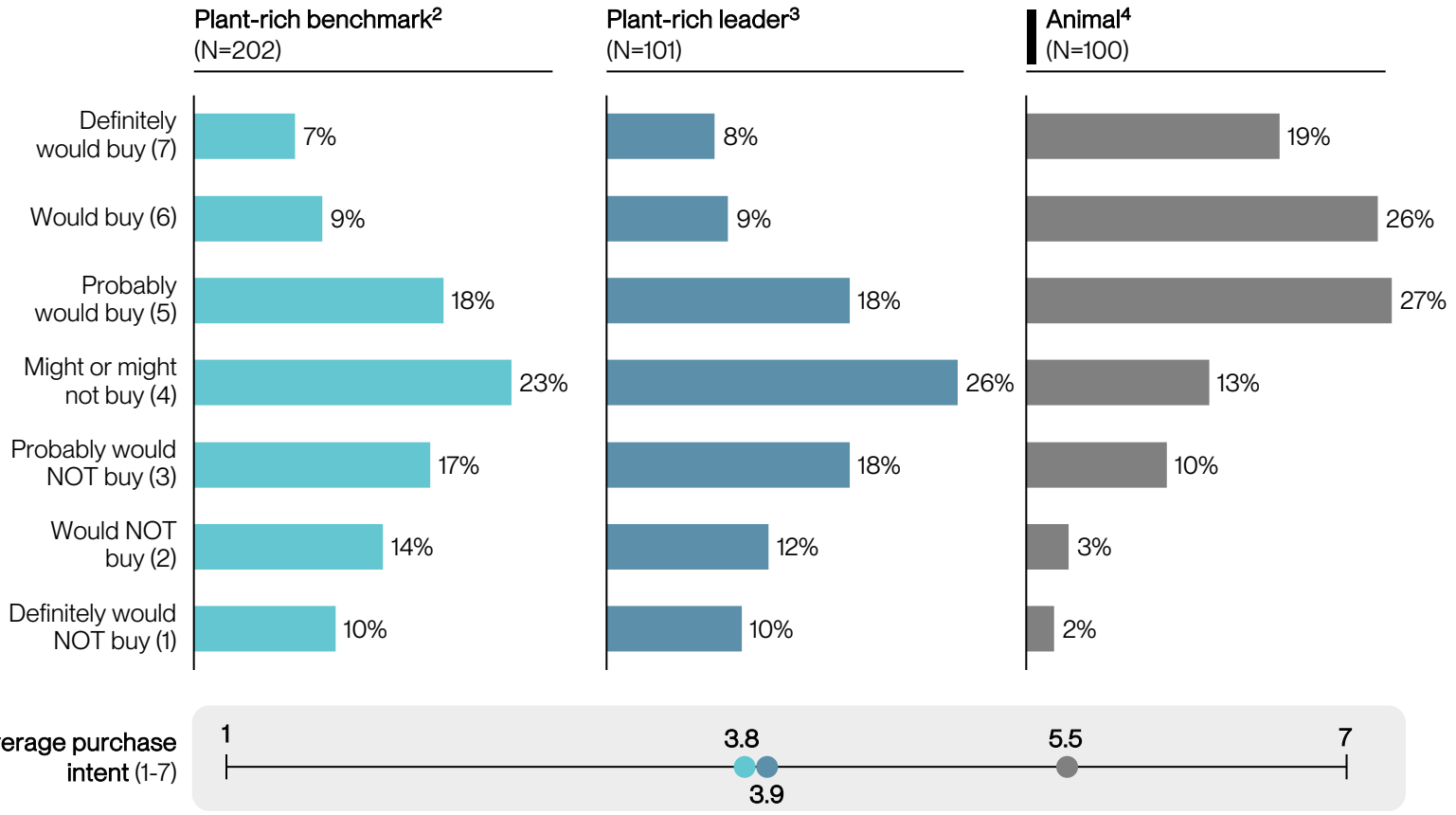
# **Chicken Sausage:** Purchase Intent

How would you rate your PURCHASE INTENT of chicken sausage XXX?

**Purchase intent,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)







# Takeaways

## Opportunity for plant-rich products to improve purchase intent

- Only 16% rated plant-rich average 'would buy' or 'definitely would buy' (versus 45% for animal).

## Plant-rich average performed similarly to plant-rich leader

- Average purchase intent was 3.8pts for plant-rich average (versus 3.9pts for plant-rich leader).

1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. Aggregated across 2 commercially available plant-rich chicken sausage products.
3. The plant-rich product with the highest mean liking of those included in this test.
4. The highest retail sales volume animal chicken sausage selected for its representativeness of the chicken sausage category.

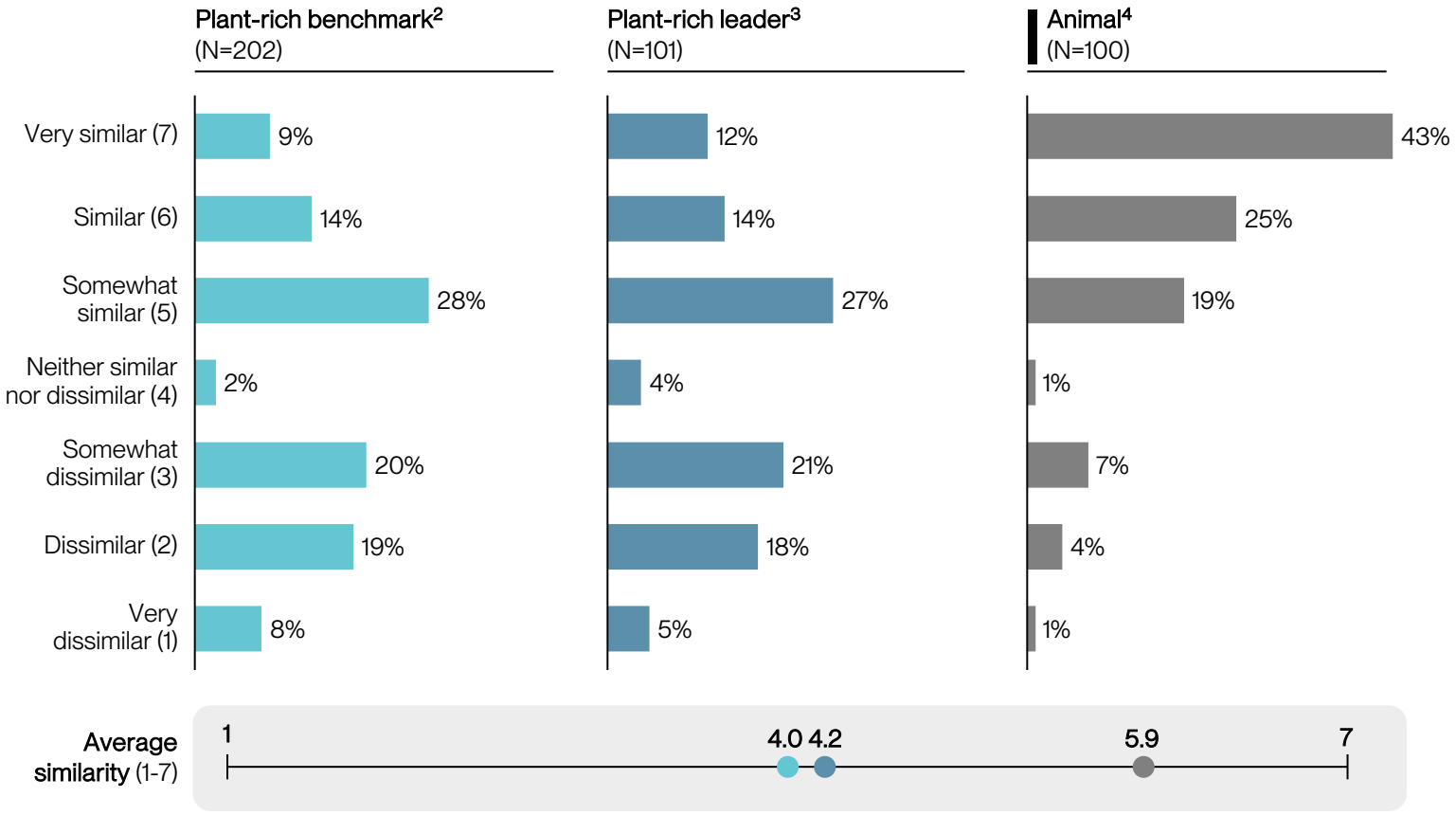
# **Chicken Sausage:** Similarity

How would you rate your SIMILARITY of XXX to a typical chicken sausage?

**Similarity,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)







# Takeaways

## Opportunity for plant-rich to improve similarity to typical chicken sausages

- Only 23% rated plant-rich average 'similar' or 'very similar' to a typical chicken sausage (versus 68% for animal).

## Plant-rich average close to leader

- Plant-rich average had average 'similarity' of 4.0pts (versus 4.2pts for plant-rich leader).

1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. Aggregated across 2 commercially available plant-rich chicken sausage products.
3. The plant-rich product with the highest mean liking of those included in this test.
4. The highest retail sales volume animal chicken sausage selected for its representativeness of the chicken sausage category.

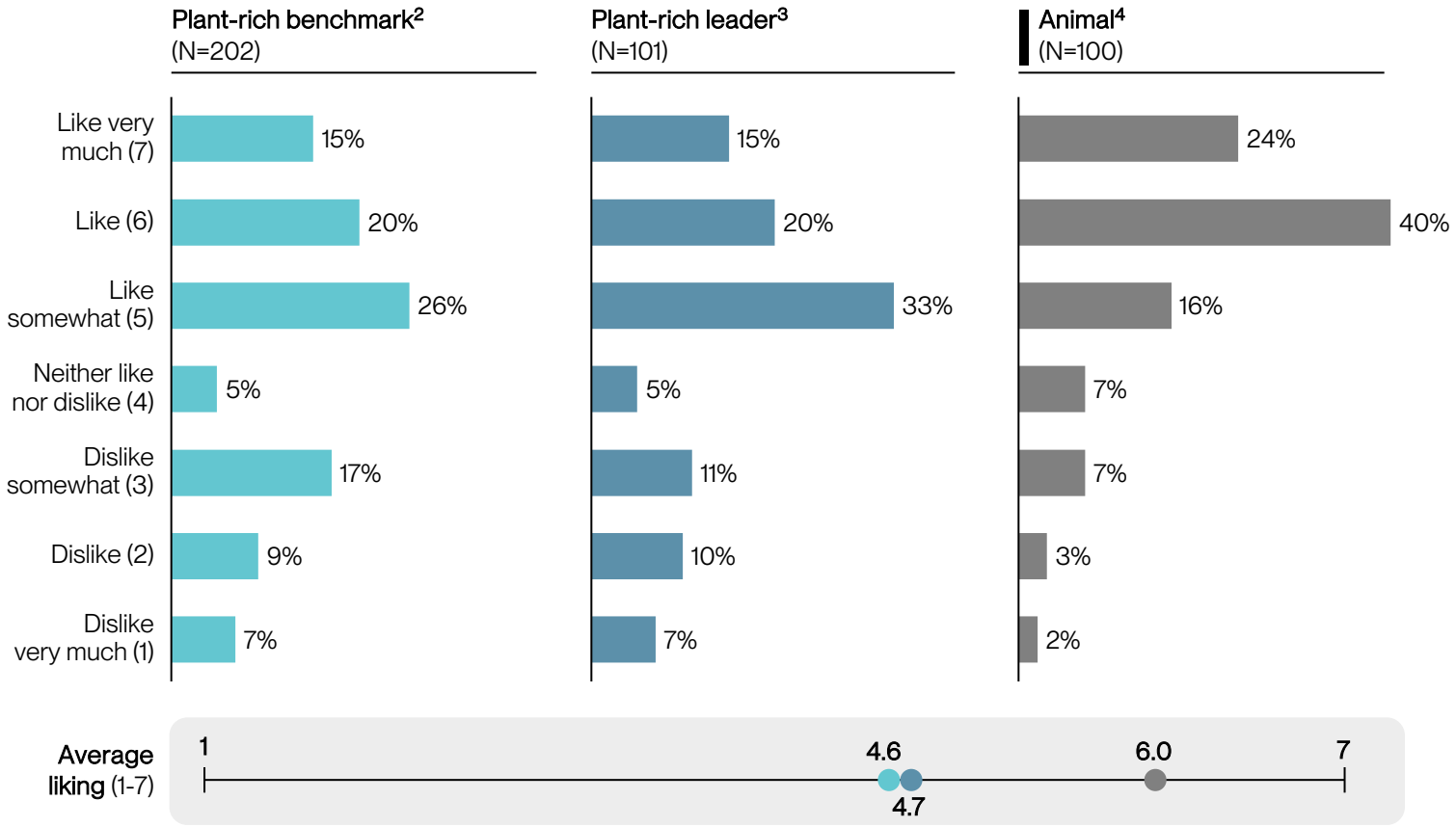
# **Chicken Sausage:** Flavor

How would you rate your FLAVOR of chicken sausage XXX?

**Flavor,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)







# Takeaways

## Plant-rich products need to improve flavor

- Only 35% rated plant-rich leader 'like' or 'like very much' (versus 64% for animal).

## Plant-rich average performed comparably to leader

- Average liking for plant-rich average was 4.6pts (versus 4.7pts for plant-rich leader).

1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. Aggregated across 2 commercially available plant-rich chicken sausage products.
3. The plant-rich product with the highest mean liking of those included in this test.
4. The highest retail sales volume animal chicken sausage selected for its representativeness of the chicken sausage category.

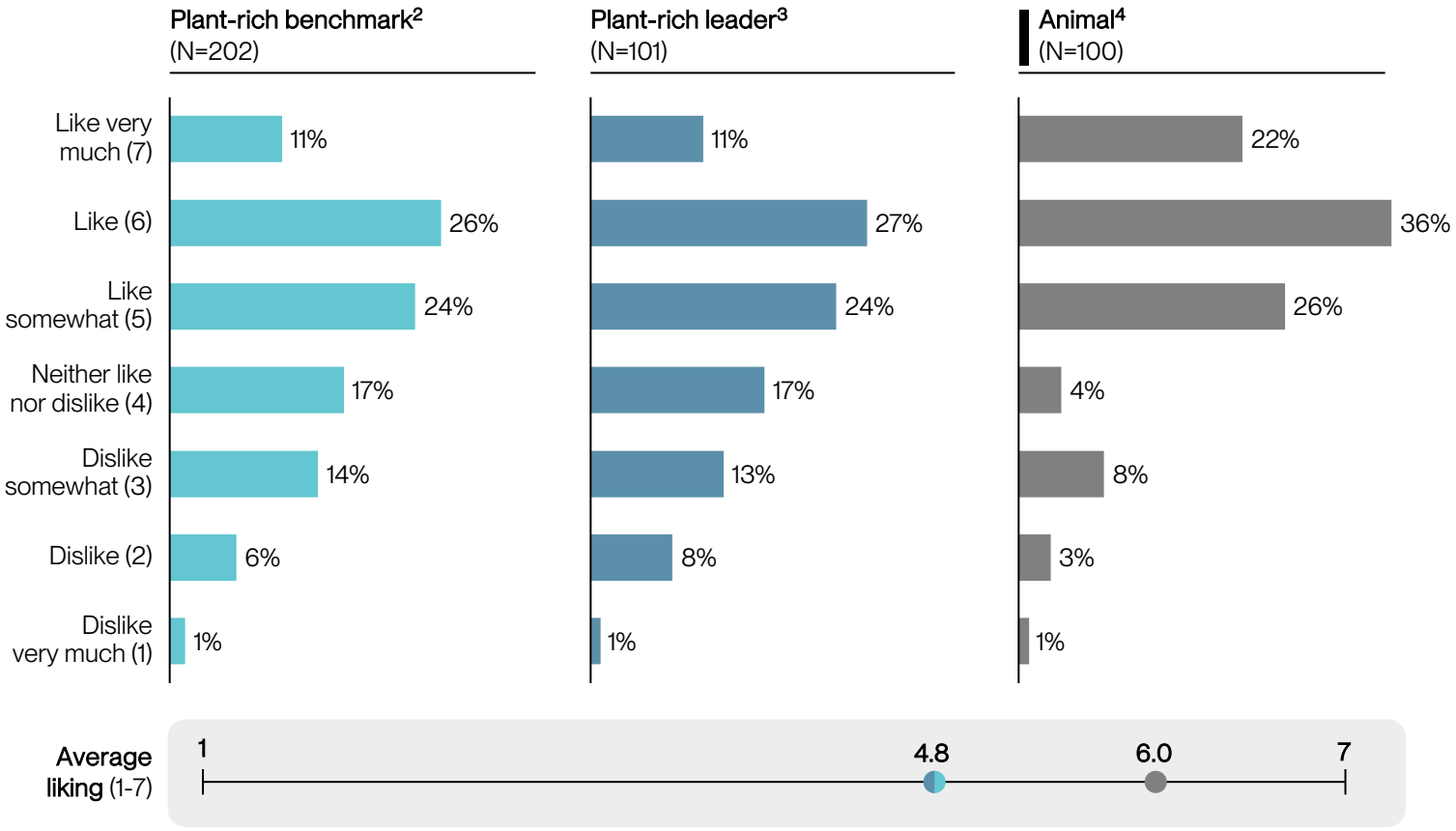
# **Chicken Sausage:** Texture

How would you rate your TEXTURE of chicken sausage XXX?

**Texture,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)







# Takeaways

## Opportunity for plant-rich products to improve texture

- Only 38% rated plant-rich leader 'like' or 'like very much' (versus 58% for animal).

## Plant-rich leader does not differentiate itself on texture

- Plant-rich average and leader scored the same on texture, with an average liking of 4.8pts.

1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. Aggregated across 2 commercially available plant-rich chicken sausage products.
3. The plant-rich product with the highest mean liking of those included in this test.
4. The highest retail sales volume animal chicken sausage selected for its representativeness of the chicken sausage category.

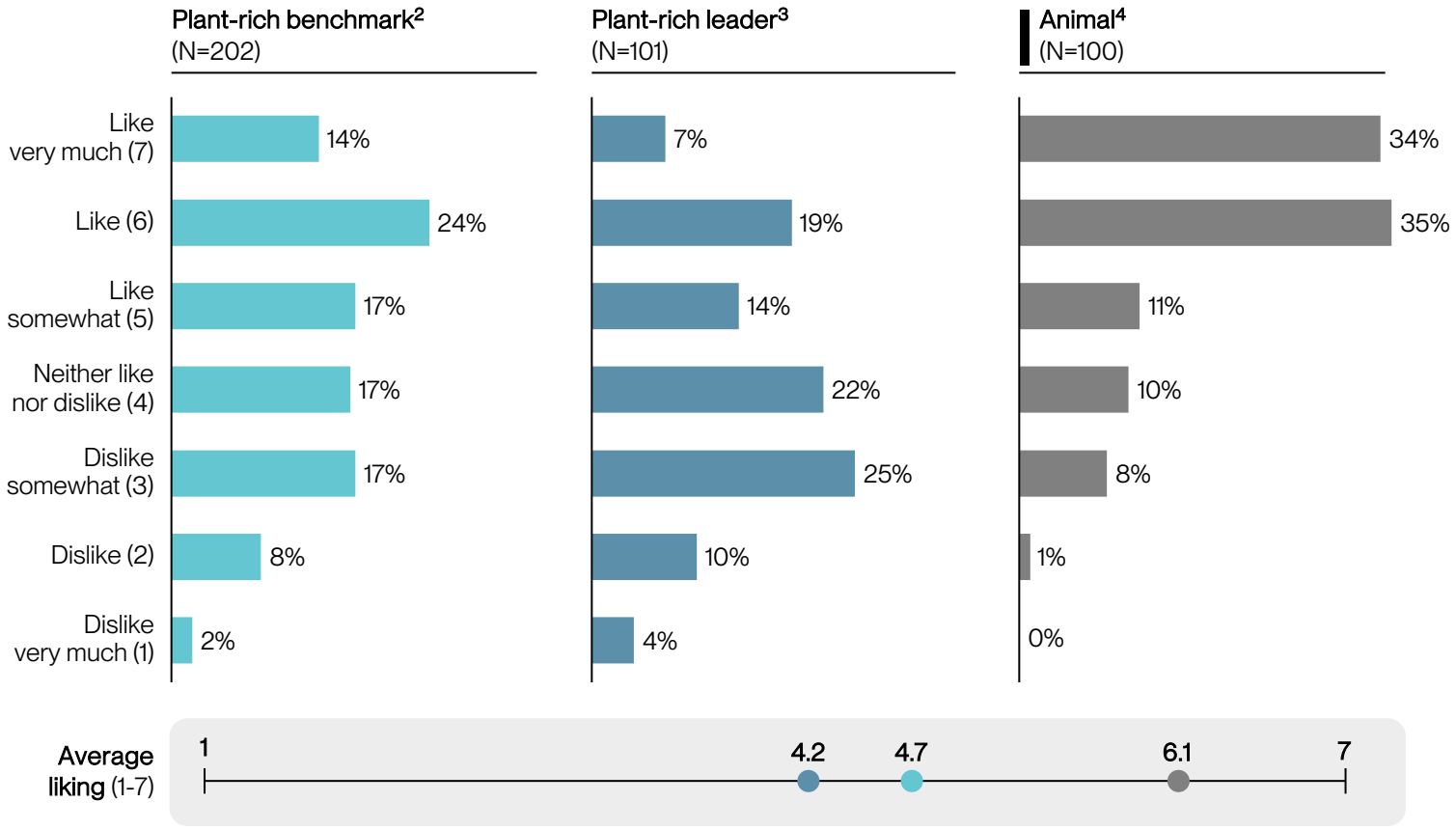
# **Chicken Sausage:** Appearance

How would you rate your APPEARANCE of chicken sausage XXX?

**Appearance,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)







# Takeaways

## Plant-rich products trail behind animal on appearance

- Only 38% rated plant-rich average 'like' or 'like very much' (versus 69% for animal).

## Plant-rich average outperforms leader on appearance

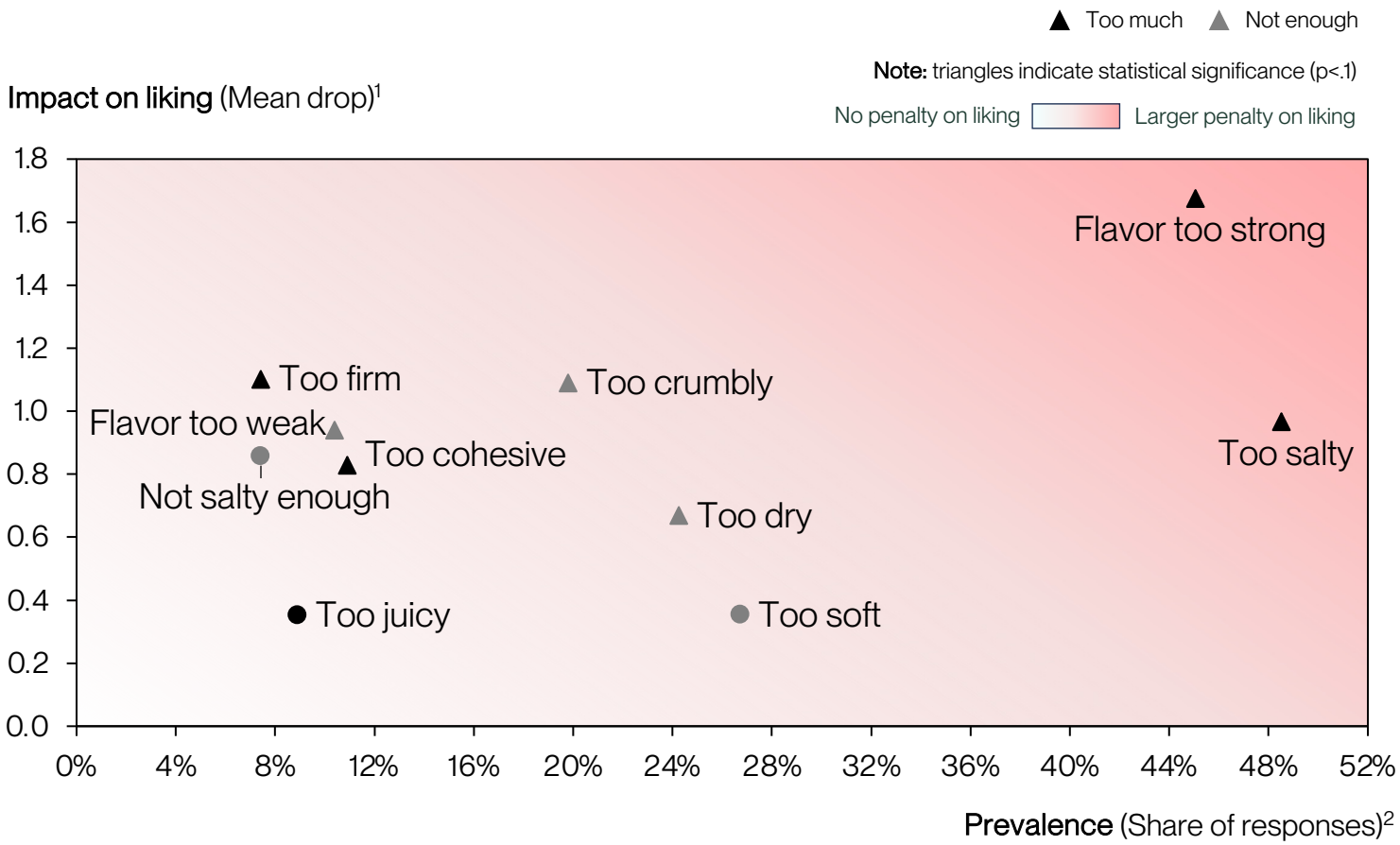
- Average liking was 4.7pts for plant-rich average (versus 4.2pts for leader).

1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. Aggregated across 2 commercially available plant-rich chicken sausage products.
3. The plant-rich product with the highest mean liking of those included in this test.
4. The highest retail sales volume animal chicken sausage selected for its representativeness of the chicken sausage category.

# **Chicken Sausage:** Top R&D Opportunities

Prioritization framework for identifying attributes with large impacts on liking

**Penalty analysis using responses on just-about-right questions,** Mean drop and Prevalence




## Takeaways

### Reduce overwhelming flavors in product development

- 44% reported 'flavor too strong,' which had the largest impact on liking (1.6pts).

### Opportunity to adjust saltiness

- 48% noted the product as 'too salty,' with a 0.9pt impact to liking.

### Avoid dryness and crumbliness

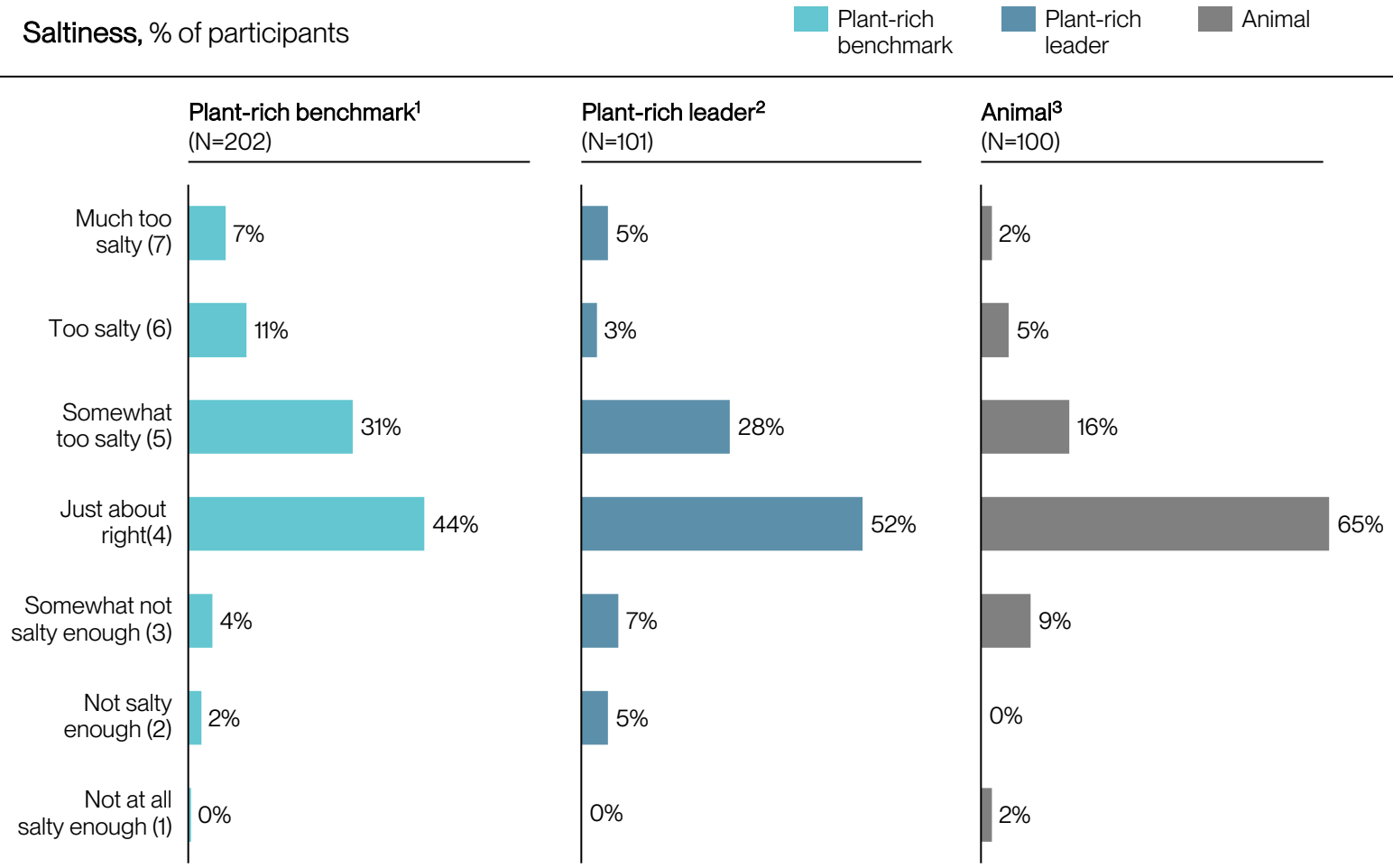
- 'Too crumbly' and 'too dry' were reported by 20-24% of participants, with impacts to liking of 1.1pts and 0.7pts, respectively.

1. The average change in overall liking on 7pt scale for products for all responses using the relevant attribute as a descriptor compared to the mean liking for all products rated 'just about right' on that attribute. Calculated as Mean Liking (JAR) minus Mean Liking (descriptor used).
2. Share of responses for all plant-rich products in this category in each direction for each attribute.

# **Chicken Sausage:** Saltiness

How would you rate your SALTINESS of chicken sausage XXX?

**Saltiness,** % of participants




## Takeaways

### Plant-rich leader behind animal on saltiness

- 52% rated saltiness of the plant-rich leader as 'just about right,' compared to 65% for animal.

### Opportunity for plant-rich average to close the gap on saltiness

- Only 44% rated the saltiness of the plant-rich average 'just about right' (versus 52% for plant-rich leader).

### Reduce excess saltiness

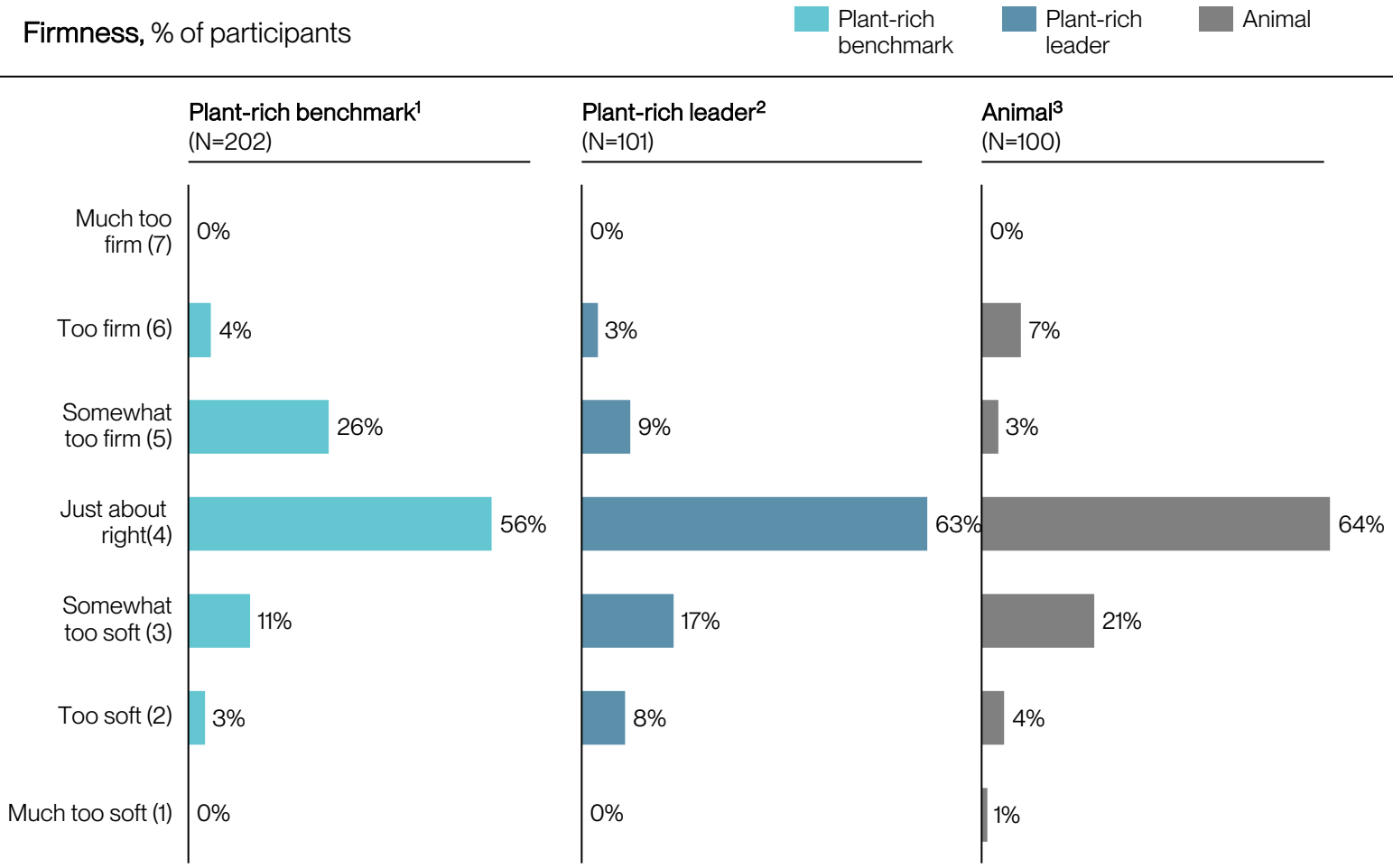
- Plant-rich products tended towards the 'too salty' side (which was associated with a 0.9pt impact to liking).

1. Aggregated across 2 commercially available plant-rich chicken sausage products.
2. The plant-rich product with the highest mean liking of those included in this test.
3. The highest retail sales volume animal chicken sausage selected for its representativeness of the chicken sausage category.

# **Chicken Sausage:** Firmness

How would you rate your FIRMNESS of chicken sausage XXX?

**Firmness,** % of participants




## Takeaways

### Plant-rich leader close to animal on firmness

- 63% rated the plant-rich leader 'just about right' on firmness (versus 64% for animal).

### Opportunity for plant-rich average to catch up to leader on firmness

- Just 56% rated the plant-rich average 'just about right' on firmness (versus 63% for plant-rich leader).

### Plant-rich average should reduce firmness

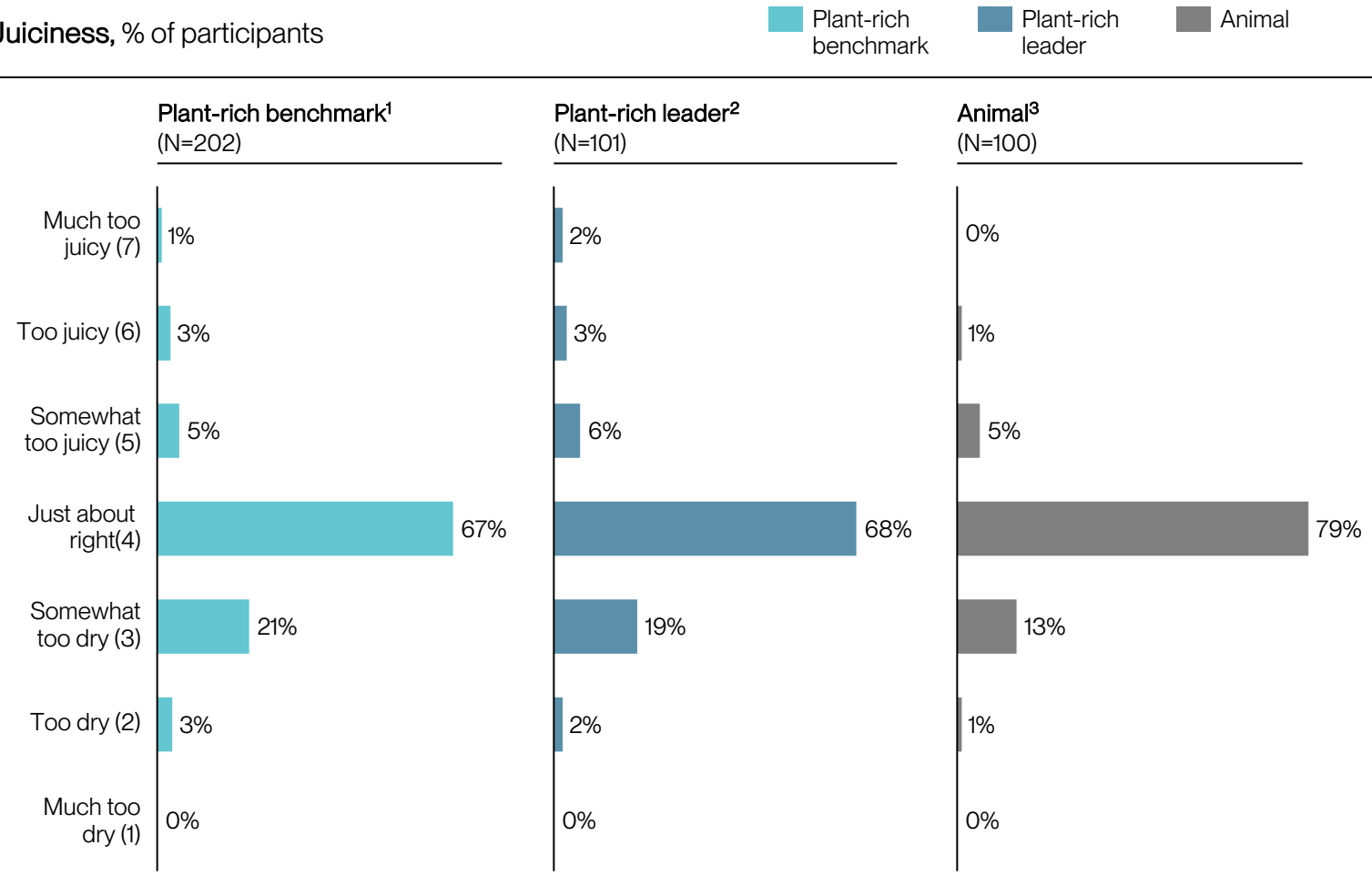
- Plant-rich average tended to be 'too firm,' which was associated with a drop in liking of 1.1pts.

1. Aggregated across 2 commercially available plant-rich chicken sausage products.
2. The plant-rich product with the highest mean liking of those included in this test.
3. The highest retail sales volume animal chicken sausage selected for its representativeness of the chicken sausage category.

# **Chicken Sausage:** Juiciness

How would you rate your JUICINESS of chicken sausage XXX?

**Juiciness,** % of participants




## Takeaways

### Increase juiciness in product development

- 68% described plant-rich leader's juiciness as 'just about right' (versus 79% for animal).
- Plant-rich products tended towards the dry side, associated with a 0.7pt drop in liking.

### Plant-rich average performs comparably to plant-rich leader

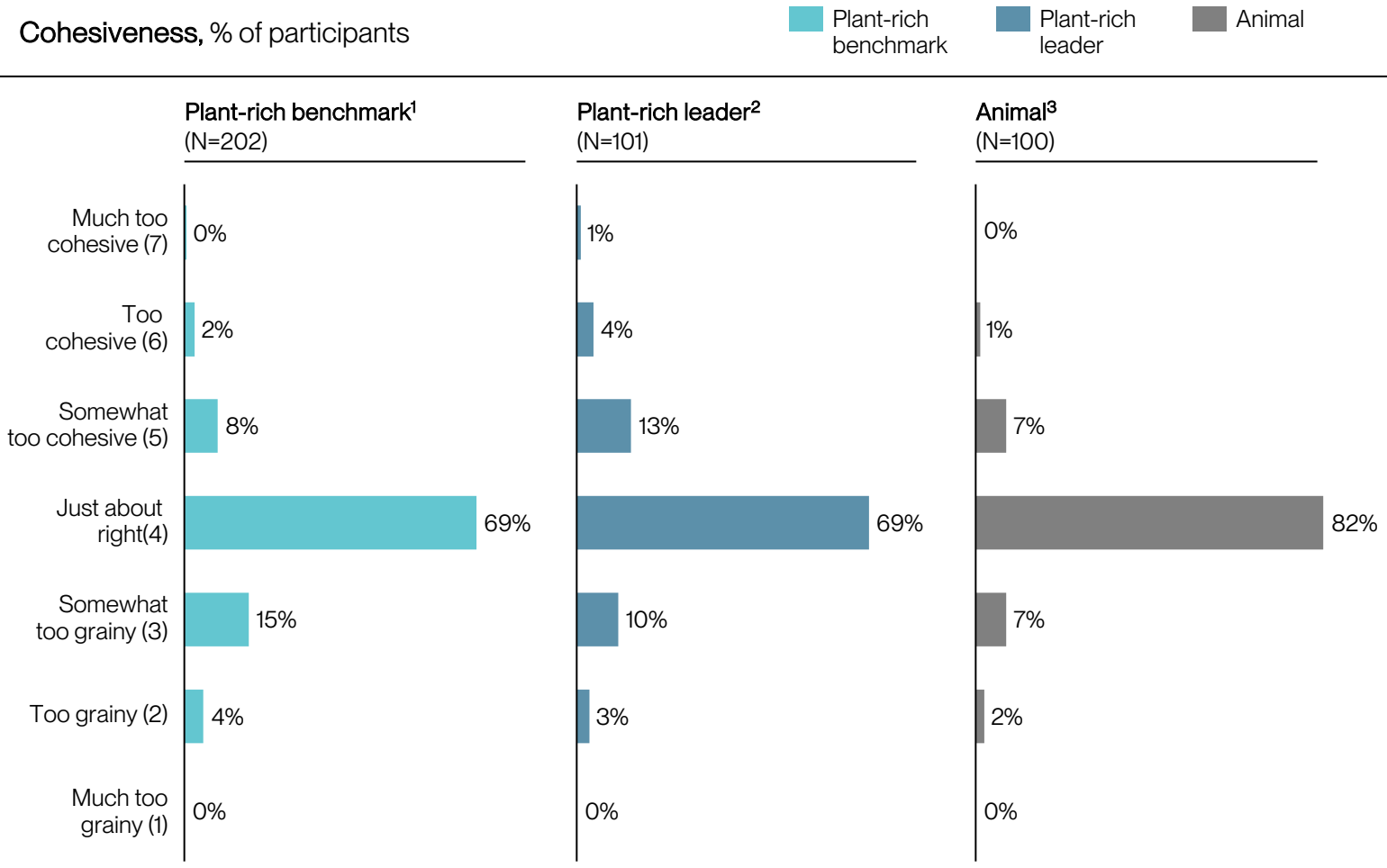
- 67% rated plant-rich average 'just about right' juiciness (versus 68% for plant-rich leader).

1. Aggregated across 2 commercially available plant-rich chicken sausage products.
2. The plant-rich product with the highest mean liking of those included in this test.
3. The highest retail sales volume animal chicken sausage selected for its representativeness of the chicken sausage category.

# **Chicken Sausage:** Cohesiveness

How would you rate your COHESIVENESS of chicken sausage XXX?

**Cohesiveness,** % of participants




## Takeaways

### Plant-rich products should improve cohesiveness

- 69% rated plant-rich leader 'just about right' in cohesiveness (versus 82% for animal).

### Plant-rich average performed similarly to plant-rich leader

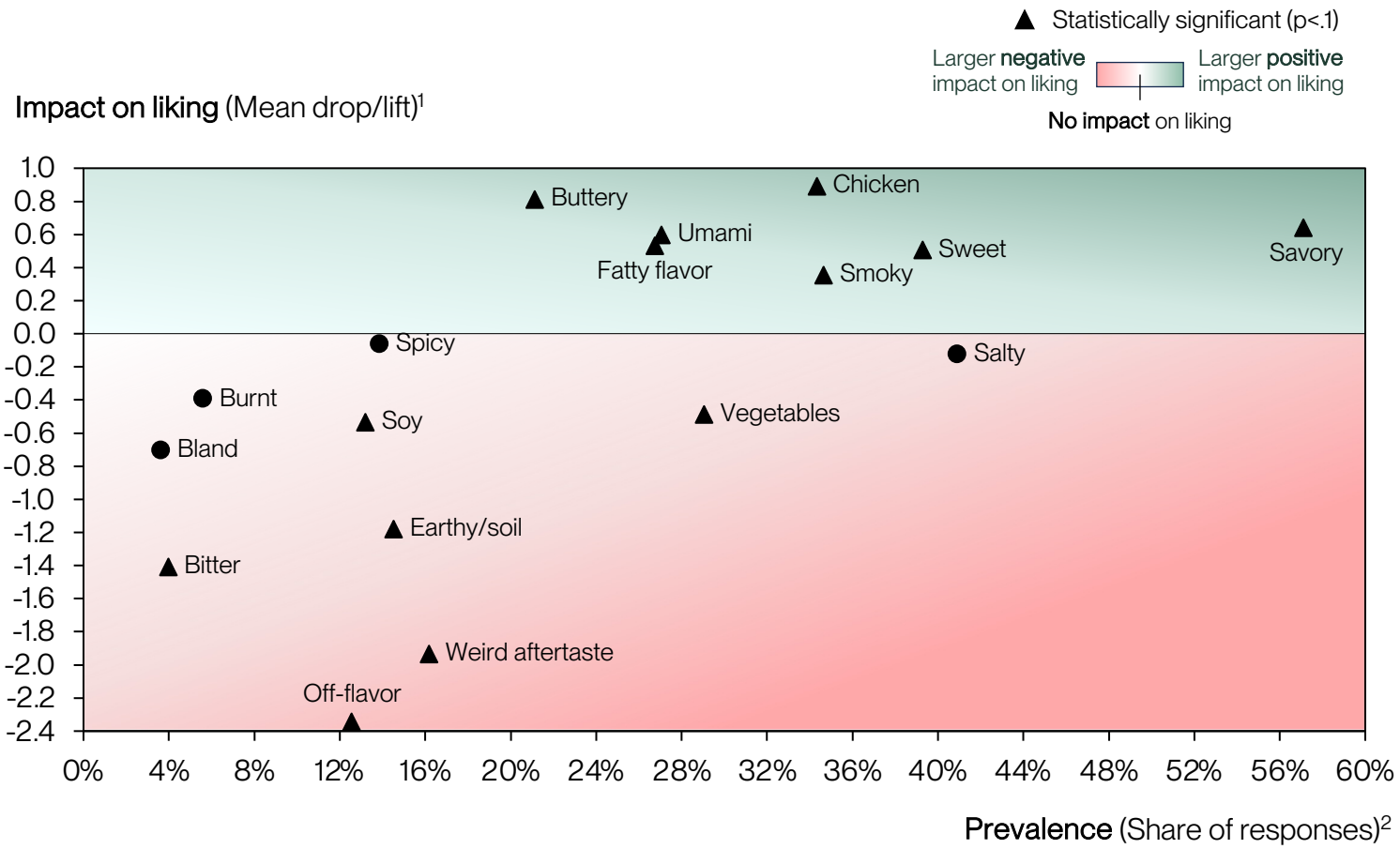
- 69% rated plant-rich average 'just about right' cohesiveness (versus 69% for plant-rich leader).

1. Aggregated across 2 commercially available plant-rich chicken sausage products.
2. The plant-rich product with the highest mean liking of those included in this test.
3. The highest retail sales volume animal chicken sausage selected for its representativeness of the chicken sausage category.

# **Chicken Sausage:** Top Flavor R&D Opportunities

Prioritization framework for identifying attributes with large impacts on liking

**Penalty analysis on flavor using check-all-that-apply responses,** Mean drop/lift and Prevalence




## Takeaways

### Chicken and buttery flavors enhance liking the most

- Each was associated with a ~0.8pt increase in liking.

### Avoid off-flavor and weird aftertaste

- 'Off-flavor' and 'weird aftertaste' were associated with largest drops in liking (-2.3pts and -2.0pts, respectively).

### Savory flavor was enjoyed and noticed by consumers

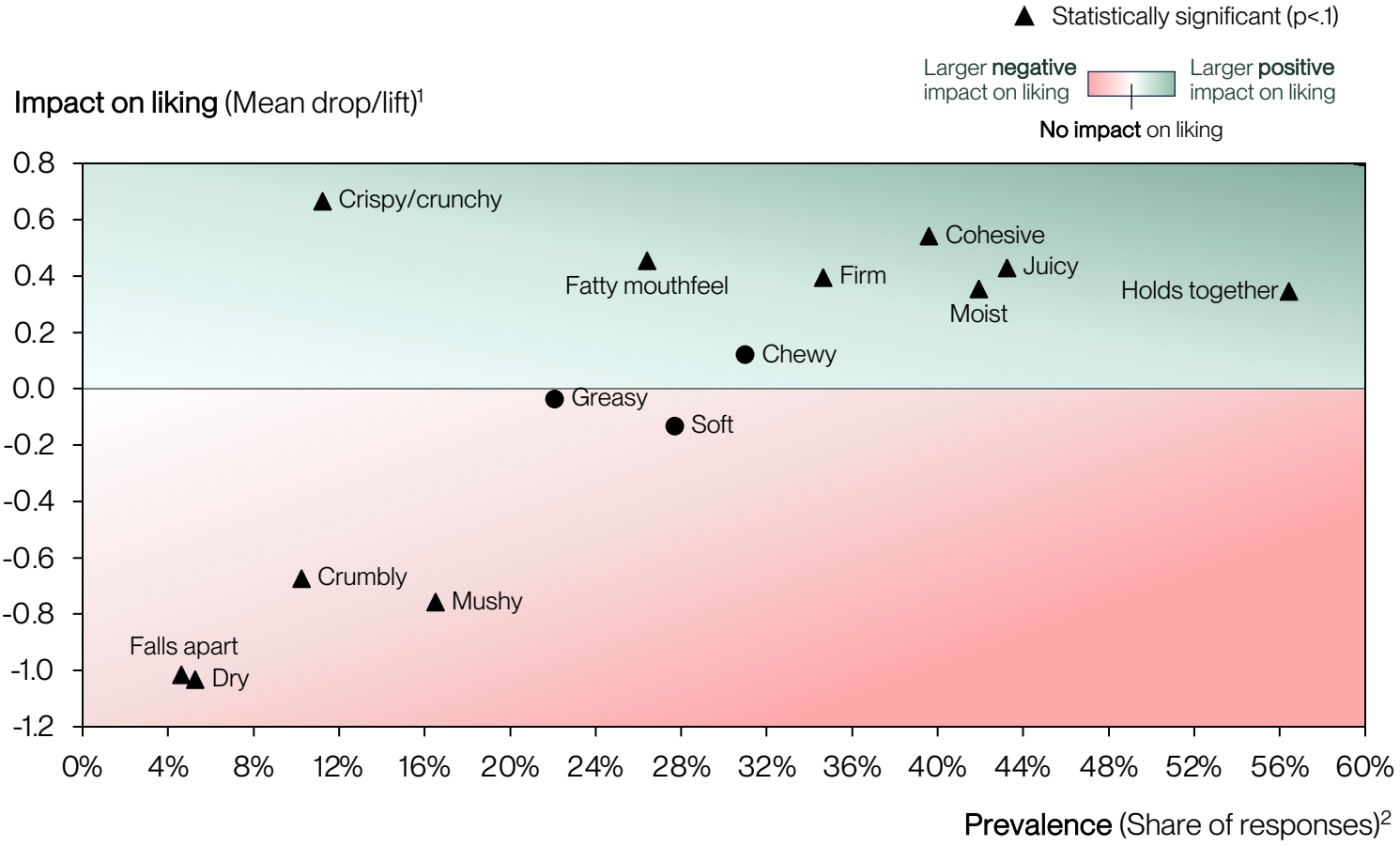
- More than half of participants noted 'savory' flavor, which was associated with a 0.6pt increase in liking.

1. The average change in overall liking on 7pt scale for products for all responses using the relevant attribute as a descriptor compared to the mean liking for all products rated 'just about right' on that attribute. Calculated as Mean Liking (JAR) minus Mean Liking (descriptor used).
2. Share of responses for all products in this category (including animal, plant-rich, and plant) in each direction for each attribute.

# **Chicken Sausage:** Top Texture R&D Opportunities

Prioritization framework for identifying attributes with large impacts on liking

**Penalty analysis on texture using check-all-that-apply responses,** Mean drop/lift and Prevalence




# Takeaways

## Focus on cohesive textures which hold together

- Each was associated with a 0.4-0.6pt increase in liking (compared to 'crumbly' and 'falls apart' which were associated with a 0.6-1.0pt drop in liking).

## Consumers show slight preference for firmness over softness

- 'Firm' texture was associated with a 0.4pt increase in liking (versus -0.2 for 'soft').

## Consumers prefer moist, juicy texture over dry

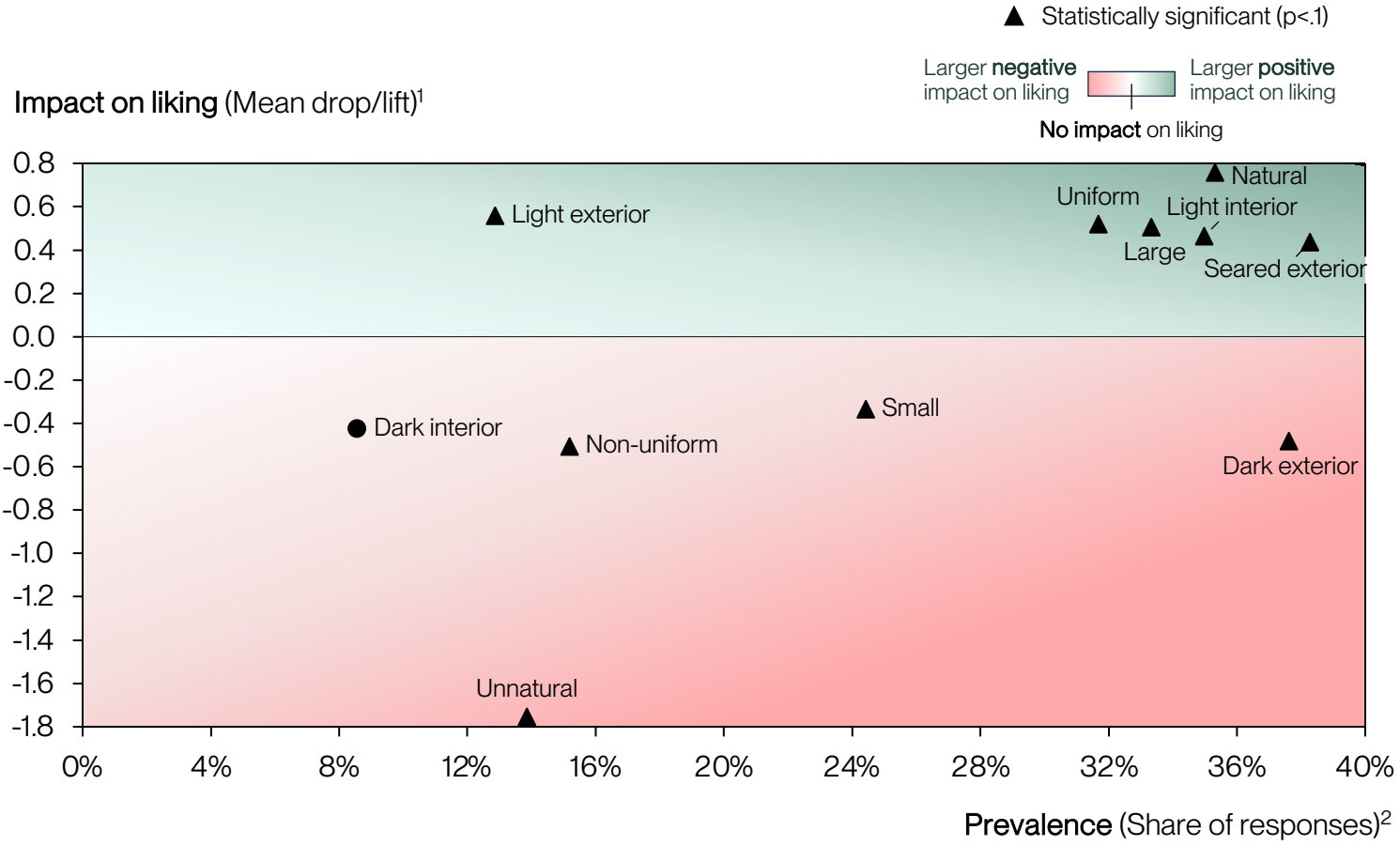
- 'Moist' and 'juicy' were associated with a 0.4pt increase in liking (versus -1.0 for 'dry').

1. The average change in overall liking on 7pt scale for products for all responses using the relevant attribute as a descriptor compared to the mean liking for all products rated 'just about right' on that attribute. Calculated as Mean Liking (JAR) minus Mean Liking (descriptor used).
2. Share of responses for all products in this category (including animal, plant-rich, and plant) in each direction for each attribute.

# **Chicken Sausage:** Top Appearance R&D Opportunities

Prioritization framework for identifying attributes with large impacts on liking

**Penalty analysis on appearance using check-all-that-apply responses,** Mean drop/lift and Prevalence




## Takeaways

### Prioritize a natural appearance

- 'Natural' appearance was associated with the highest increase in liking (0.8pts), while 'unnatural' was associated with the biggest drop (-1.8pts).

### Consumers prefer a light exterior to a dark exterior

- 'Light exterior' associated with a 0.6pts increase in liking (versus -0.5pts for 'dark exterior').

### Uniform appearance preferred over non-uniform

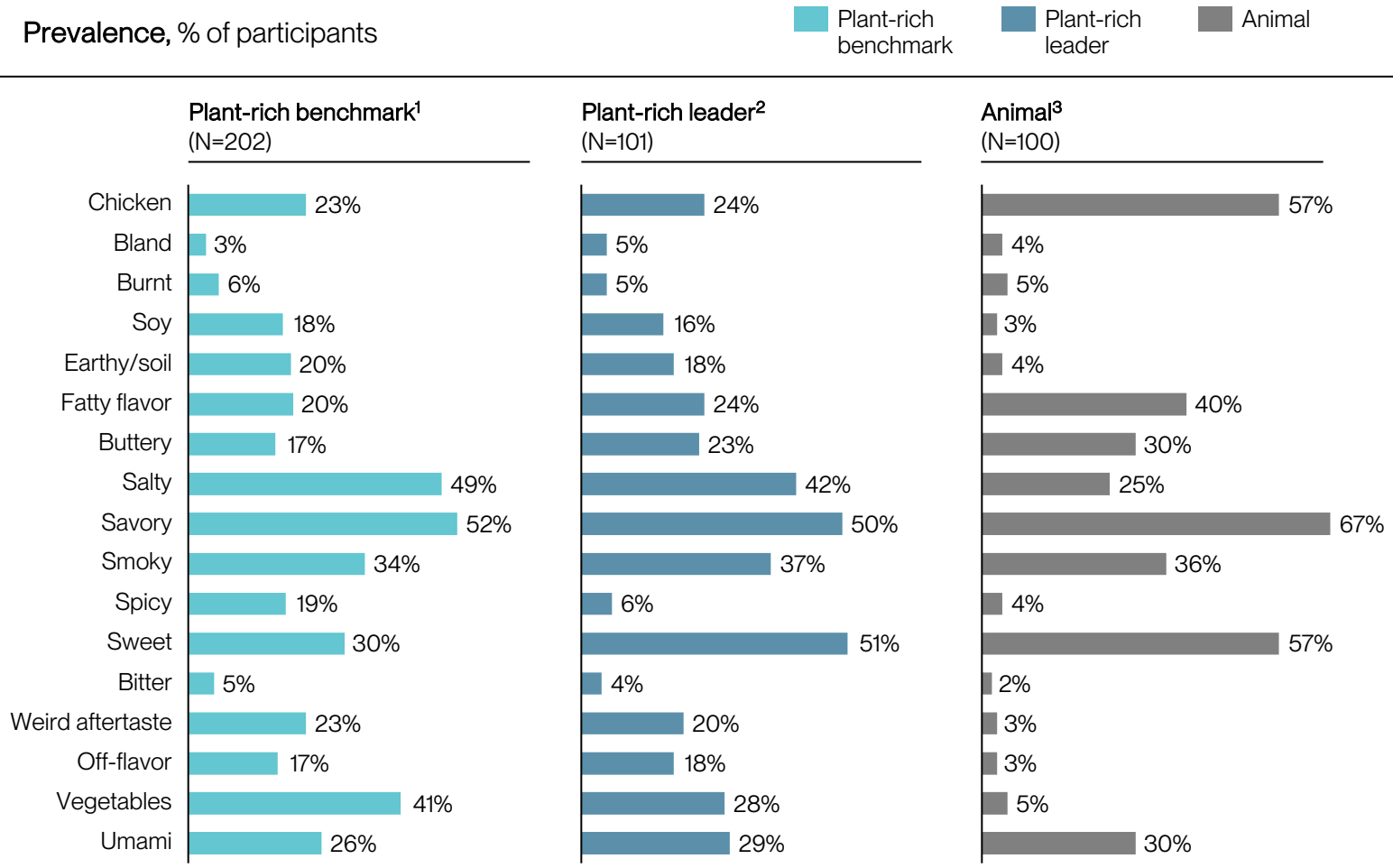
- 'Uniform' associated with a 0.6pts increase in liking (versus -0.6 for 'non-uniform').

1. The average change in overall liking on 7pt scale for products for all responses using the relevant attribute as a descriptor compared to the mean liking for all products rated 'just about right' on that attribute. Calculated as Mean Liking (JAR) minus Mean Liking (descriptor used).
2. Share of responses for all products in this category (including animal, plant-rich, and plant) in each direction for each attribute.

# **Chicken Sausage:** Flavor Profile

Please check all words or phrases that describe the flavor of XXX.

**Prevalence,** % of participants




## Takeaways

### Focus on chicken flavors

- Only 23% rated plant-rich average as having ‘chicken’ flavor (versus 57% for animal). ‘Chicken’ was associated with a 0.9pt increase in liking.

### Increase fatty and savory flavors

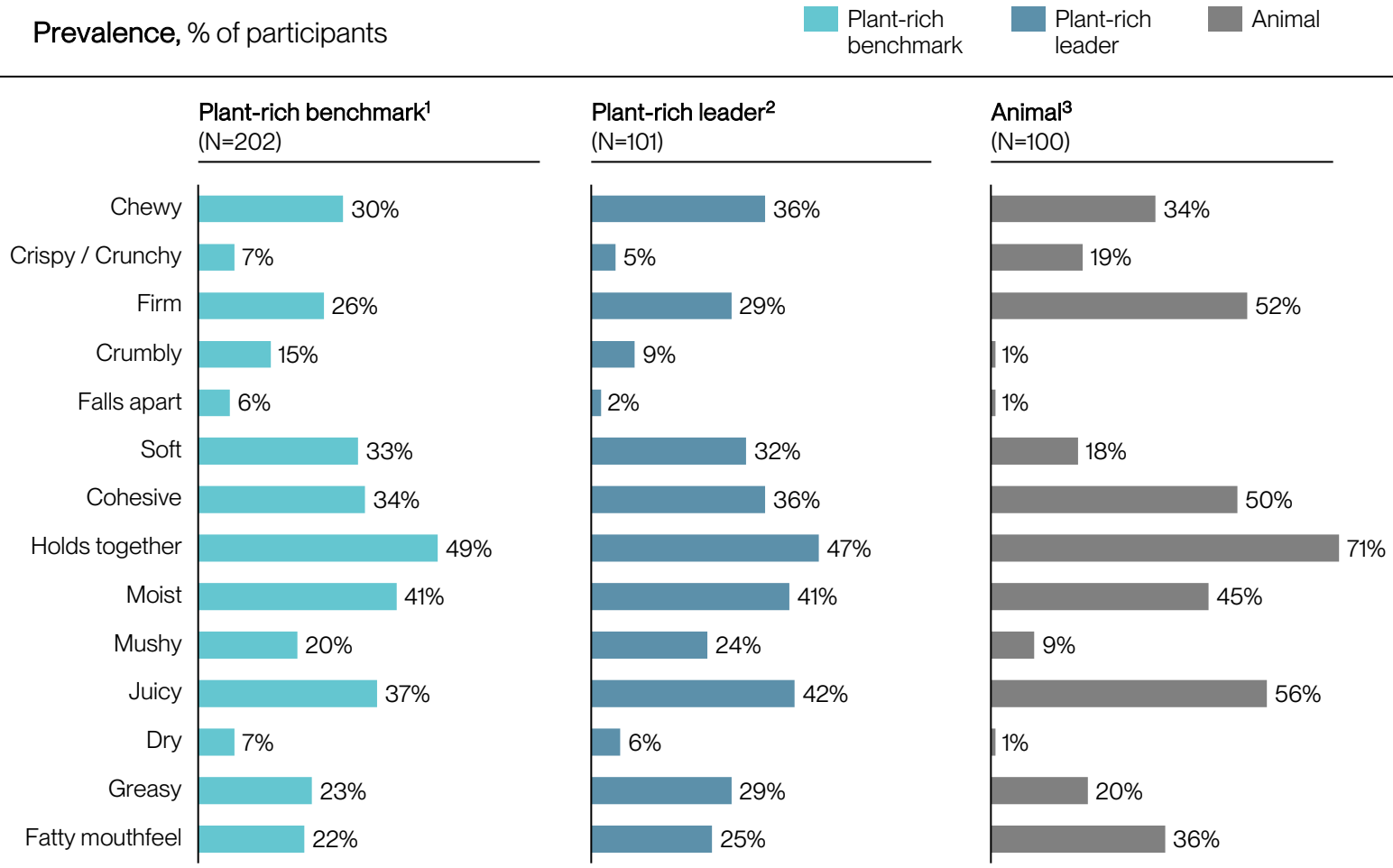
- Only 20% rated plant-rich average as having ‘fatty flavor’ (versus 40% for animal). ‘Fatty flavor’ was associated with a 0.5pt increase in liking.
- Only 52% rated plant-rich average as ‘savory’ (versus 67% for animal). ‘Savory’ was associated with a 0.6pt increase in liking.

1. Aggregated across 2 commercially available plant-rich chicken sausage products.
2. The plant-rich product with the highest mean liking of those included in this test.
3. The highest retail sales volume animal chicken sausage selected for its representativeness of the chicken sausage category.

# **Chicken Sausage:** Texture Profile

Please check all words or phrases that describe the texture of XXX.

**Prevalence,** % of participants




# Takeaways

## Plant-rich products should focus on texture that holds together

- Only 49% rated plant-rich average as 'holds together' (versus 71% for animal).

## Plant-rich products need to increase juiciness

- Just 37% rated plant-rich average as 'juicy' (versus 56% for animal).

## Plant-rich products are doing well on moistness

- 41% described plant-rich average as 'moist' (versus 45% for animal).

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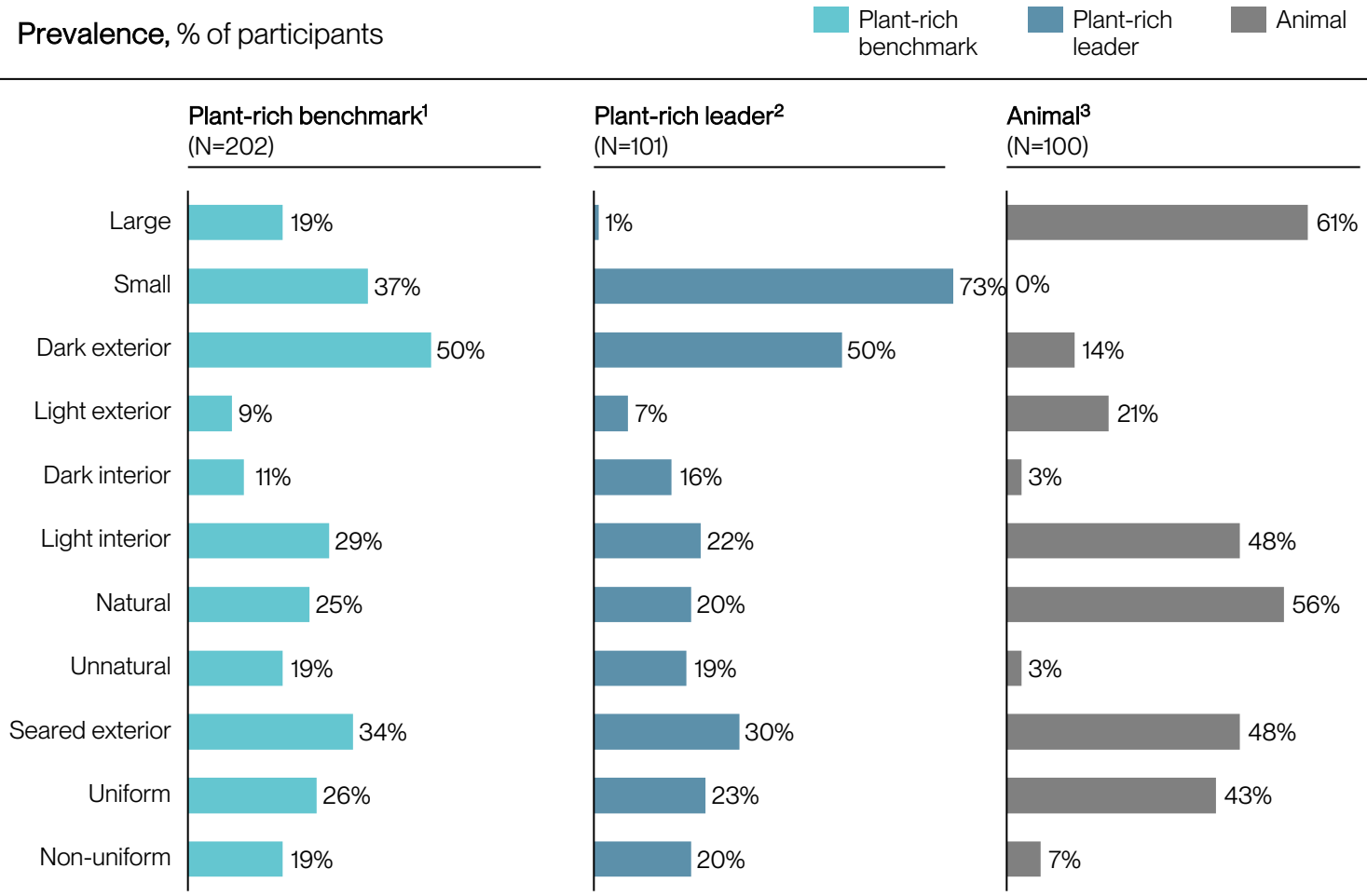
2. The plant-rich product with the highest mean liking of those included in this test.
3. The highest retail sales volume animal chicken sausage selected for its representativeness of the chicken sausage category.

# **Chicken Sausage:** Appearance Profile

Please check all words or phrases that describe the appearance of XXX.

**Prevalence,** % of participants




# Takeaways

## Plant-rich products need a more natural appearance

- 25% rated plant-rich average as ‘natural’ (versus 56% for animal). ‘Natural’ was associated with a 0.8pt increase in liking.

## Opportunity for plant-rich products to increase uniformity

- Just 26% rated plant-rich average as having a ‘uniform’ exterior (versus 43% for animal).

## Plant-rich products should have a lighter interior

- Only 29% described plant-rich average as having a ‘light exterior’ (versus 48% for animal). ‘Light exterior’ was associated with a 0.4pt increase in liking.

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2. The plant-rich product with the highest mean liking of those included in this test.
3. The highest retail sales volume animal chicken sausage selected for its representativeness of the chicken sausage category.

Category-Specific Deep Dive

# Chicken Meatball

# Chicken Meatball

## Executive summary of R&D opportunities

### Performance Overview

The average plant-rich chicken meatball outperformed plant-based and is slightly behind animal.

- **Plant-rich chicken meatballs performed better than plant-based, but not quite as well as animal** – Plant-rich leader scored 5.3pts on overall average liking (versus 4.6pts for plant-based and 5.5pts for animal).
- **Plant-rich leader differentiated against the average** – Plant-rich leader outperformed in similarity, flavor, and texture.
- **Plant-rich products outperformed plant-based across all sensory categories** – The plant-rich average scored better than plant-based across flavor, texture, and appearance.

### Top Sensory Opportunities

Opportunity for plant-rich chicken meatballs to catch up to and exceed animal by increasing firmness, cohesiveness and juiciness.

- **Plant-rich products should increase firmness** – 51% found plant-rich average to be ‘too soft’ (versus 10% for animal).
- **Plant-rich average lacks cohesiveness** – Only 59% described plant-rich average as ‘just about right’ (versus 72% for plant-rich leader and 73% for animal).
- **Plant-rich average needs to increase juiciness** – Only 32% reported plant-rich average as ‘juicy’ (versus 44% for plant-rich leader).

# Chicken Meatballs Tested

Chicken meatballs from two commercially available plant-rich brands were prepared according to manufacturer instructions using a skillet and compared against animal and plant-based chicken meatballs.

Participants were screened to exclude consumers who do not eat animal-based meat and only include those who eat meatballs at least every 1-2 months.

## Testing Environment

Participants tried the chicken meatballs at Haight St. Café in San Francisco, a restaurant environment, in order to achieve an authentic, natural experience.

## Preparation

All chicken meatballs were prepared by restaurant staff using a skillet according to manufacturer instructions.

## Dish Served

All participants were served four dishes of spaghetti and meatballs. While they ate, participants filled out a survey via mobile phone detailing their experience with each product. Products were evaluated in a randomized order.

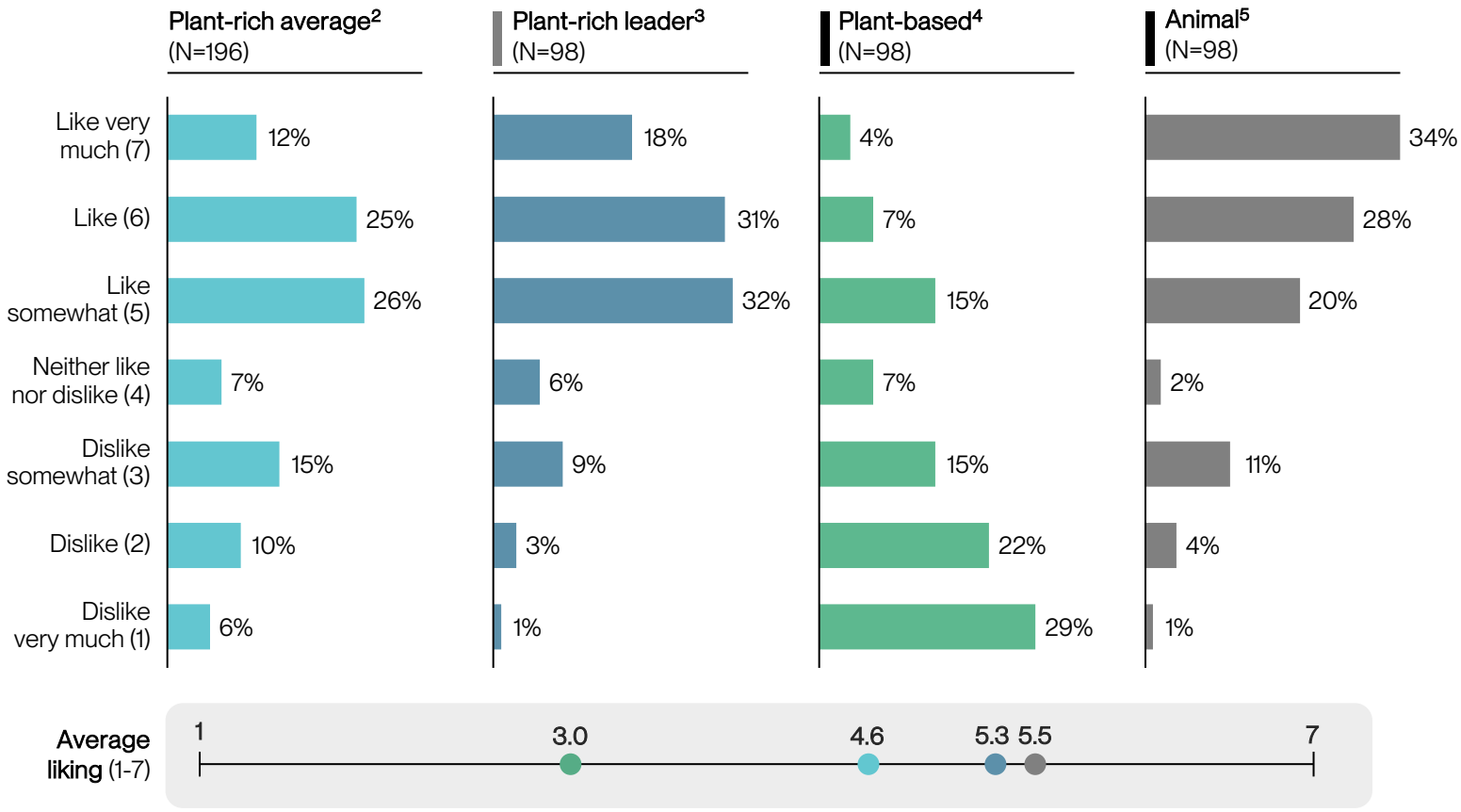
# **Chicken Meatball:** Overall Liking

How would you rate your OVERALL LIKING of chicken meatball XXX?

**Overall liking,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)




## Takeaways

### Plant-rich leader is approaching the animal benchmark

- Plant-rich leader scored 5.3 on average liking versus 5.5 for the animal.

### Plant-rich average has room to grow against the leader

- Plant-rich average scored 0.7pts behind the plant-rich leader.

### Plant-rich products strongly outperform plant-based on overall liking

- Plant-rich average performed 1.6pts better than plant-based benchmark.

1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. Aggregated across 2 commercially available plant-rich chicken meatball products.
3. The plant-rich product with the highest mean liking of those included in this test.
4. Made from commercially available plant-based ground chicken.
5. The highest retail sales volume animal chicken meatball that was available, selected for its representativeness of the animal chicken meatball category.

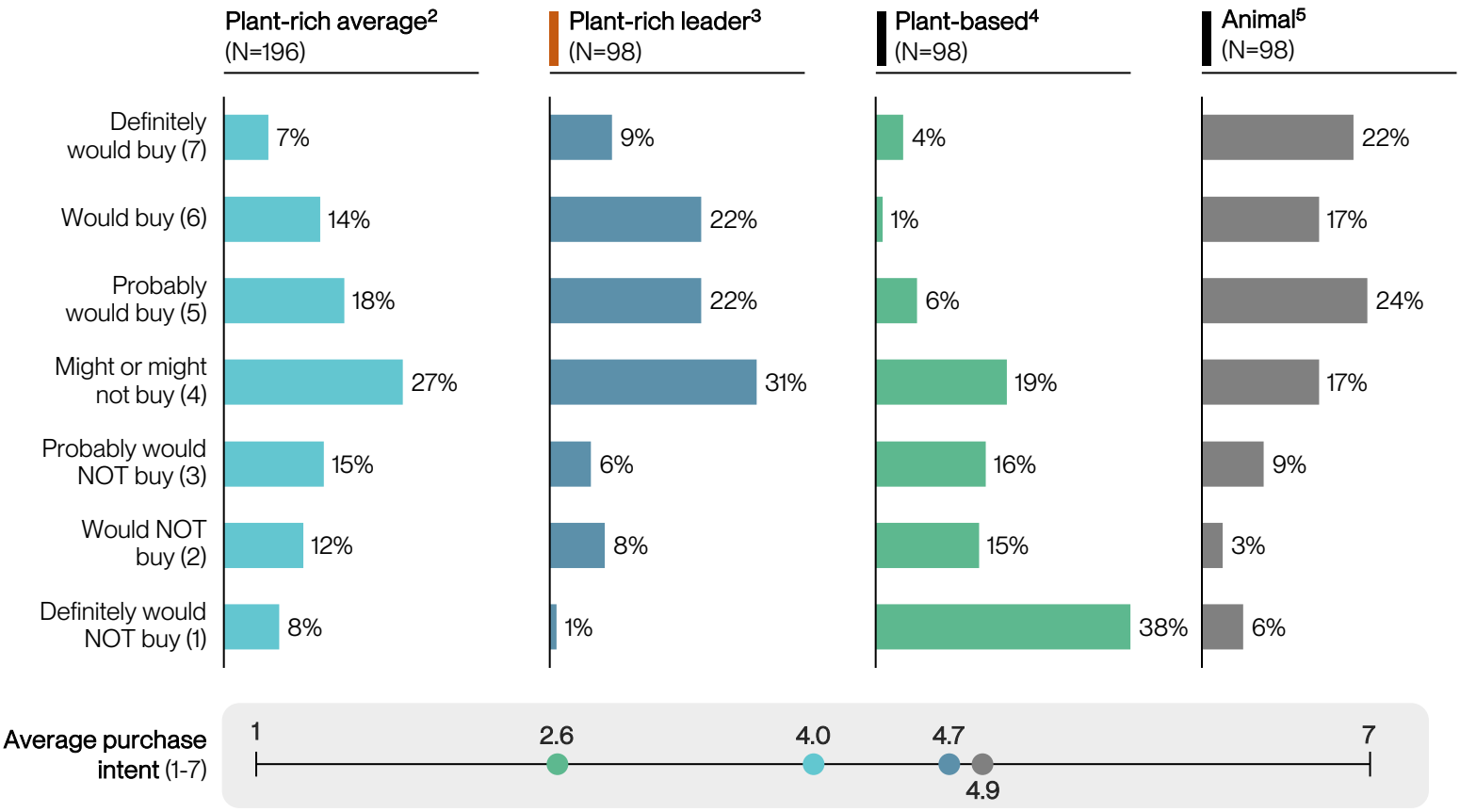
# **Chicken Meatball:** Purchase Intent

How would you rate your PURCHASE INTENT of chicken meatball XXX?

**Purchase intent,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)







# Takeaways

## Participants indicated similar purchase intent for the plant-rich and animal products

- Plant-rich leader scored 4.7pts compared to 4.9pts for the animal benchmark.

## Plant-rich products strongly outperformed plant-based

- Plant-rich average scored 4.0 on average purchase intent versus 2.6pts for plant-based.

## Plant-rich leader had higher purchase intent than average

- 31% rated plant-rich leader 'would buy' or 'definitely would buy' (versus 21% for plant-rich average).

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3. The plant-rich product with the highest mean liking of those included in this test.
4. Made from commercially available plant-based ground chicken.
5. The highest retail sales volume animal chicken meatball that was available, selected for its representativeness of the animal chicken meatball category.

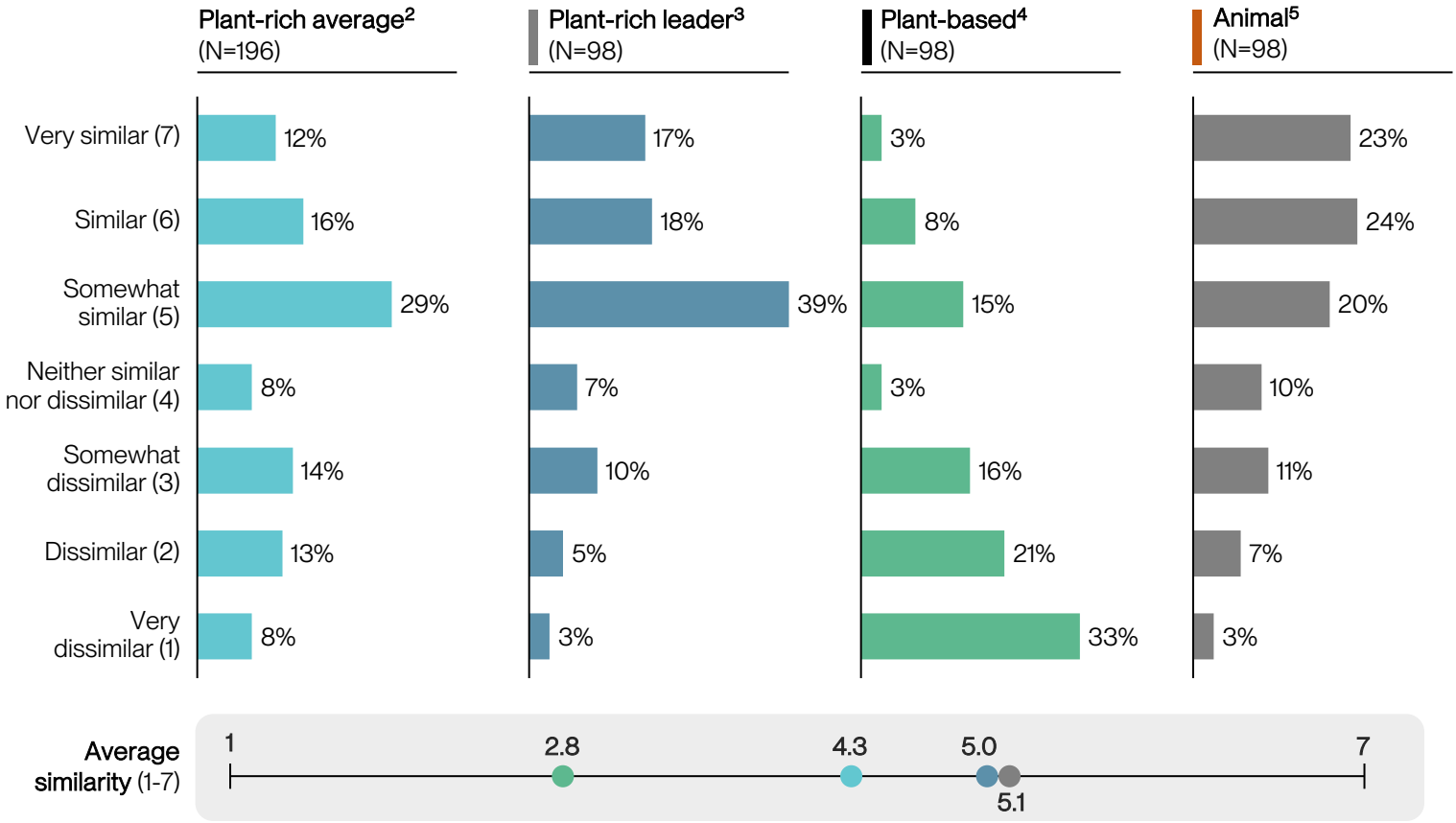
# **Chicken Meatball:** Similarity

How would you rate your SIMILARITY of XXX to a typical chicken meatball?

**Similarity,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)







# Takeaways

## Plant-rich leader performed comparably to the animal on similarity

- Plant-rich leader scored 5.0 on similarity to a typical chicken meatball versus 5.1 for the animal product.

## Opportunity for plant-rich products to be more similar to a typical chicken meatball

- Plant-rich leader outperformed the plant-rich average on similarity (p<0.1).

## Plant-rich products outperformed the plant-based benchmark

- Plant-rich average scored 4.3pts versus 2.8pts for the plant-based product.

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4. Made from commercially available plant-based ground chicken.
5. The highest retail sales volume animal chicken meatball that was available, selected for its representativeness of the animal chicken meatball category.

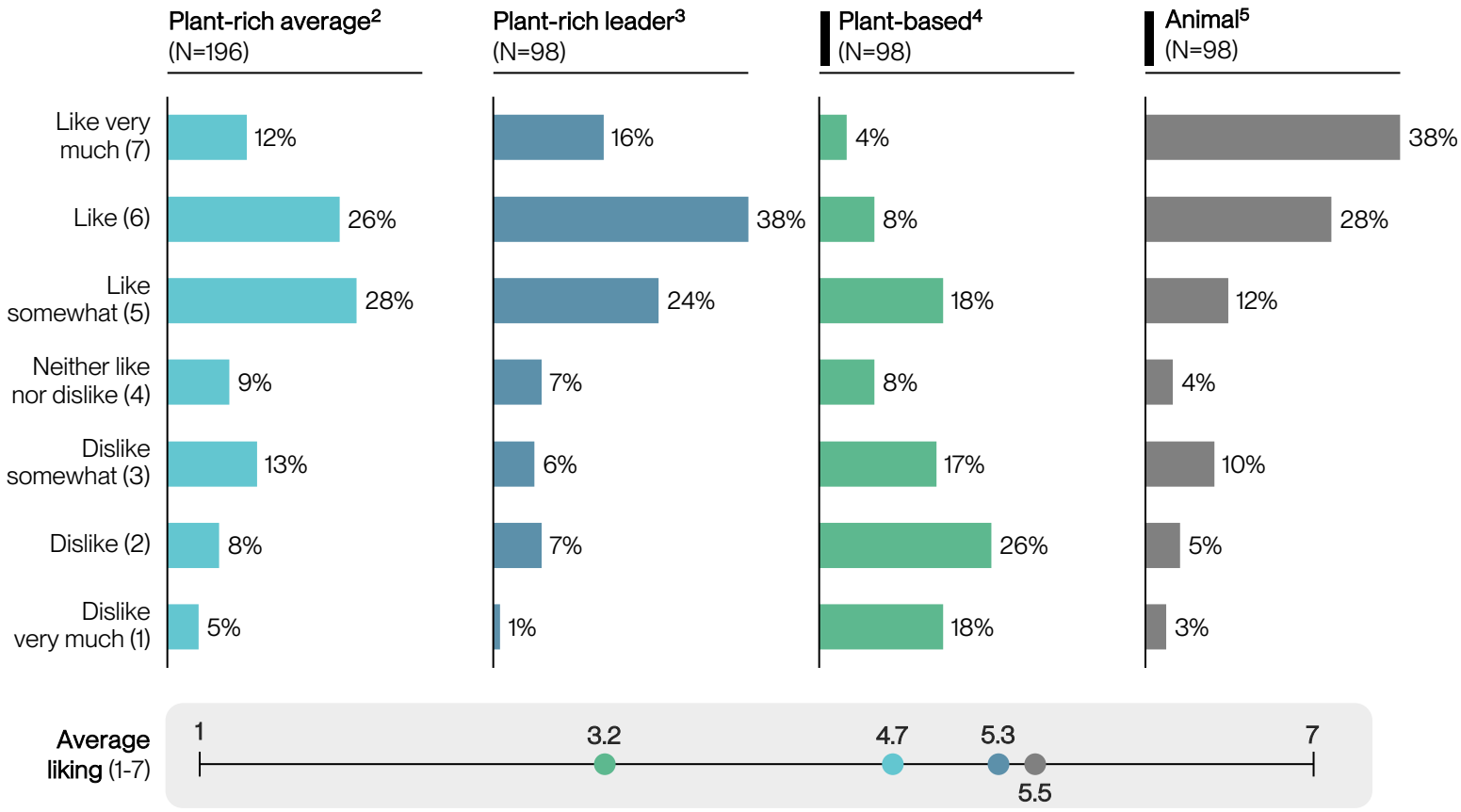
# **Chicken Meatball:** Flavor

How would you rate your FLAVOR of chicken meatball XXX?

**Flavor,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)




# Takeaways

## Plant-rich leader performed similarly to the animal benchmark

- 5.3pts average liking for the plant-rich leader versus 5.5pts for the animal.

## Plant-rich average behind plant-rich leader on flavor

- 54% rated the plant-rich leader 'like very much' or 'like' (versus just 48% for the plant-rich average).

## Flavor ratings were correlated with overall liking ratings

- Average scores on flavor were similar for all products to their scores on overall liking.

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4. Made from commercially available plant-based ground chicken.
5. The highest retail sales volume animal chicken meatball that was available, selected for its representativeness of the animal chicken meatball category.

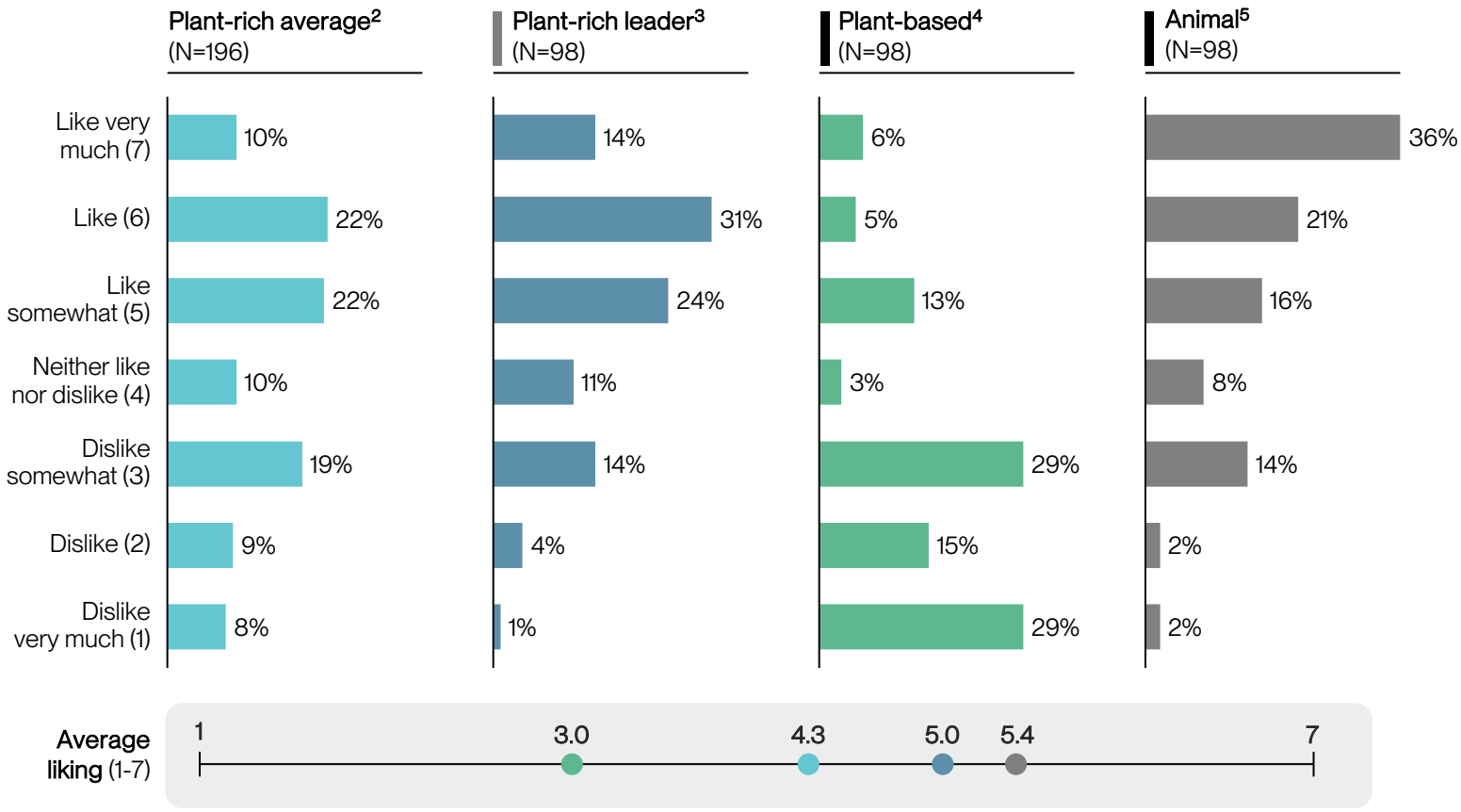
# **Chicken Meatball:** Texture

How would you rate your TEXTURE of chicken meatball `XXX?

**Texture,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)







# Takeaways

## Plant-rich average significantly outperformed plant-based

- Plant-rich average liking (4.3pts) was higher than plant-based (3.0pts).

## Plant-rich leader behind animal on texture

- 44% of participants rated the texture of the plant-rich leader 'like' or 'like very much' (versus 57% for animal).

## Opportunity for plant-rich average to catch up to leader

- Only 32% of participants liked the texture of plant-rich average (versus 45% for plant-rich leader).

1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. Aggregated across 2 commercially available plant-rich chicken meatball products.
3. The plant-rich product with the highest mean liking of those included in this test.
4. Made from commercially available plant-based ground chicken.
5. The highest retail sales volume animal chicken meatball that was available, selected for its representativeness of the animal chicken meatball category.

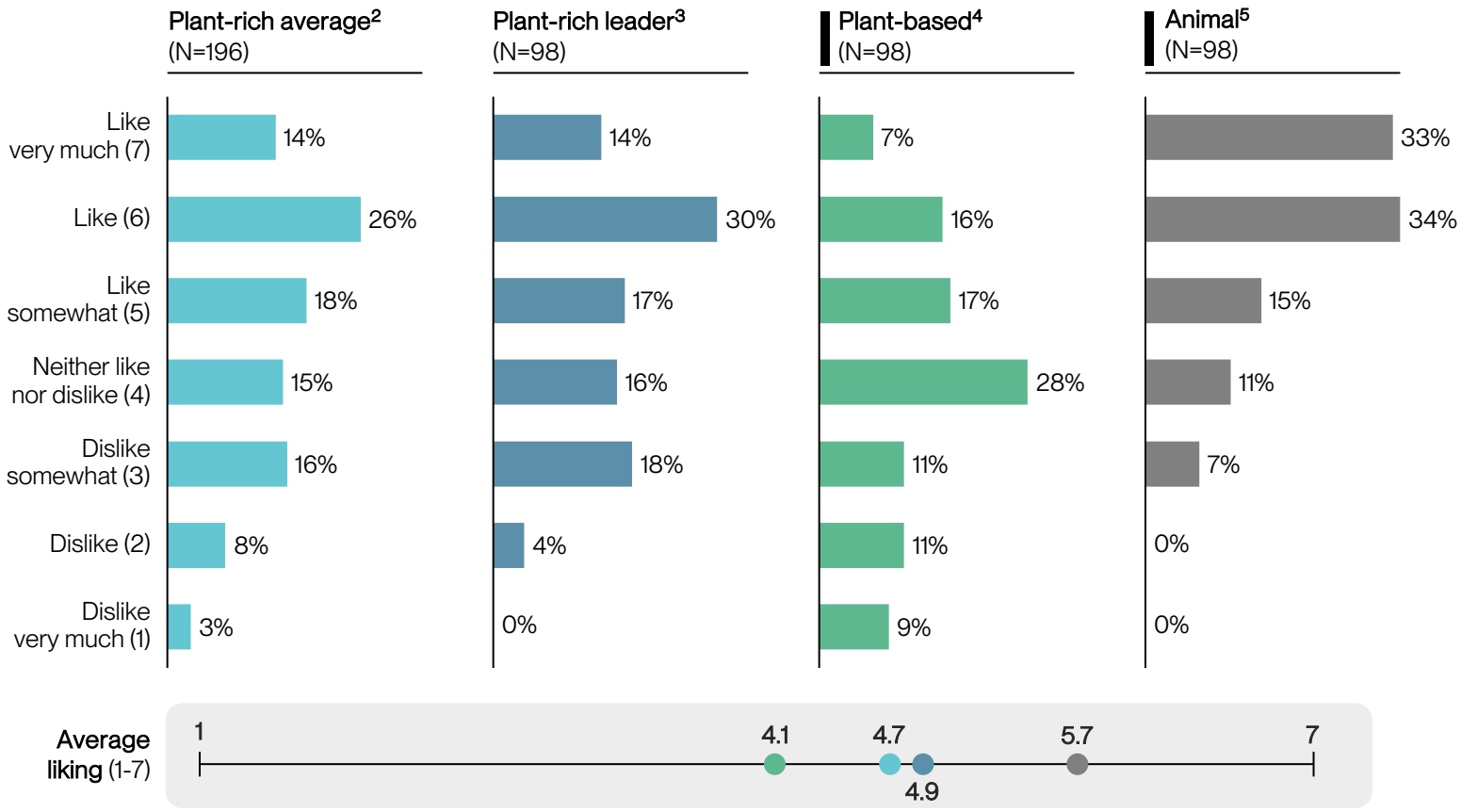
# **Chicken Meatball:** Appearance

How would you rate your APPEARANCE of chicken meatball XXX?

**Appearance,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)







# Takeaways

## Plant-rich average close to the plant-rich leader on appearance

- Plant-rich average scored 4.7pts versus 4.9pts for plant-rich leader.

## Participants like the appearance of animal-based products more than plant-rich

- Only 44% rated plant-rich leader appearance 'like' or 'like very much' (versus 67% for animal).

## Plant-rich average appearance better than plant-based

- Plant-rich average score of 4.7pts was extremely significantly better than plant-based's 4.1pts.

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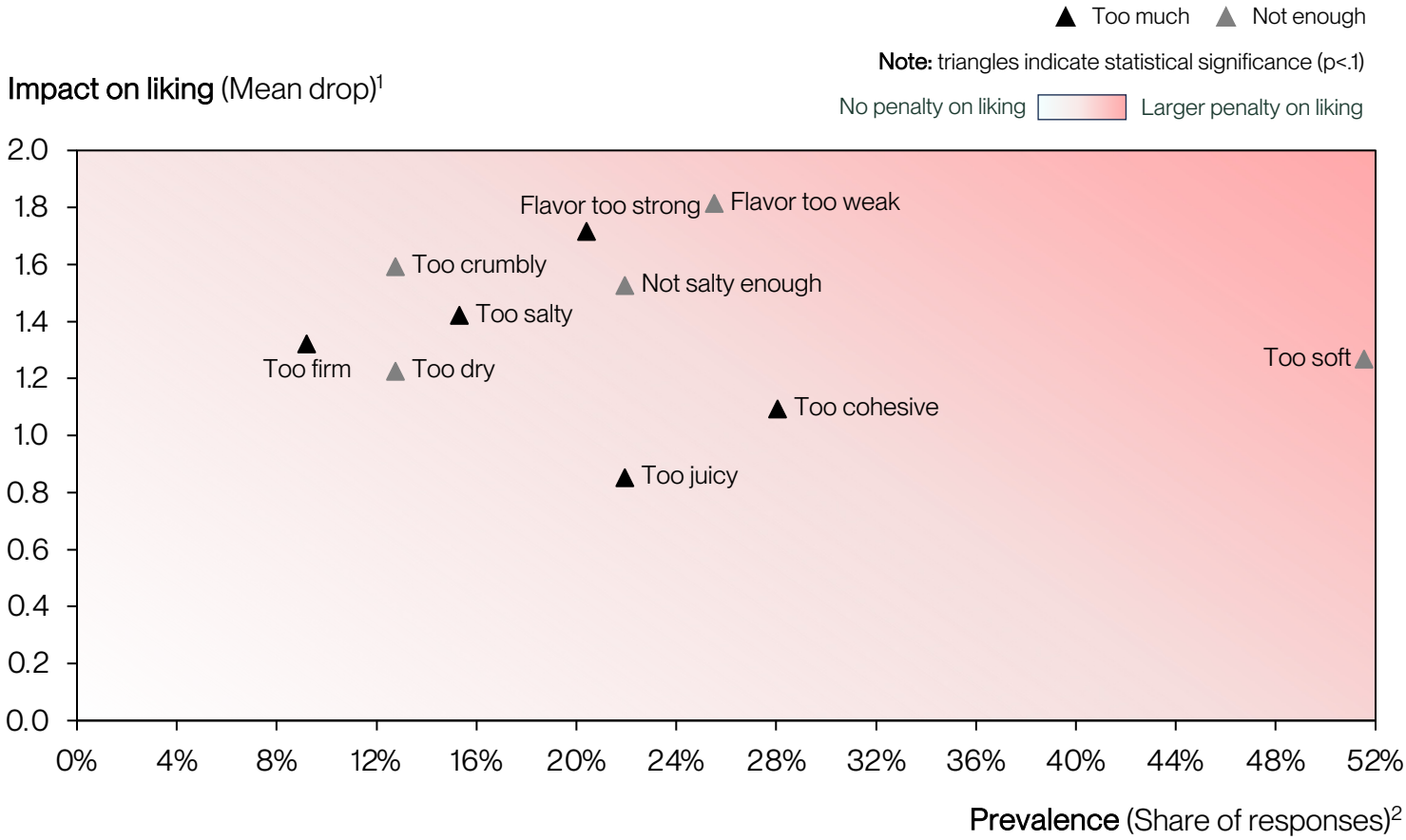
4. Made from commercially available plant-based ground chicken.
5. The highest retail sales volume animal chicken meatball that was available, selected for its representativeness of the animal chicken meatball category.

# **Chicken Meatball:** Top R&D Opportunities

Prioritization framework for identifying attributes with large impacts on liking

Penalty analysis using responses on 'just-about-right' questions, Mean drop and Prevalence




# Takeaways

## Plant-rich products should focus on increasing firmness

- 52% of participants reported meatballs being 'too soft' with a mean drop of 1.2pts.

## Plant-rich products should prioritize fine-tuning flavor intensity and saltiness

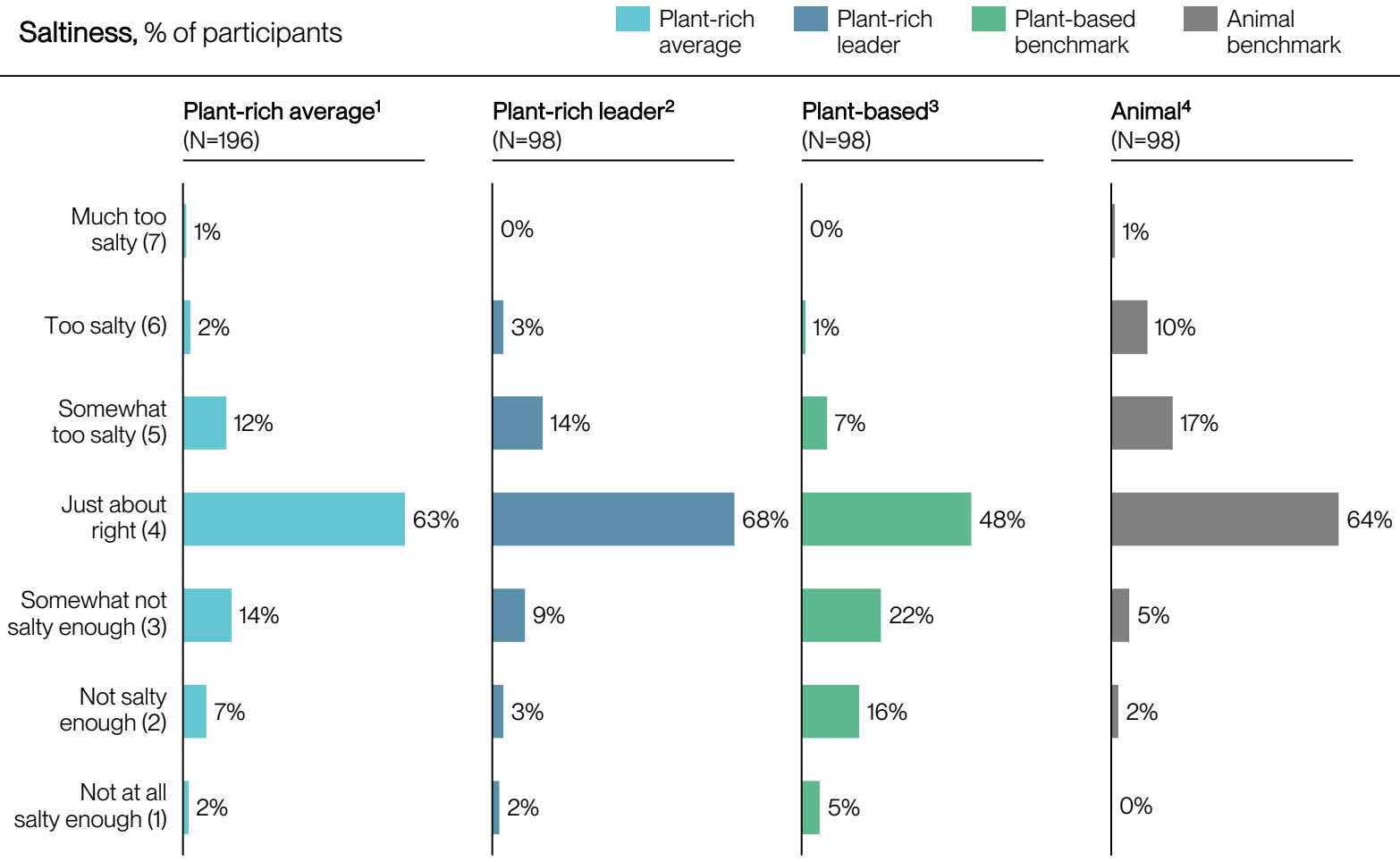
- Flavor intensity had the biggest impact on liking ('flavor too strong' and 'flavor too weak' were both associated with declines in liking of 1.8pts).
- Incorrect saltiness levels also had large impacts on liking ('not salty enough' and 'too salty' both resulted in declines in liking of ~1.5pts).

1. The average change in overall liking on 7pt scale for products for all responses using the relevant attribute as a descriptor compared to the mean liking for all products rated 'just about right' on that attribute. Calculated as Mean Liking (JAR) minus Mean Liking (descriptor used).
2. Share of responses for all plant-rich products in this category in each direction for each attribute.

# **Chicken Meatball:** Saltiness

How would you rate your SALTINESS of chicken meatball XXX?

**Saltiness,** % of participants




## Takeaways

### Plant-rich products matched animal in saltiness liking and outscored the plant-based benchmark

- 63% found the plant-rich average to be 'just about right' in saltiness, versus 64% for animal and 48% for plant-based.

### Plant-rich products can slightly increase saltiness

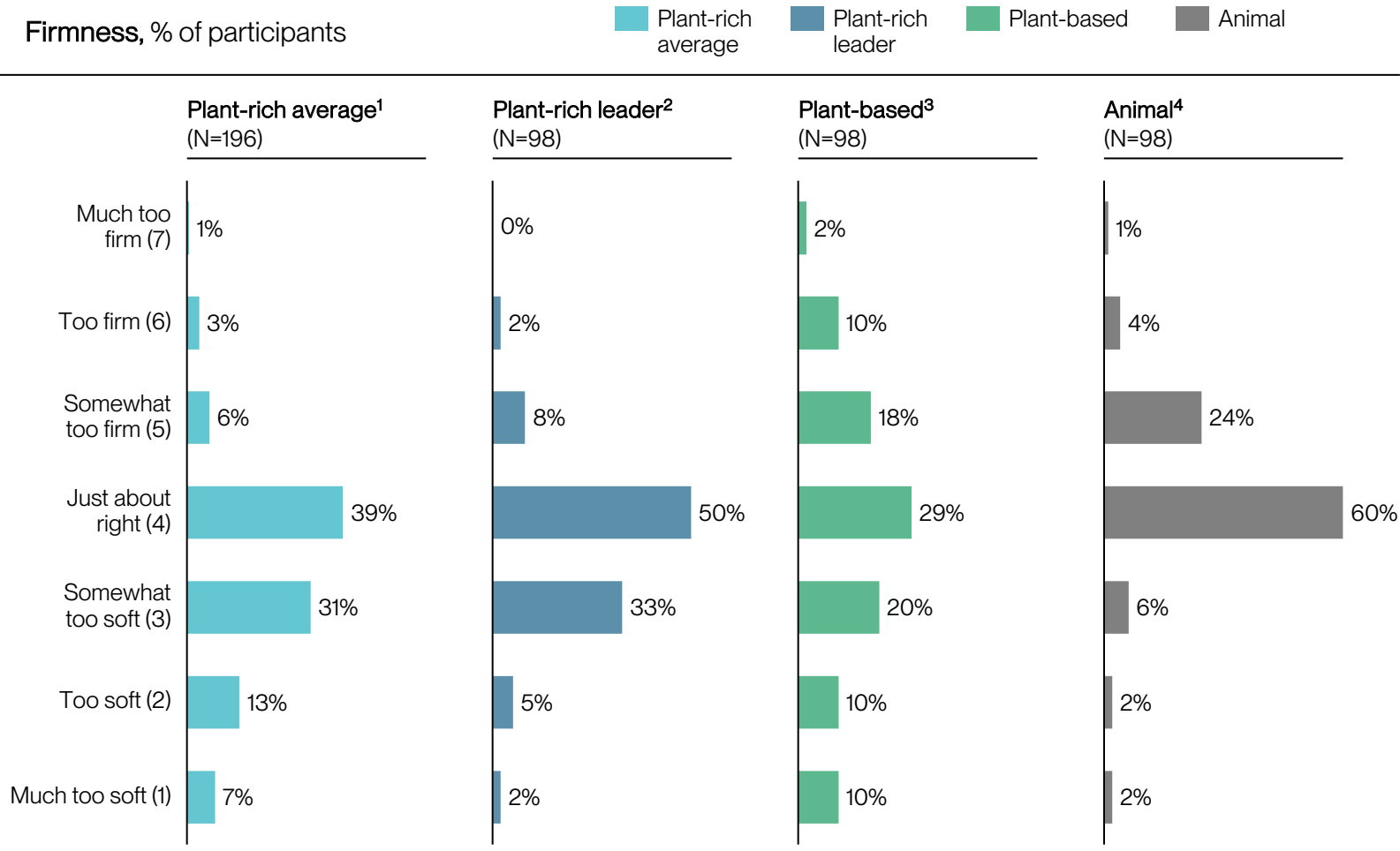
- 23% found the plant-rich average to be 'not salty enough' versus 15% for 'too salty.'

1. Aggregated across 2 commercially available plant-rich chicken meatball products.
2. The plant-rich product with the highest mean liking of those included in this test.
3. Made from commercially available plant-based ground chicken.
4. The highest retail sales volume animal chicken meatball that was available, selected for its representativeness of the animal chicken meatball category.

# **Chicken Meatball:** Firmness

How would you rate your FIRMNESS of chicken meatball XXX?

**Firmness,** % of participants




# Takeaways

## Plant-rich products should increase firmness

- 51% found plant-rich average to be 'too soft,' versus 10% for animal.

## Opportunity for plant-rich average to catch up to plant-rich leader on firmness

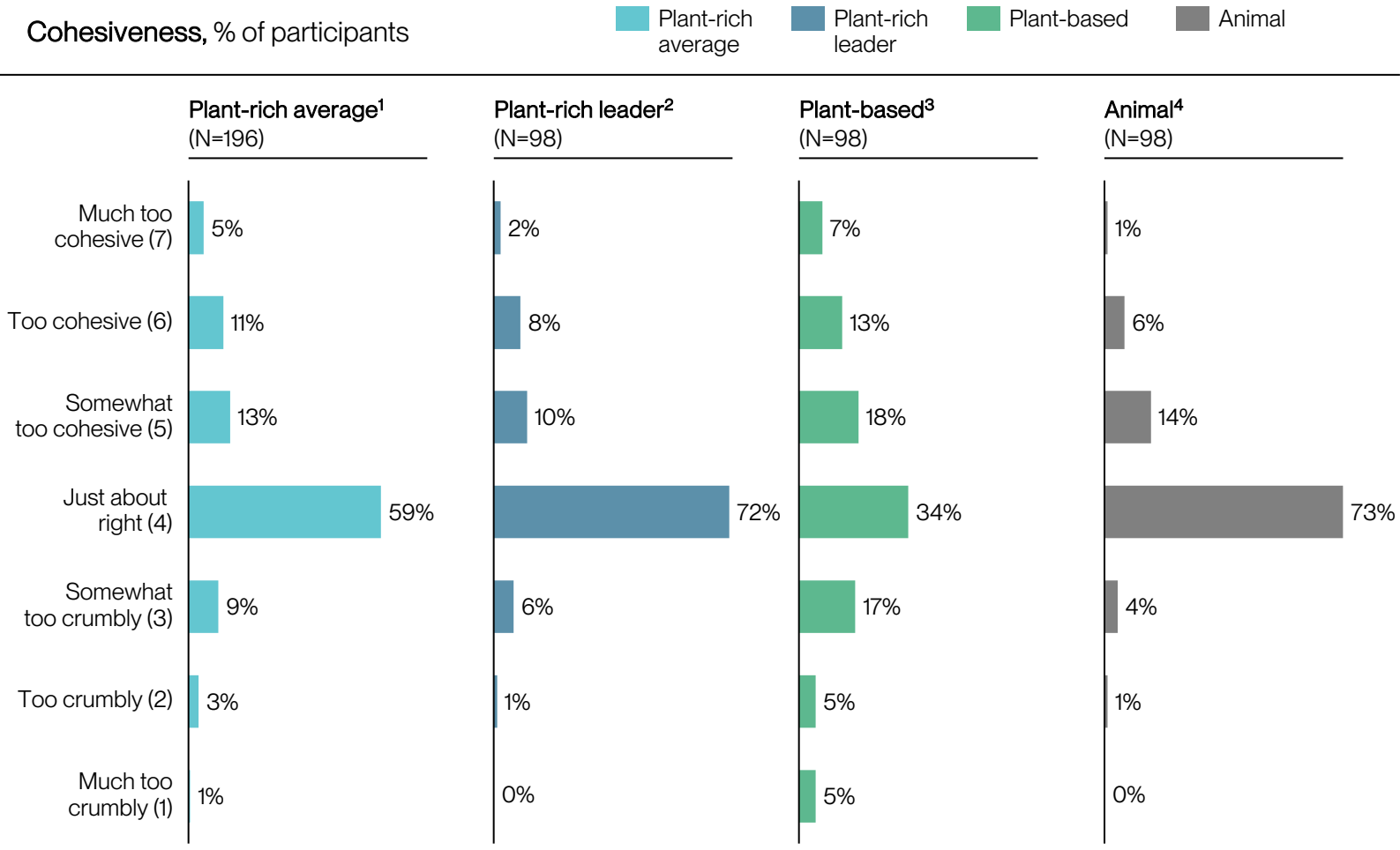
- Only 39% found plant-rich average to be 'just about right' firmness, versus 50% for plant-rich leader.

1. Aggregated across 2 commercially available plant-rich chicken meatball products.
2. The plant-rich product with the highest mean liking of those included in this test.
3. Made from commercially available plant-based ground chicken.
4. The highest retail sales volume animal chicken meatball that was available, selected for its representativeness of the animal chicken meatball category.

# **Chicken Meatball:** Cohesiveness

How would you rate your COHESIVENESS of chicken meatball XXX?

**Cohesiveness,** % of participants




## Takeaways

### Plant-rich leader equally as cohesive as animal benchmark

- 72% rated the plant-rich leader 'just about right' in cohesiveness versus 73% for the animal.

### Plant-rich products strongly outperform plant-based on cohesion

- 59% rated the plant-rich average as 'just about right' versus 34% for plant-based.

### Plant-rich products more likely to be too cohesive than too crumbly

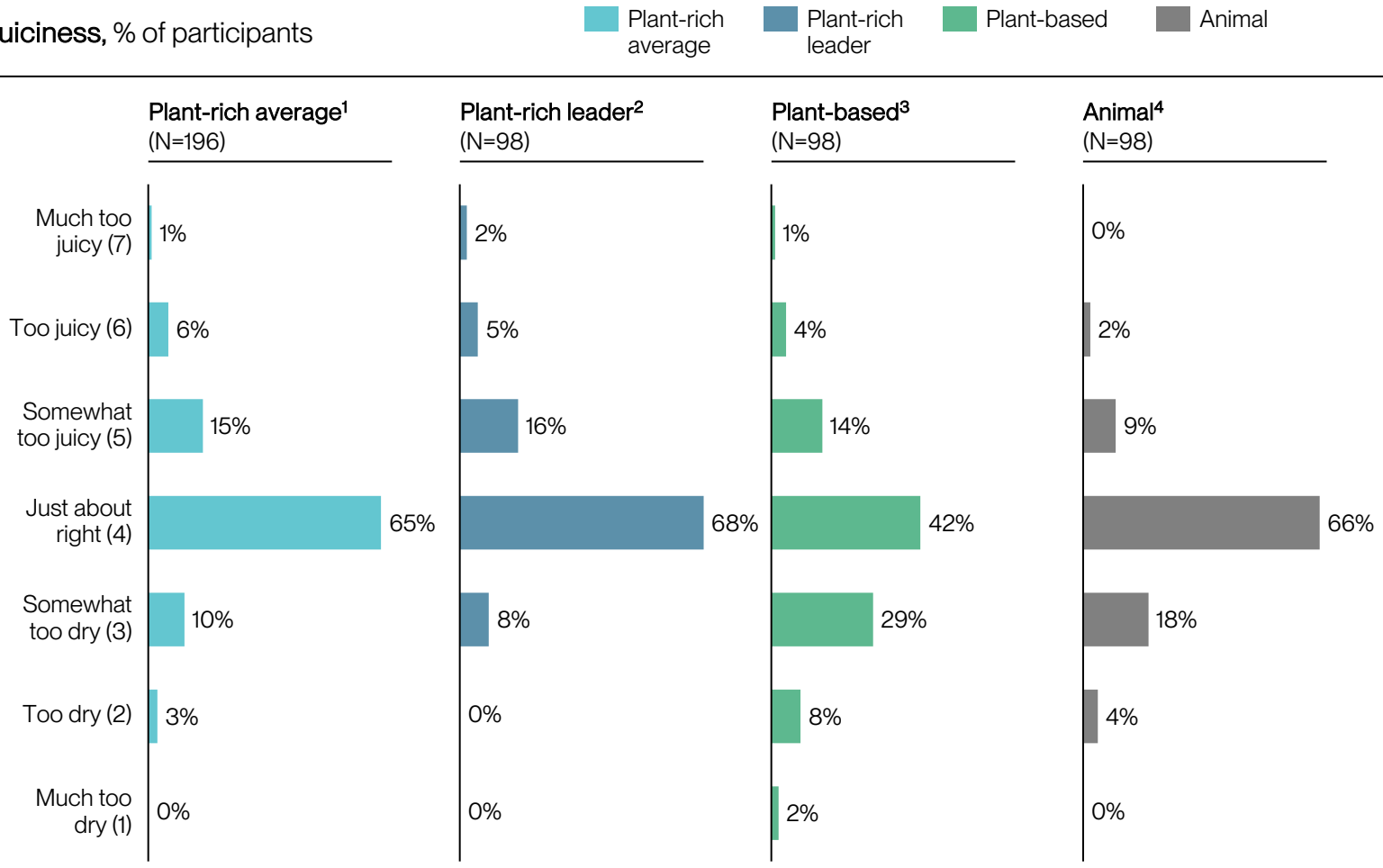
- 29% rated plant-rich average 'too cohesive' versus 13% for 'too crumbly.'

1. Aggregated across 2 commercially available plant-rich chicken meatball products.
2. The plant-rich product with the highest mean liking of those included in this test.
3. Made from commercially available plant-based ground chicken.
4. The highest retail sales volume animal chicken meatball that was available, selected for its representativeness of the animal chicken meatball category.

# **Chicken Meatball:** Juiciness

How would you rate your JUICINESS of chicken meatball XXX?

**Juiciness,** % of participants




## Takeaways

### Plant-rich leader slightly ahead of animal on juiciness

- 68% rated plant-rich leader 'just about right' on juiciness versus 66% for animal.

### Plant-rich products tended to be too juicy

- 22% rated the plant-rich average as 'too juicy.'

### Plant-rich average juiciness is close to plant-rich leader

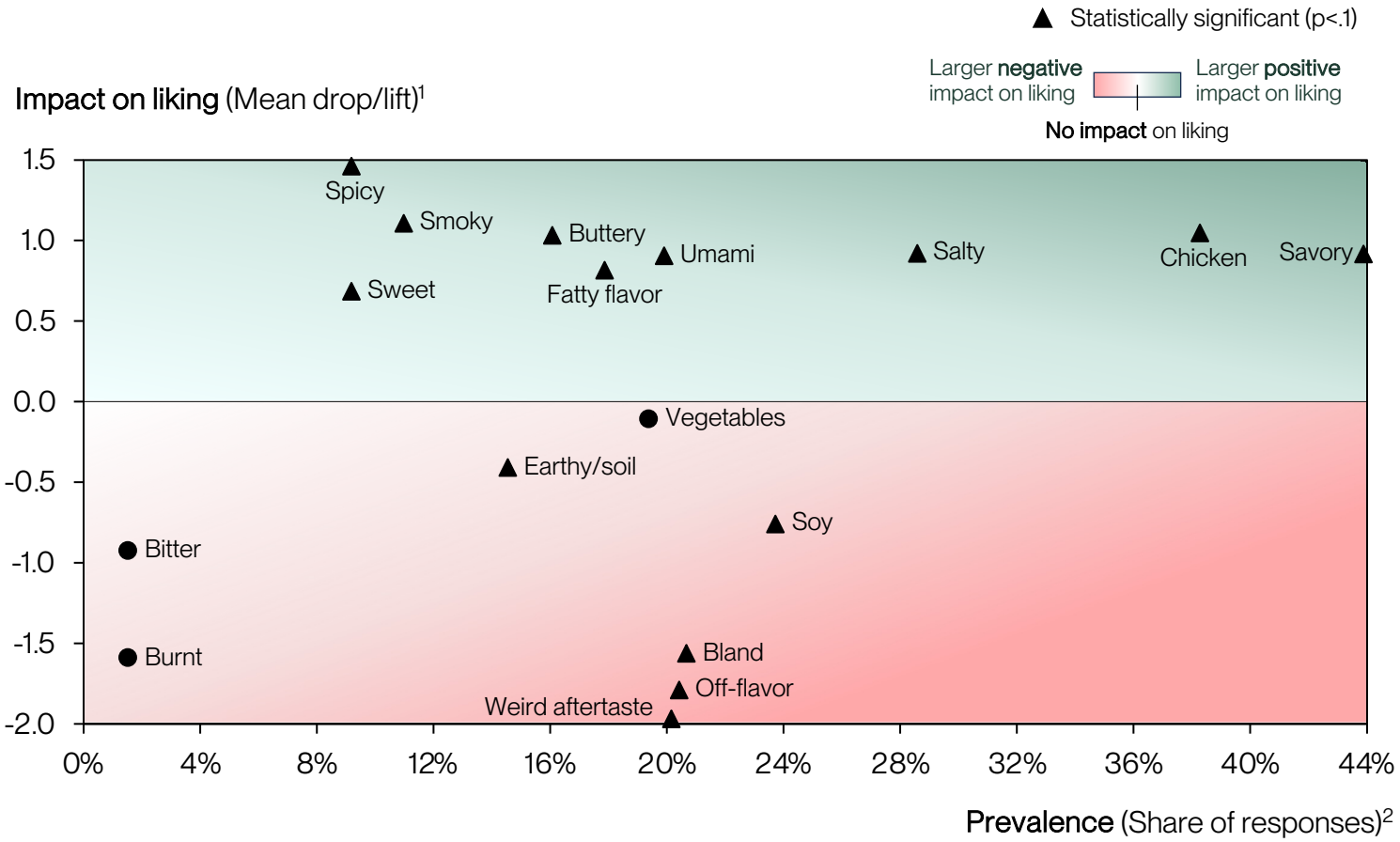
- 65% rated the plant-rich average 'just about right' versus 68% for plant-rich leader.

1. Aggregated across 2 commercially available plant-rich chicken meatball products.
2. The plant-rich product with the highest mean liking of those included in this test.
3. Made from commercially available plant-based ground chicken.
4. The highest retail sales volume animal chicken meatball that was available, selected for its representativeness of the animal chicken meatball category.

# **Chicken Meatball:** Top Flavor R&D Opportunities

Prioritization framework for identifying attributes with large impacts on liking

**Penalty analysis on flavor using check-all-that-apply responses,** Mean drop/lift and Prevalence




## Takeaways

### Plant-rich products should focus on savory and chicken flavors

- Almost half of participants reported 'chicken' or 'savory' flavors, with a lift in liking of ~1pt.

### Bland, off-flavor, and weird aftertaste caused the largest drops in liking

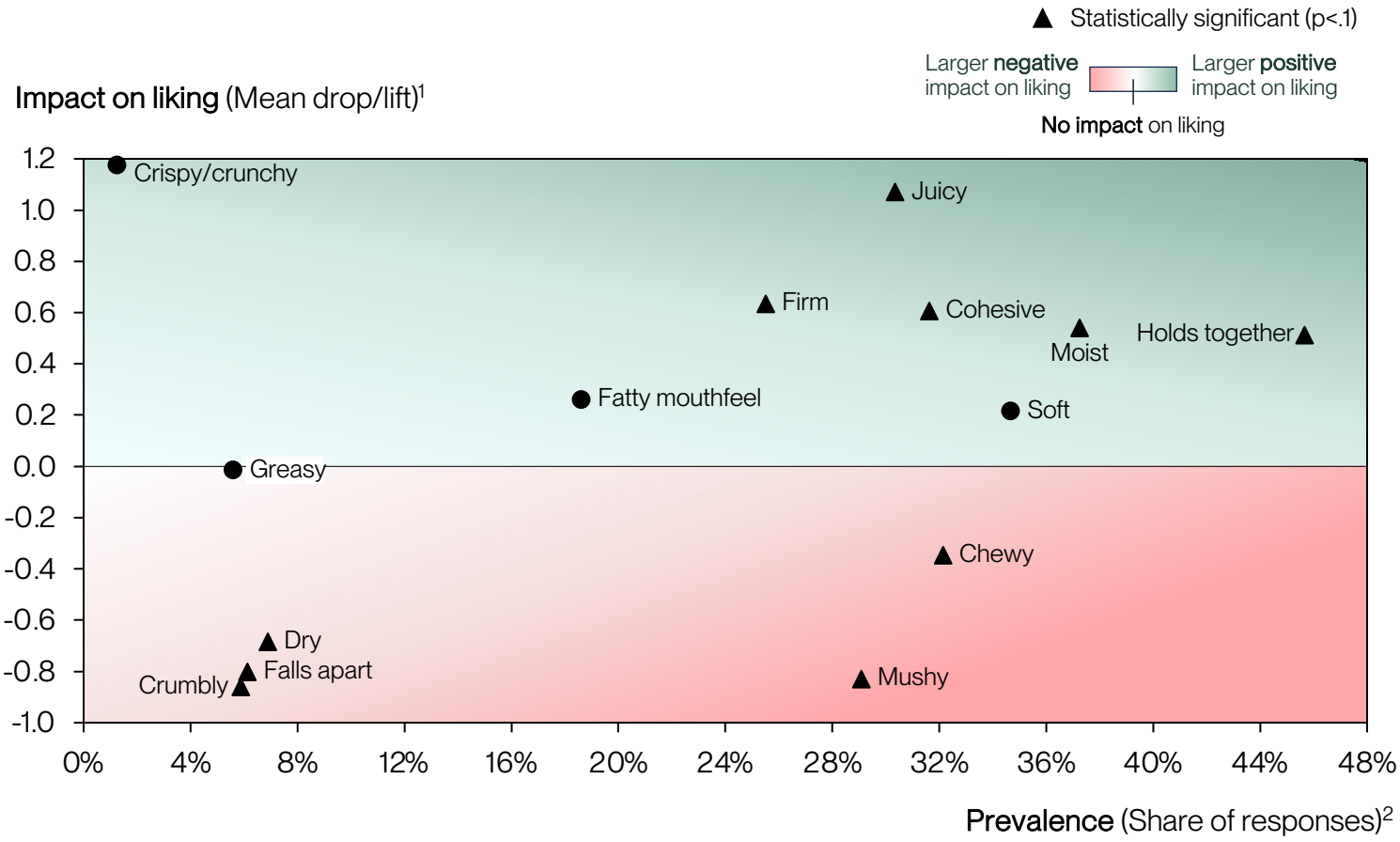
- Each was associated with a 1.5-2pt drop in liking.

1. The average change in overall liking on 7pt scale for products for all responses using the relevant attribute as a descriptor compared to the mean liking for all products tested in this category. Calculated as mean liking of products with the associated response minus mean liking of all products for all responses.
2. Share of responses for all products in this category (including animal, plant-rich, and plant) in each direction for each attribute.

# **Chicken Meatball:** Top Texture R&D Opportunities

Prioritization framework for identifying attributes with large impacts on liking

**Penalty analysis on texture using check-all-that-apply responses,** Mean drop/lift and Prevalence




## Takeaways

### Juiciness should be targeted in product development

- 'Juicy' was associated with an increase in liking of 1-1.1pts.

### Mushiness hurt liking the most

- Associated with an average drop of ~0.8pts.

### Participants preferred meatballs that held together

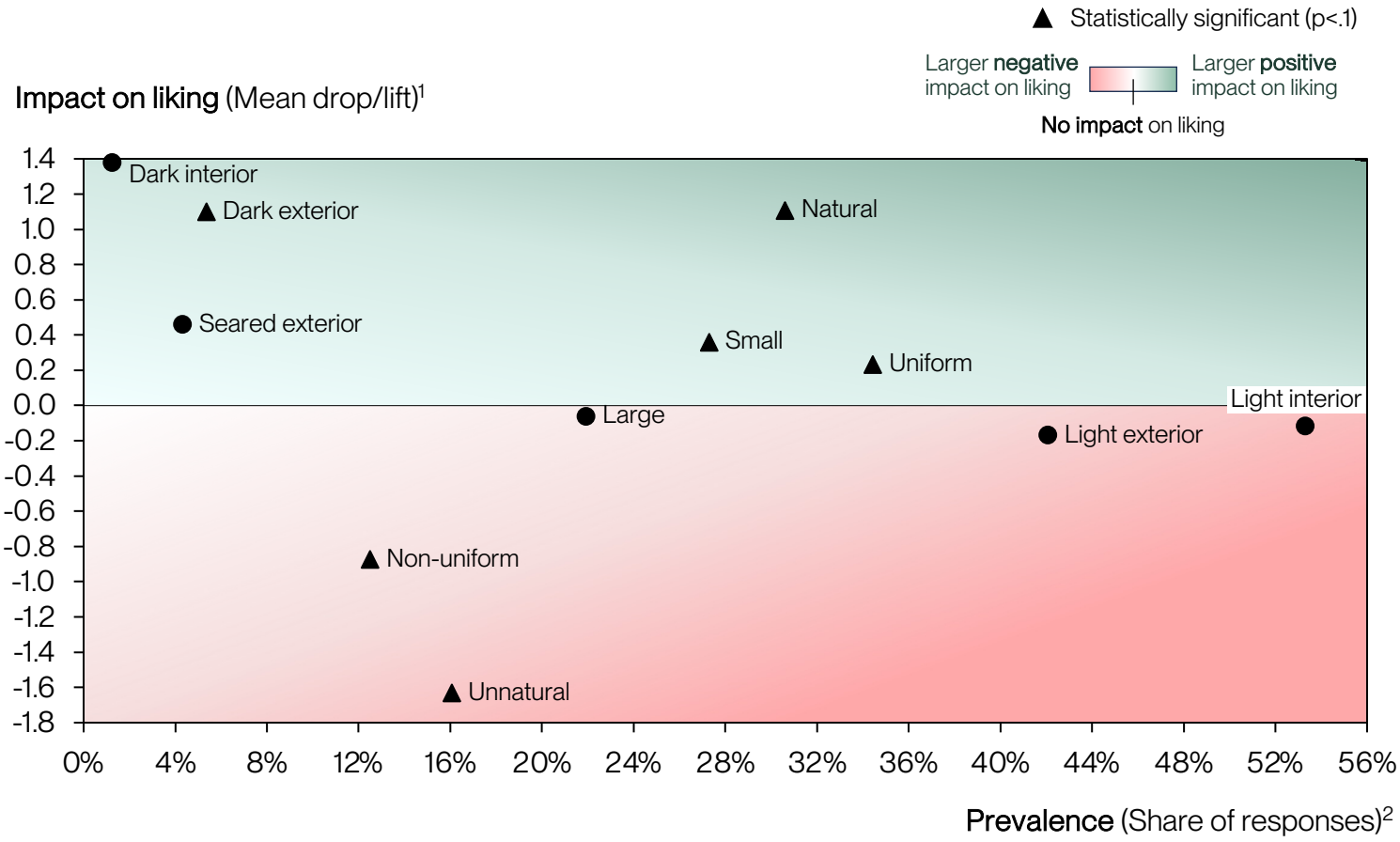
- Almost half of respondents reported that the meatballs held together, which was associated with a lift of 0.6pts.

1. The average change in overall liking on 7pt scale for products for all responses using the relevant attribute as a descriptor compared to the mean liking for all products tested in this category. Calculated as mean liking of products with the associated response minus mean liking of all products for all responses.
2. Share of responses for all products in this category (including animal, plant-rich, and plant) in each direction for each attribute.

# **Chicken Meatball:** Top Appearance R&D Opportunities

Prioritization framework for identifying attributes with large impacts on liking

**Penalty analysis on appearance using check-all-that-apply responses,** Mean drop/lift and Prevalence




## Takeaways

### Natural appearance was significantly preferred to unnatural

- 'Natural' appearance associated with a 1.2pt increase in liking (versus a 1.6pt drop in liking for 'unnatural' appearance).

### Uniform meatballs had a better impact to liking than non-uniform

- Uniformity associated with a 0.2pt increase in liking (versus a 0.8pt drop for 'non-uniform').

### Interior color can be deprioritized

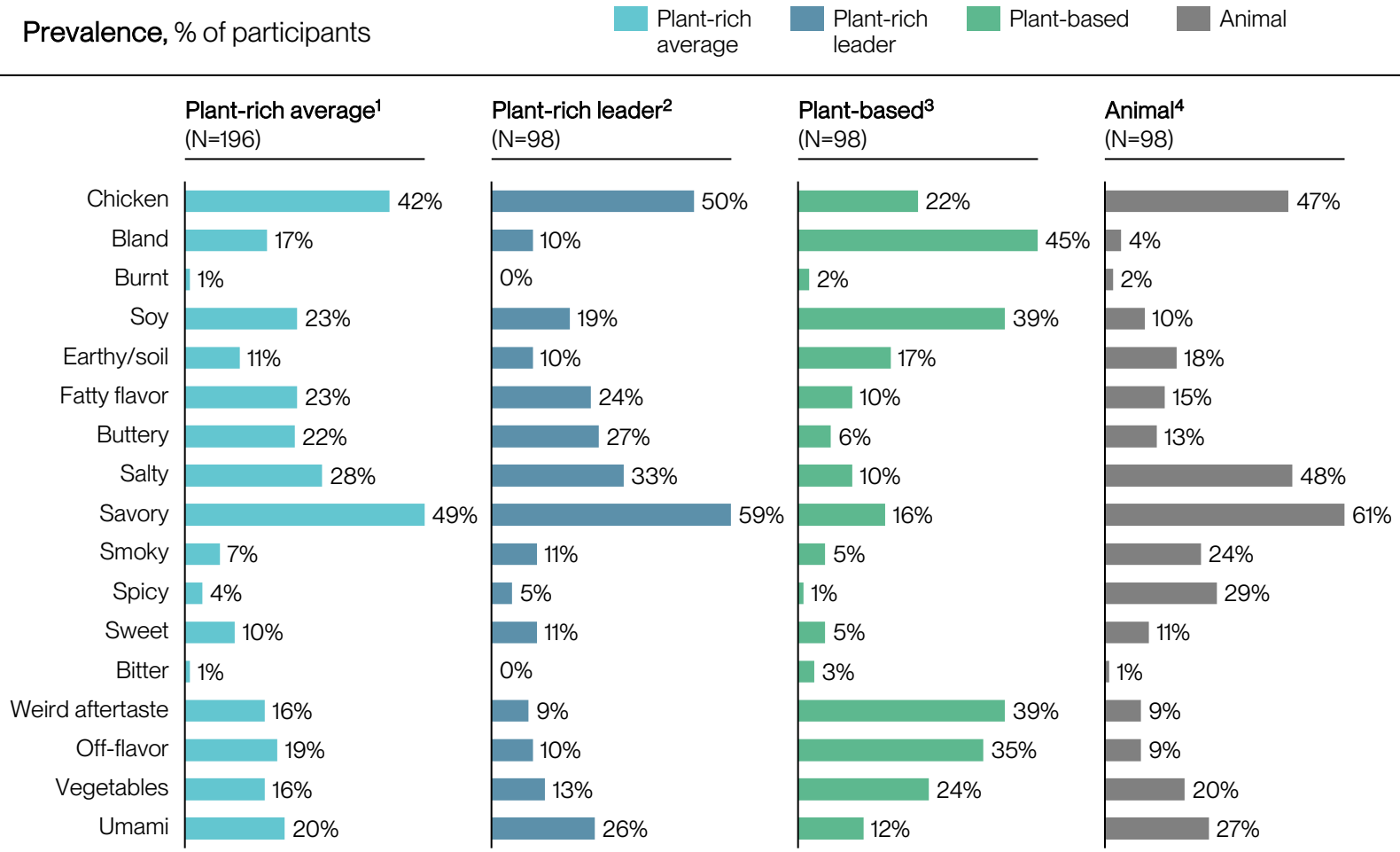
- Though 'dark interior' had a better impact to liking than 'light interior,' neither was statistically significant.

1. The average change in overall liking on 7pt scale for products for all responses using the relevant attribute as a descriptor compared to the mean liking for all products tested in this category. Calculated as mean liking of products with the associated response minus mean liking of all products for all responses.
2. Share of responses for all products in this category (including animal, plant-rich, and plant) in each direction for each attribute.

# **Chicken Meatball:** Flavor Profile

Please check all words or phrases that describe the flavor of XXX.

**Prevalence,** % of participants




## Takeaways

### Opportunity for plant-rich products to increase spiciness

- Spiciness had the biggest positive impact on flavor liking (+1.5pts) but was only reported by 4% of participants when describing the plant-rich average.

### Plant-rich products are successfully capturing chicken flavor

- 50% rated the plant-rich leader as having ‘chicken’ flavor versus 47% for the animal.

### Plant-rich products beat plant-based by avoiding negative flavors

- ‘Bland,’ ‘off-flavor,’ and ‘weird aftertaste’ were reported by 16-19% for the plant-rich average versus 35-45% for plant-based.

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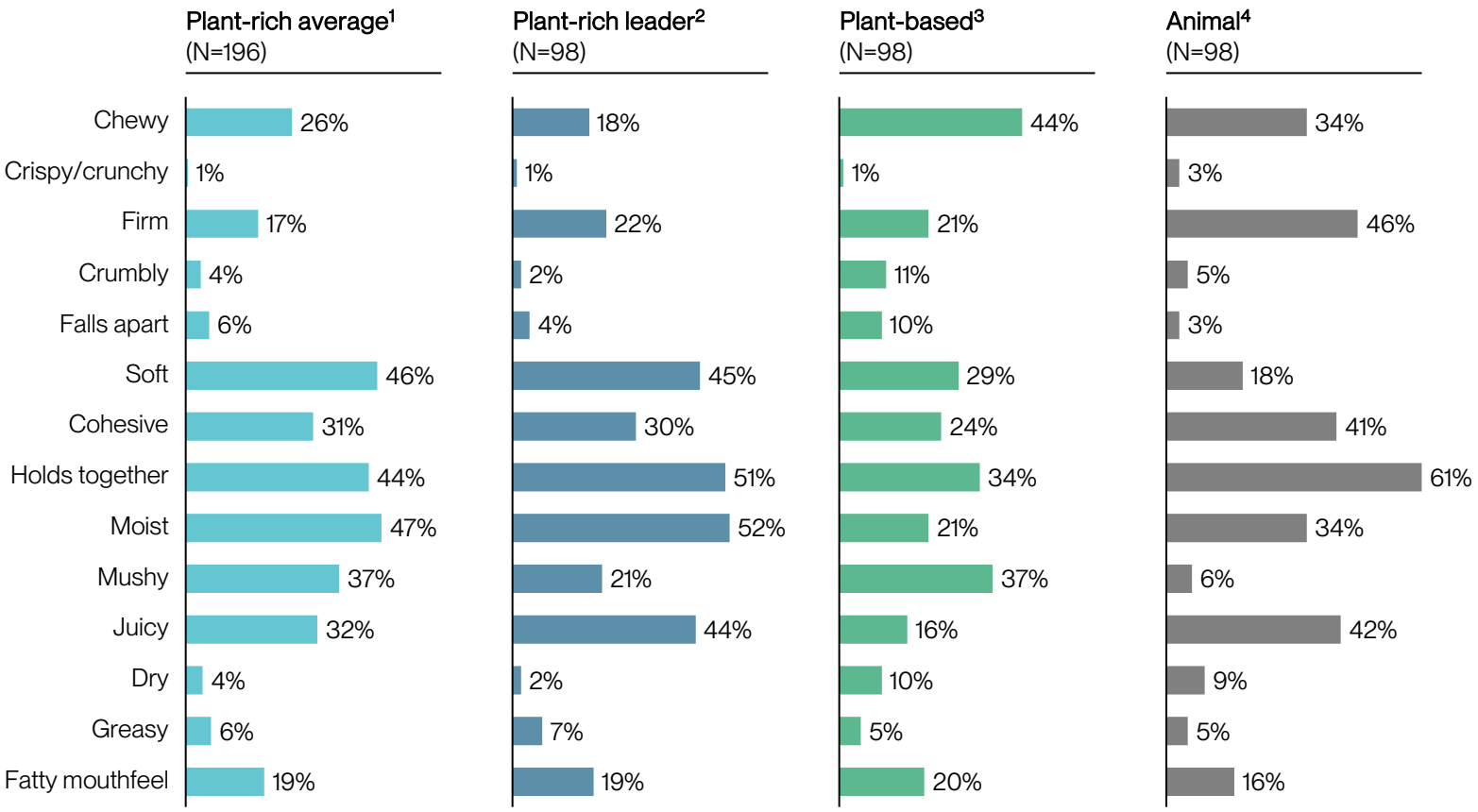
2. The plant-rich product with the highest mean liking of those included in this test.
3. Made from commercially available plant-based ground chicken.
4. The highest retail sales volume animal chicken meatball that was available, selected for its representativeness of the animal chicken meatball category.

# **Chicken Meatball:** Texture Profile

Please check all words or phrases that describe the texture of XXX.

**Prevalence,** % of participants




# Takeaways

## Plant-rich leader slightly outperformed animal on juiciness

- 44% reported plant-rich leader as 'juicy' versus 42% for animal.

## Plant-rich products ahead of plant-based on key flavor attributes

- Plant-rich average performed better than plant-based on 'juicy,' 'holds together,' 'cohesive,' and 'moist,' all positively associated with overall liking.

## Opportunity for plant-rich average to catch up to leader on texture

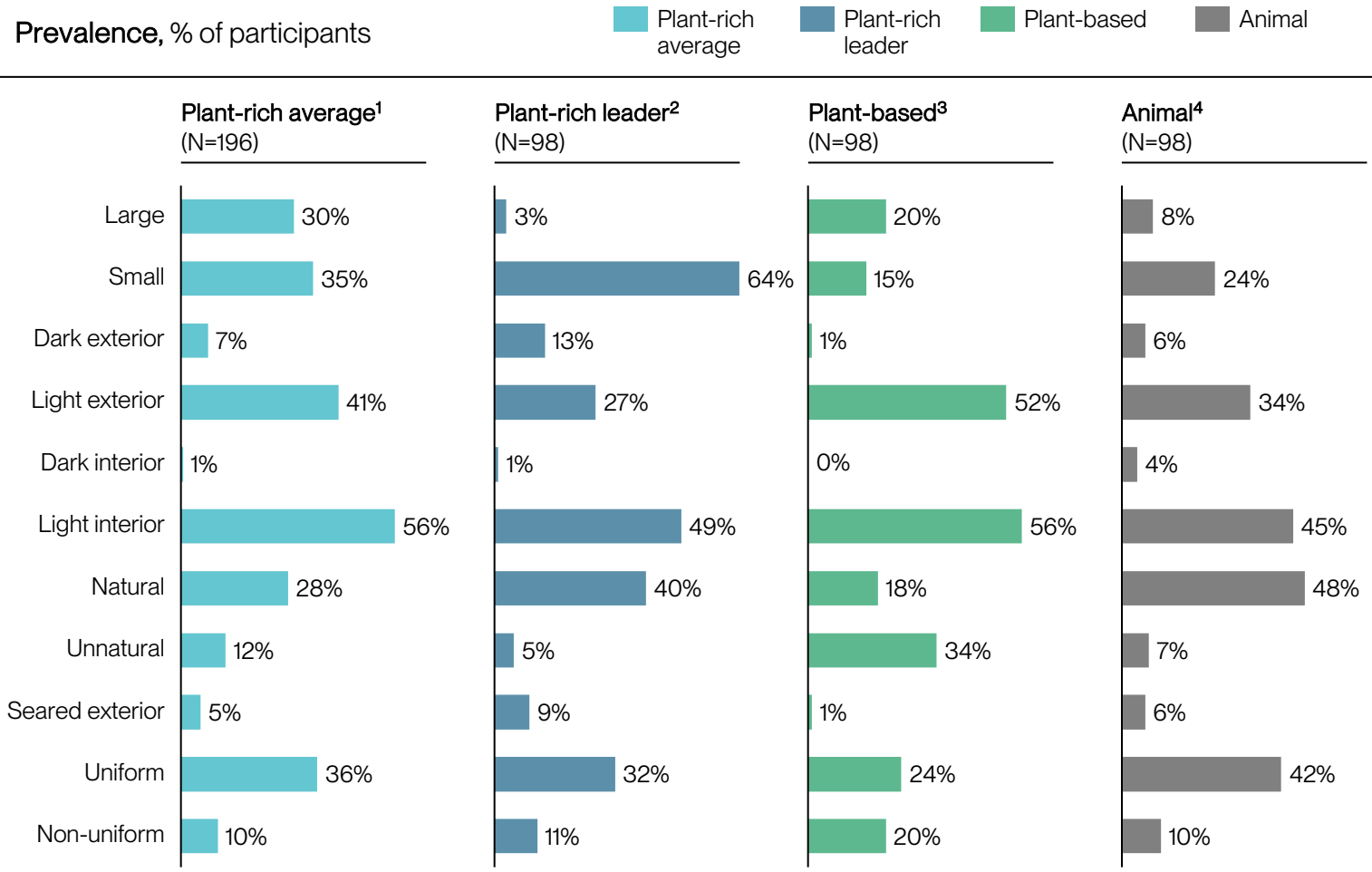
- Only 32% reported plant-rich average as 'juicy,' and 44% said it 'held together' (versus 44% and 51% for plant-rich leader, respectively).

1. Aggregated across 2 commercially available plant-rich chicken meatball products.
2. The plant-rich product with the highest mean liking of those included in this test.
3. Made from commercially available plant-based ground chicken.
4. The highest retail sales volume animal chicken meatball that was available, selected for its representativeness of the animal chicken meatball category.

# **Chicken Meatball:** Appearance Profile

Please check all words or phrases that describe the appearance of XXX.

**Prevalence,** % of participants




## Takeaways

### Opportunity for plant-rich products to look more natural

- 40% mentioned ‘natural’ for plant-rich leader versus 28% for plant-rich average.
- 12% mentioned ‘unnatural’ for plant-rich average versus just 5% for plant-rich leader.

### Plant-rich products outperformed plant-based on key attributes

- 28% mentioned ‘natural’ and 36% mentioned ‘uniform’ for plant-rich average versus just 18% and 24% respectively for plant-based.

1. Aggregated across 2 commercially available plant-rich chicken meatball products.
2. The plant-rich product with the highest mean liking of those included in this test.
3. Made from commercially available plant-based ground chicken.
4. The highest retail sales volume animal chicken meatball that was available, selected for its representativeness of the animal chicken meatball category.

Category-Specific Deep Dive

# Chicken Nugget

# Chicken Nugget

## Executive summary of R&D opportunities

### Performance Overview

The average plant-rich chicken nugget performs similarly to animal and plant-based with the plant-rich leader outperforming both benchmarks.

- **Plant-rich leader outperforms animal** – Average liking was 5.5pts (versus 5.1pts for animal), driven by strong performance in flavor, texture, appearance, and breading.
- **Plant-rich average performs comparably to animal and plant-based** – 51% rated plant-rich average 'like' or 'like very much' (versus 47% for animal and plant-based, respectively).

### Top Sensory Opportunities

Plant-rich chicken nuggets can improve further by increasing fatty flavor, juiciness, and firmness.

- **Plant-rich products should increase fatty flavor** – Only 12% described plant-rich average as having 'fatty flavor' (versus 32% for animal). 'Fatty flavor' was associated with a 0.4pt increase in liking.
- **Prioritize increasing juiciness** – Only 20% rated plant-rich leader as 'juicy' (versus 48% for animal).
- **Opportunity for plant-rich products to increase firmness** – Plant-rich products tended to be 'too soft' rather than 'too firm.'

# Chicken Nuggets Tested

Chicken nuggets from two commercially available plant-rich chicken nugget brands were prepared according to manufacturer instructions using a deep fryer and compared against animal and plant-based chicken nuggets.

Participants were screened to exclude consumers who do not eat animal-based meat and only include those who eat chicken nuggets at least every 1-2 months.

## Testing Environment

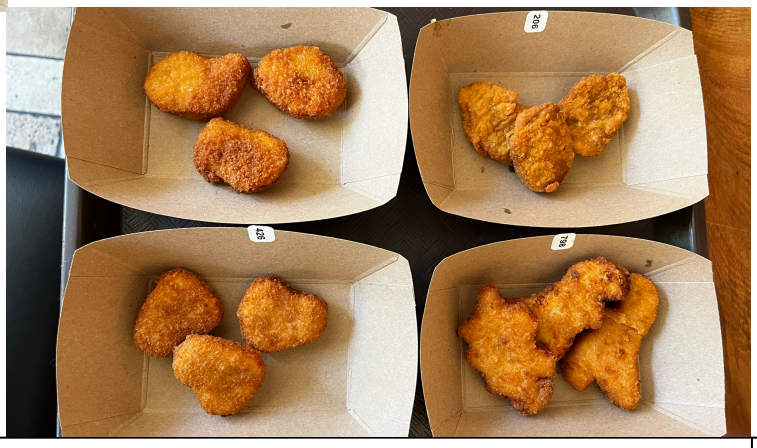
Participants experienced the chicken nuggets at the Haight St. Cafe in San Francisco, a restaurant environment, in order to achieve an authentic, natural experience.

## Preparation

All chicken nuggets were prepared by restaurant staff using a deep fryer according to manufacturer instructions. Participants were allowed to add condiments to keep the experience natural but were required to be consistent in their application across nuggets.

## Dish Served

All participants were served three nuggets in trays and filled out a survey while they ate via mobile phone detailing their experience with each product. Products were evaluated in a randomized order.

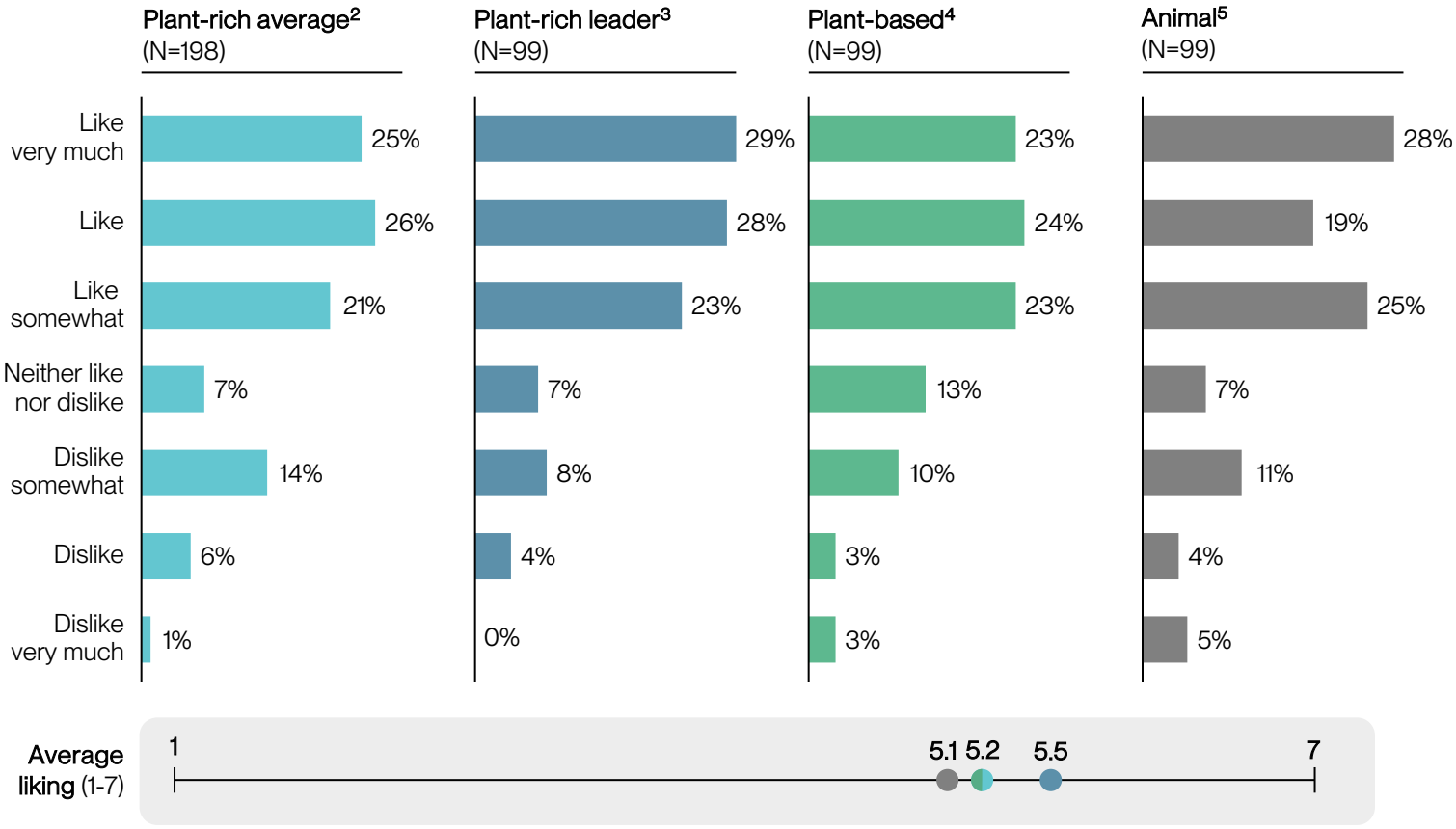


# **Chicken Nugget:** Overall Liking

**Overall liking,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)




# Takeaways

## Plant-rich leader outperforms animal

- Average liking 5.5pts (versus 5.1pts for animal).

## Plant-rich average performs comparably to animal and plant-based

- 51% rated plant-rich average 'like' or 'like very much' (versus 47% for animal and plant-based, respectively).

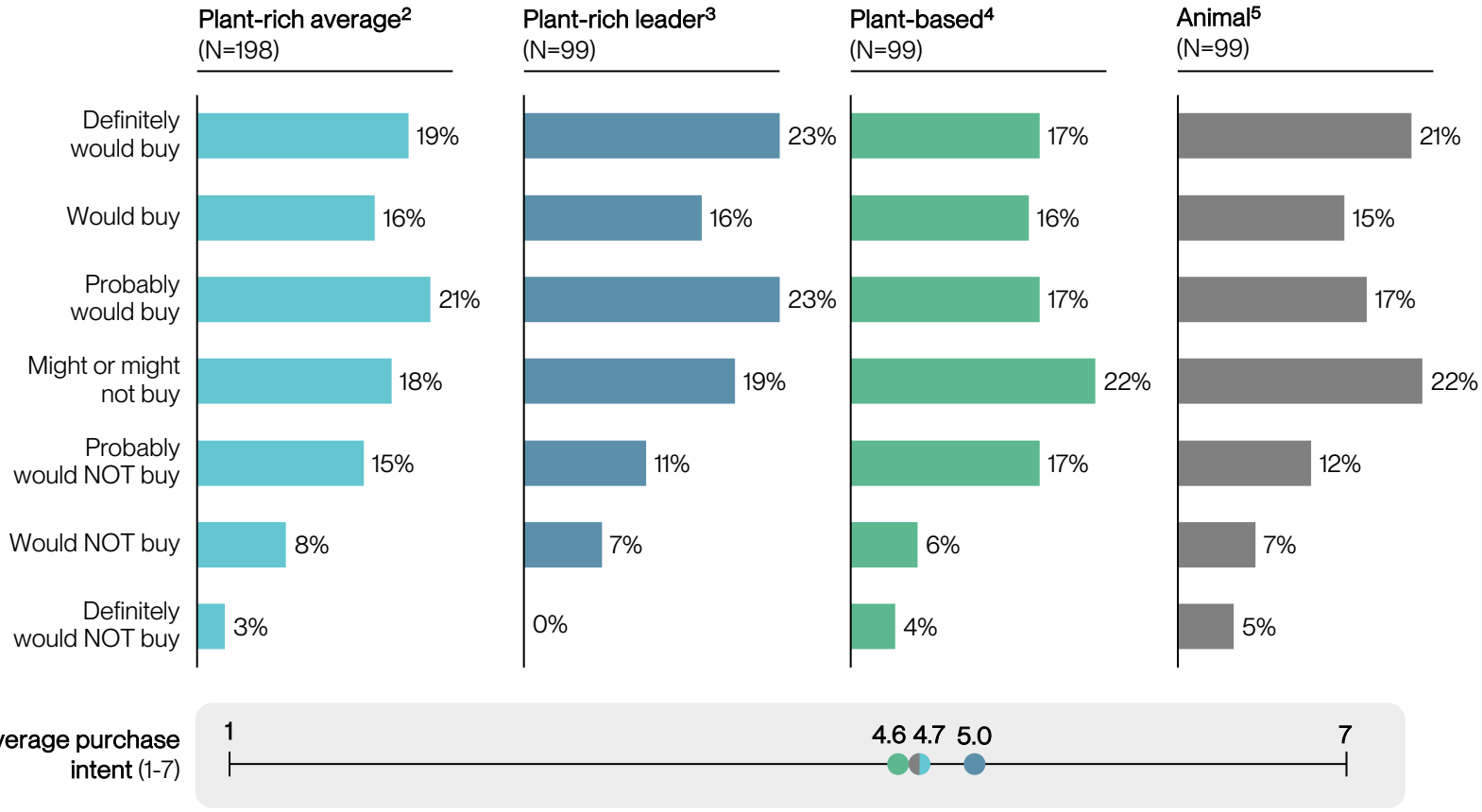
1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. Aggregated across 2 commercially available plant-rich nuggets products.
3. The plant-rich product with the highest mean liking of those included in this test.
4. The top-performing plant-based nugget identified by NECTAR during previous testing of plant-based nuggets (*Taste of Industry 2024*).
5. The highest retail sales volume animal nugget selected for its representativeness of the animal chicken nugget category.

# **Chicken Nugget:** Purchase Intent

**Purchase intent,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)







# Takeaways

## Plant-rich leader narrowly outperforms animal on purchase intent

- Average purchase 5.0pts compared to animal at 4.7pts.

## Plant-rich average tied with animal

- Plant-rich average and animal each rated 4.7pts for purchase intent.

## Plant-rich average performs comparably to plant-based

- Plant-rich average purchase intent 4.7pts (versus 4.6pts for plant-based).

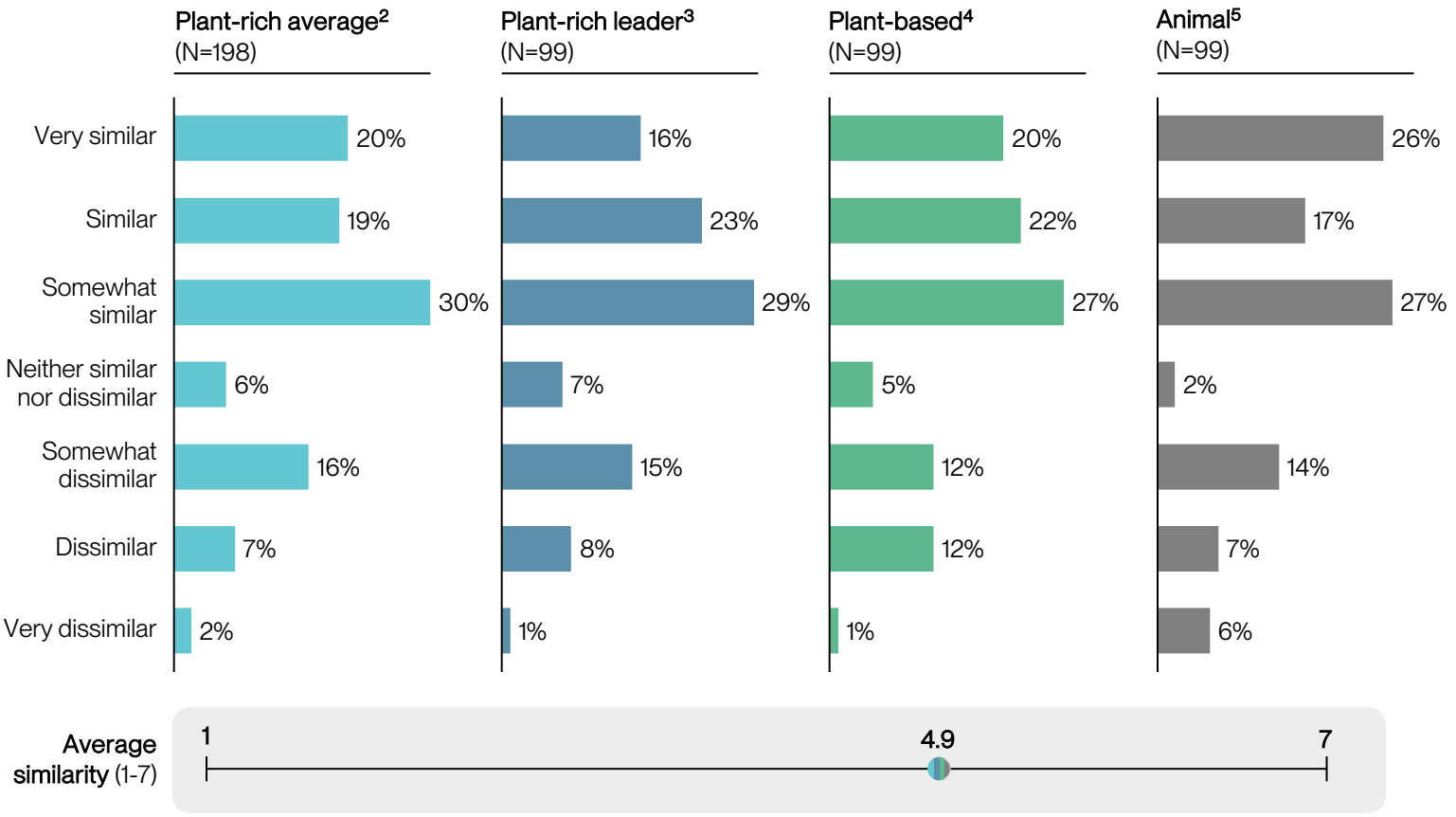
1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. Aggregated across 2 commercially available plant-rich nuggets products.
3. The plant-rich product with the highest mean liking of those included in this test.
4. The top-performing plant-based nugget identified by NECTAR during previous testing of plant-based nuggets (*Taste of Industry 2024*).
5. The highest retail sales volume animal nugget selected for its representativeness of the animal chicken nugget category.

# **Chicken Nugget:** Similarity

**Similarity,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)







## Takeaways

### Plant-rich products perform well on similarity

- Average similarity rating was 4.9pts across all product types.

### Plant-rich average is as similar as plant-rich leader to typical chicken nugget

- 39% rated each of plant-rich average and plant-rich leader as 'similar' or 'very similar' to typical chicken nugget.

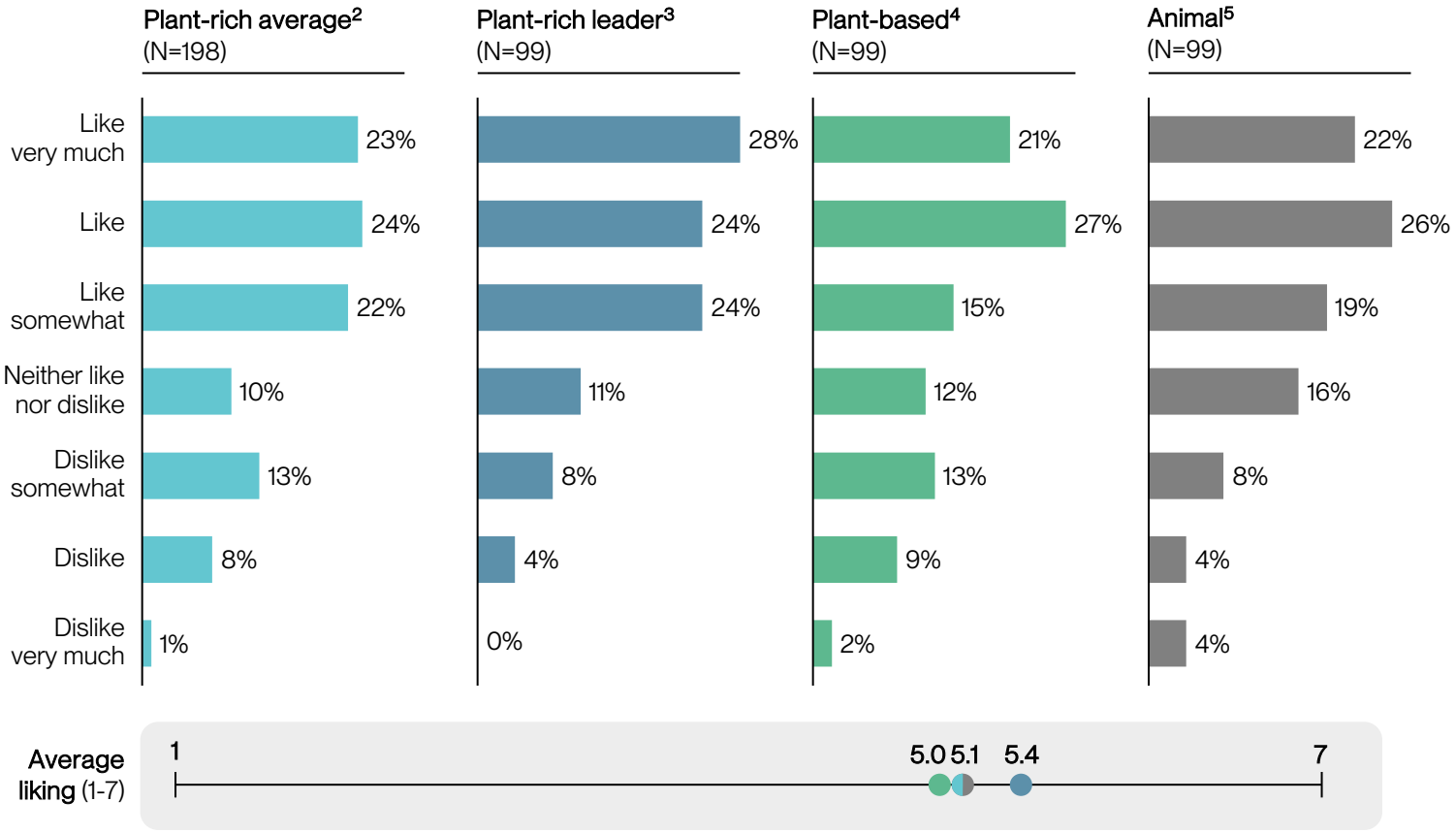
1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. Aggregated across 2 commercially available plant-rich nuggets products.
3. The plant-rich product with the highest mean liking of those included in this test.
4. The top-performing plant-based nugget identified by NECTAR during previous testing of plant-based nuggets (*Taste of Industry 2024*).
5. The highest retail sales volume animal nugget selected for its representativeness of the animal chicken nugget category.

# **Chicken Nugget:** Flavor

**Flavor,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)




# Takeaways

## Plant-rich leader outperforms animal on flavor

- 52% rated plant-rich leader 'like' or 'like very much' (versus 48% for animal).

## Plant-rich average tied with animal on flavor

- Average liking 5.1pts for each.

## Plant-rich products perform comparably to plant-based on flavor

- 47% rated plant-rich average 'like' or 'like very much' (versus 48% for plant-based).

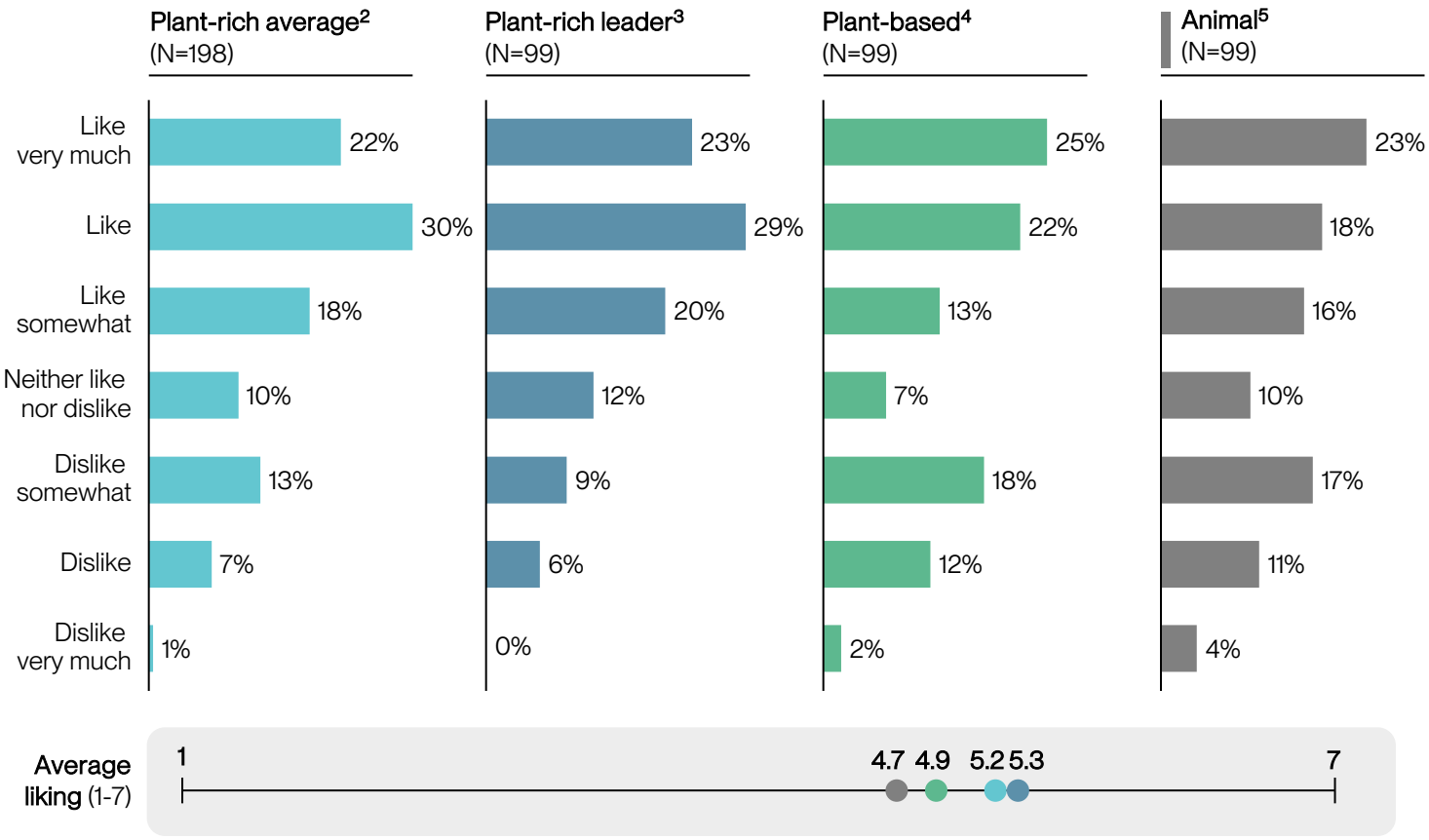
1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. Aggregated across 2 commercially available plant-rich nuggets products.
3. The plant-rich product with the highest mean liking of those included in this test.
4. The top-performing plant-based nugget identified by NECTAR during previous testing of plant-based nuggets (*Taste of Industry 2024*).
5. The highest retail sales volume animal nugget selected for its representativeness of the animal chicken nugget category.

# **Chicken Nugget:** Texture

**Texture,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)




# Takeaways

## Plant-rich products beat animal in texture

- 52% rated plant-rich average ‘like’ or ‘like very much’ (versus 41% for animal).

## Texture of plant-rich average is comparable to plant-rich leader

- Average liking 5.2pts for plant-rich average (versus 5.3pts for plant-rich leader).

## Plant-rich products slightly outperform plant-based

- Average liking 0.3pts higher for plant-rich average than plant-based.

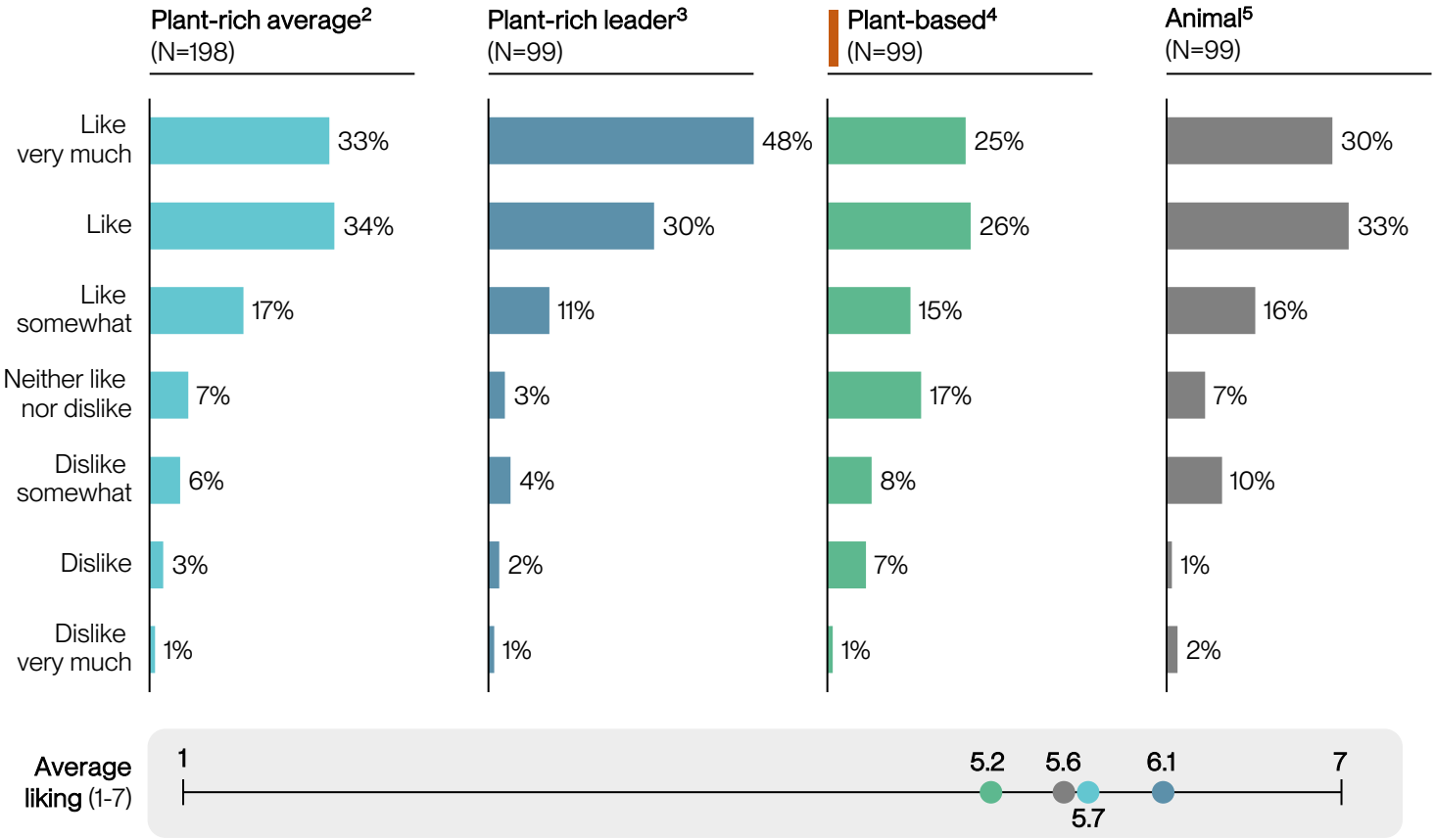
1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. Aggregated across 2 commercially available plant-rich nuggets products.
3. The plant-rich product with the highest mean liking of those included in this test.
4. The top-performing plant-based nugget identified by NECTAR during previous testing of plant-based nuggets (*Taste of Industry 2024*).
5. The highest retail sales volume animal nugget selected for its representativeness of the animal chicken nugget category.

# **Chicken Nugget:** Appearance

**Appearance,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)







# Takeaways

## Appearance is a big strength for plant-rich leader

- 78% rated plant-rich leader 'like' or 'like very much' (versus 63% for animal).

## Opportunity for plant-rich average to catch up to plant-rich leader

- Average liking 5.7pts for plant-rich average (versus 6.1pts for plant-rich leader).

## Plant-rich products outperform plant-based on appearance

- 67% rated plant-rich average 'like' or 'like very much' (versus 51% for plant-based).

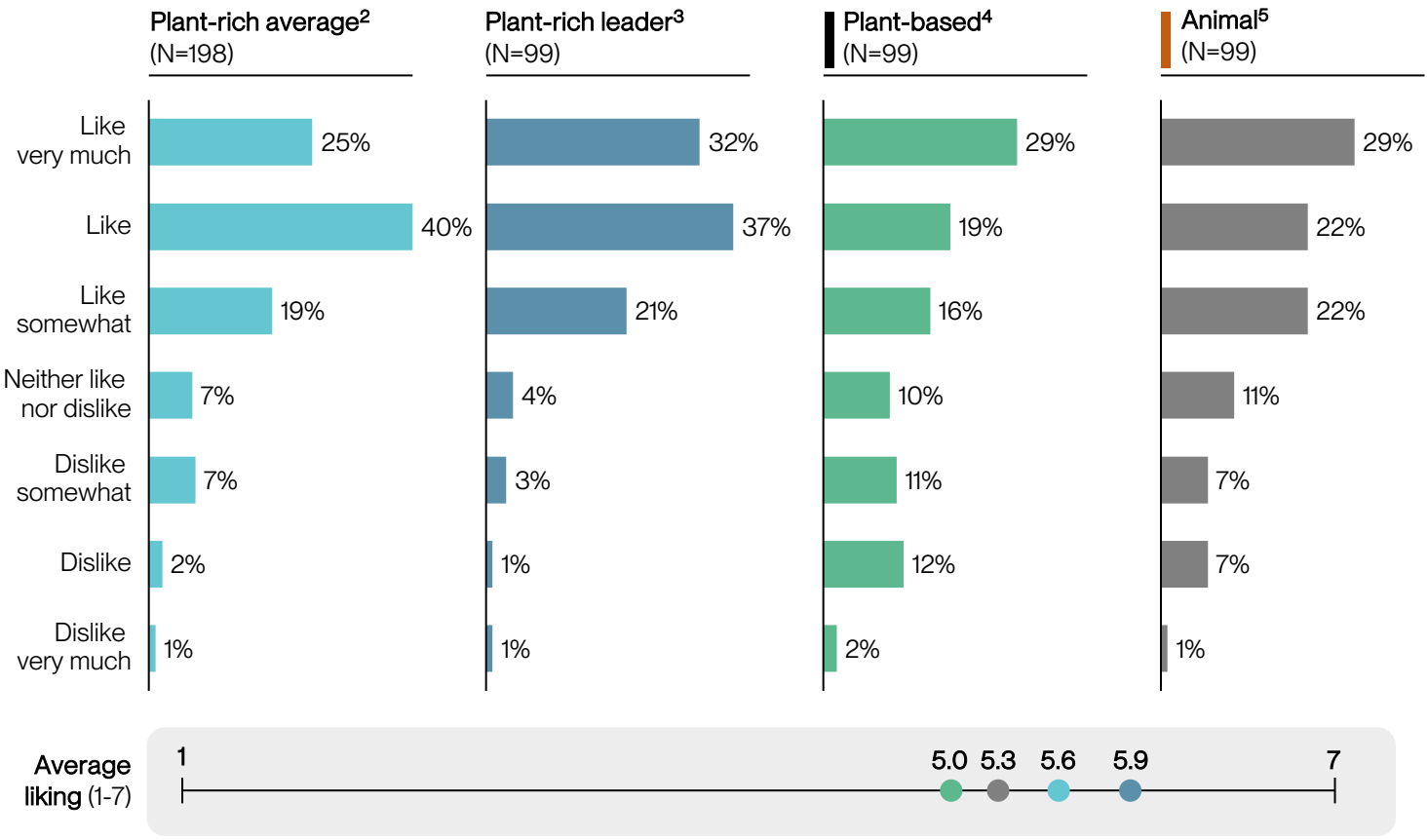
1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. Aggregated across 2 commercially available plant-rich nuggets products.
3. The plant-rich product with the highest mean liking of those included in this test.
4. The top-performing plant-based nugget identified by NECTAR during previous testing of plant-based nuggets (*Taste of Industry 2024*).
5. The highest retail sales volume animal nugget selected for its representativeness of the animal chicken nugget category.

# **Chicken Nugget:** Breading

**Breading,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)




# Takeaways

## Breading of plant-rich leader better than animal

- Average liking 5.9pts for plant-rich leader (versus 5.3pts for animal).

## Plant-rich average also outperforms animal

- 65% rated plant-rich average 'like' or 'like very much' (versus 51% for animal).

## Plant-rich products perform better than plant-based

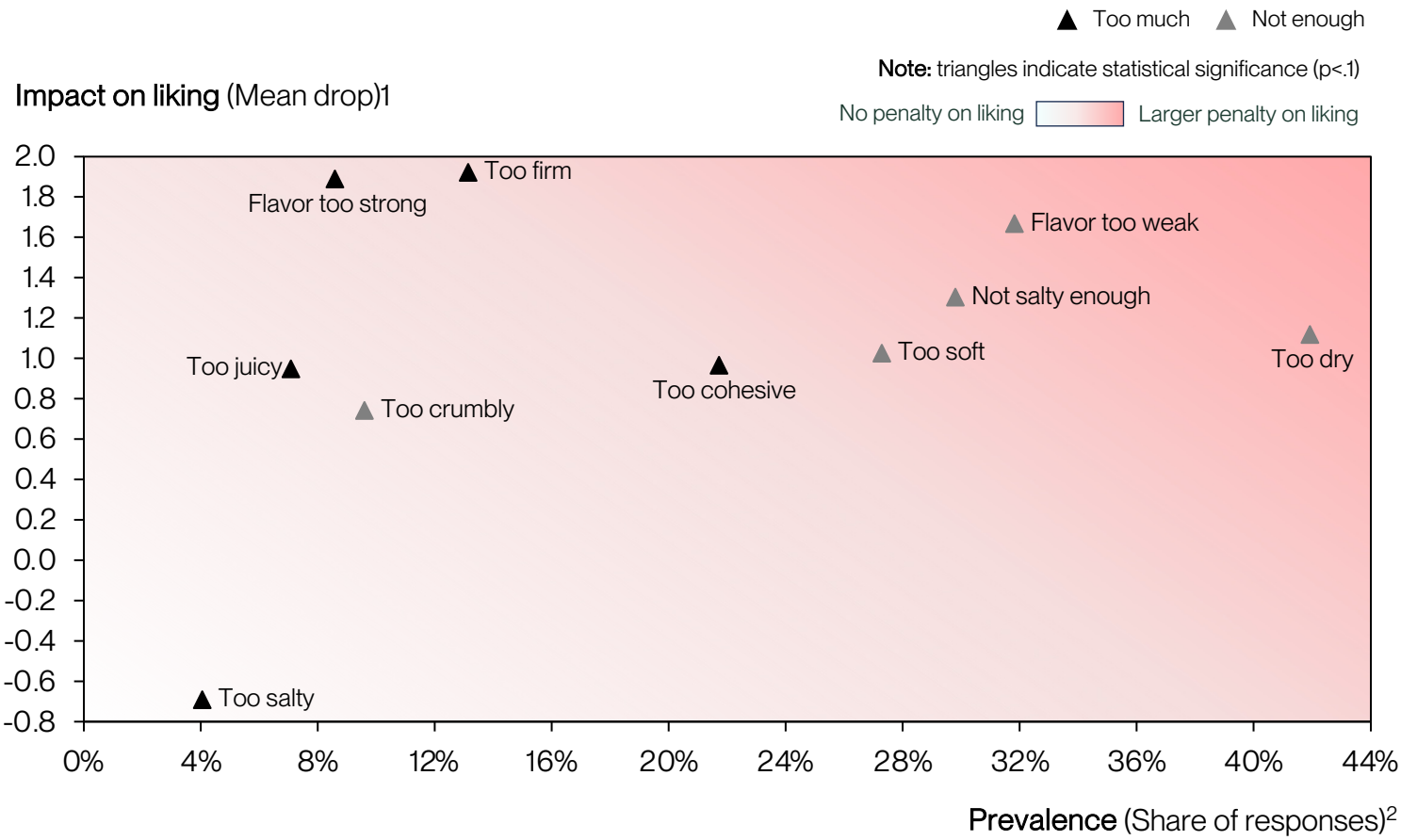
- Average liking 5.6pts for plant-rich average (versus 5.0pts for plant-based).

1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. Aggregated across 2 commercially available plant-rich nuggets products.
3. The plant-rich product with the highest mean liking of those included in this test.
4. The top-performing plant-based nugget identified by NECTAR during previous testing of plant-based nuggets (*Taste of Industry 2024*).
5. The highest retail sales volume animal nugget selected for its representativeness of the animal chicken nugget category.

# **Chicken Nugget:** Top R&D Opportunities

Prioritization framework for identifying attributes with large impacts on liking

Penalty analysis using responses on 'just-about-right' questions, Mean drop and Prevalence




# Takeaways

## Balance flavors during product development

- 'Flavor too strong' and 'flavor too weak' each associated with ~1.8pts impact to liking.

## Avoid dryness

- 'Too dry' was associated with 1.2pts impact to liking and was mentioned by 42% of participants.

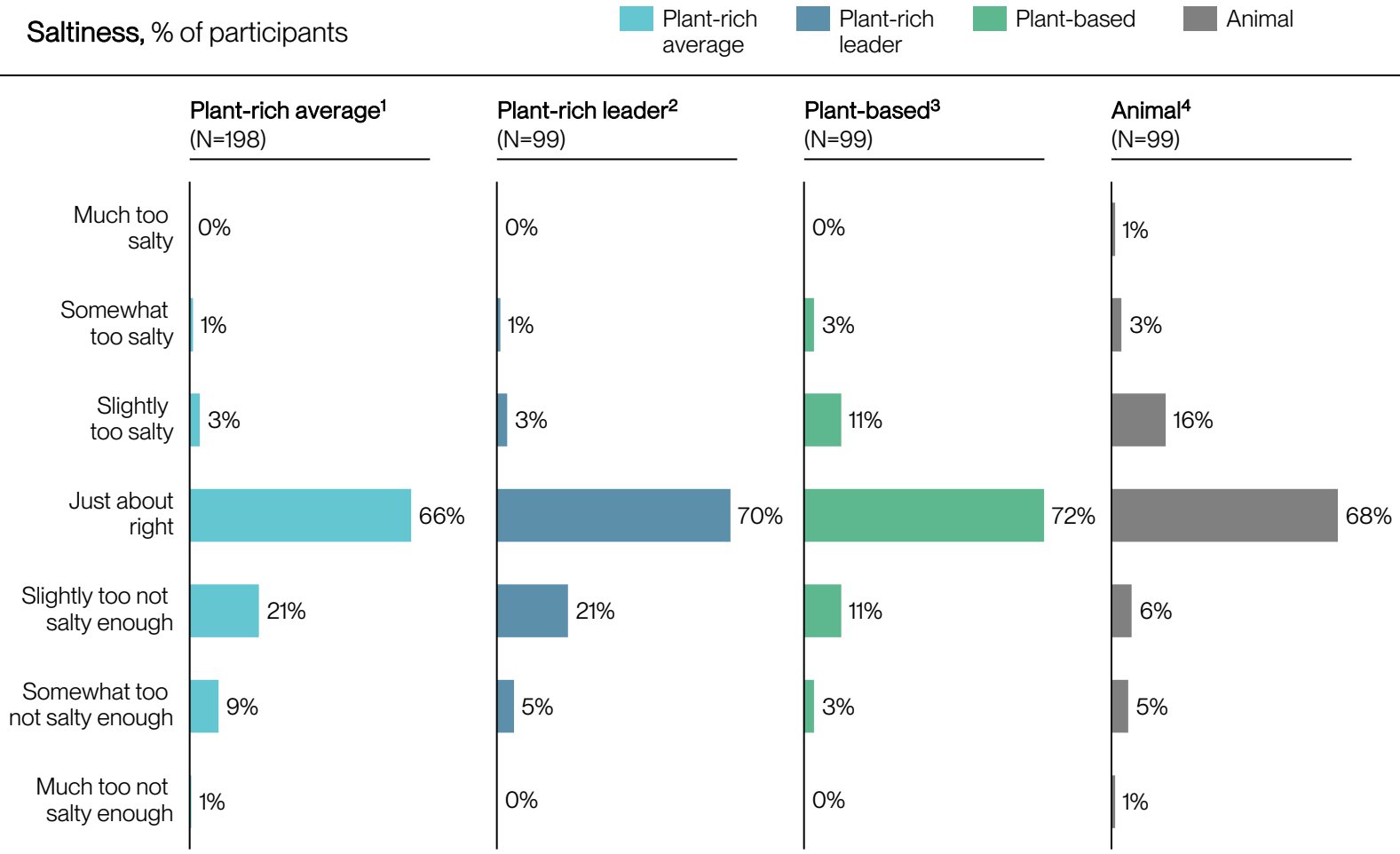
## Avoid overly firm textures

- 'Too firm' was associated with 1.9pts impact to liking.

1. The average change in overall liking on 7pt scale for products for all responses using the relevant attribute as a descriptor compared to the mean liking for all products rated 'just about right' on that attribute. Calculated as Mean Liking (JAR) minus Mean Liking (descriptor used).
2. Share of responses for all plant-rich products in this category in each direction for each attribute.

# **Chicken Nugget:** Saltiness

**Saltiness,** % of participants




## Takeaways

### Plant-rich products perform well on saltiness

- 66% rated plant-rich average 'just about right' saltiness (versus 68% for animal).

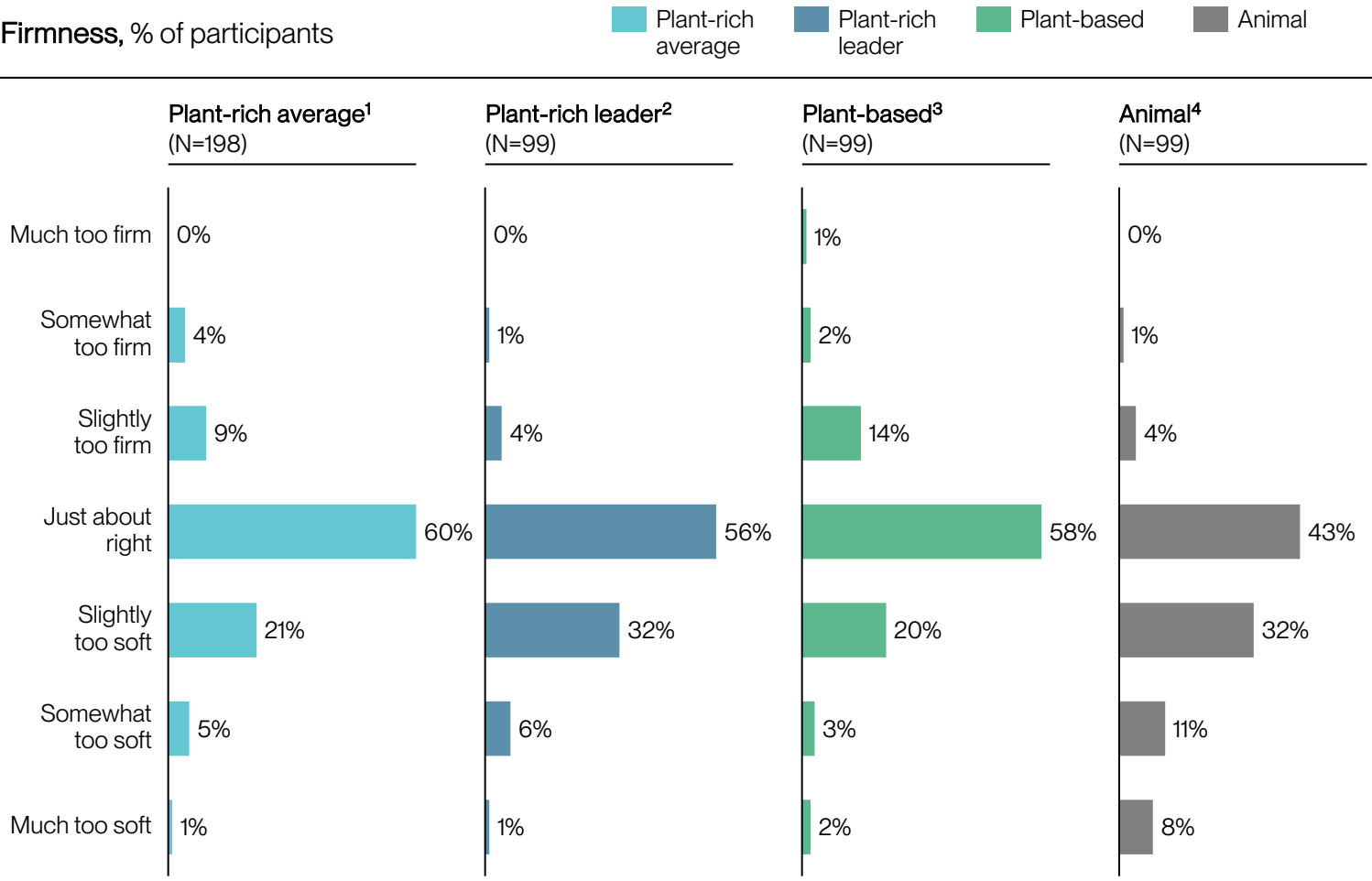
### Opportunity to increase saltiness

- Plant-rich products tended to be 'not salty enough,' which was associated with a 1.3pt impact to liking.

1. Aggregated across 2 commercially available plant-rich nuggets products.
2. The plant-rich product with the highest mean liking of those included in this test.
3. The top-performing plant-based nugget identified by NECTAR during previous testing of plant-based nuggets (*Taste of Industry 2024*).
4. The highest retail sales volume animal nugget selected for its representativeness of the animal chicken nugget category.

# **Chicken Nugget:** Firmness

**Firmness,** % of participants




## Takeaways

### Plant-rich products outperform animal and plant-based on firmness

- 60% rated plant-rich average 'just about right' firmness (versus 43% for animal).
- 60% rated plant-rich average 'just about right' firmness (versus 56% for plant-rich leader).

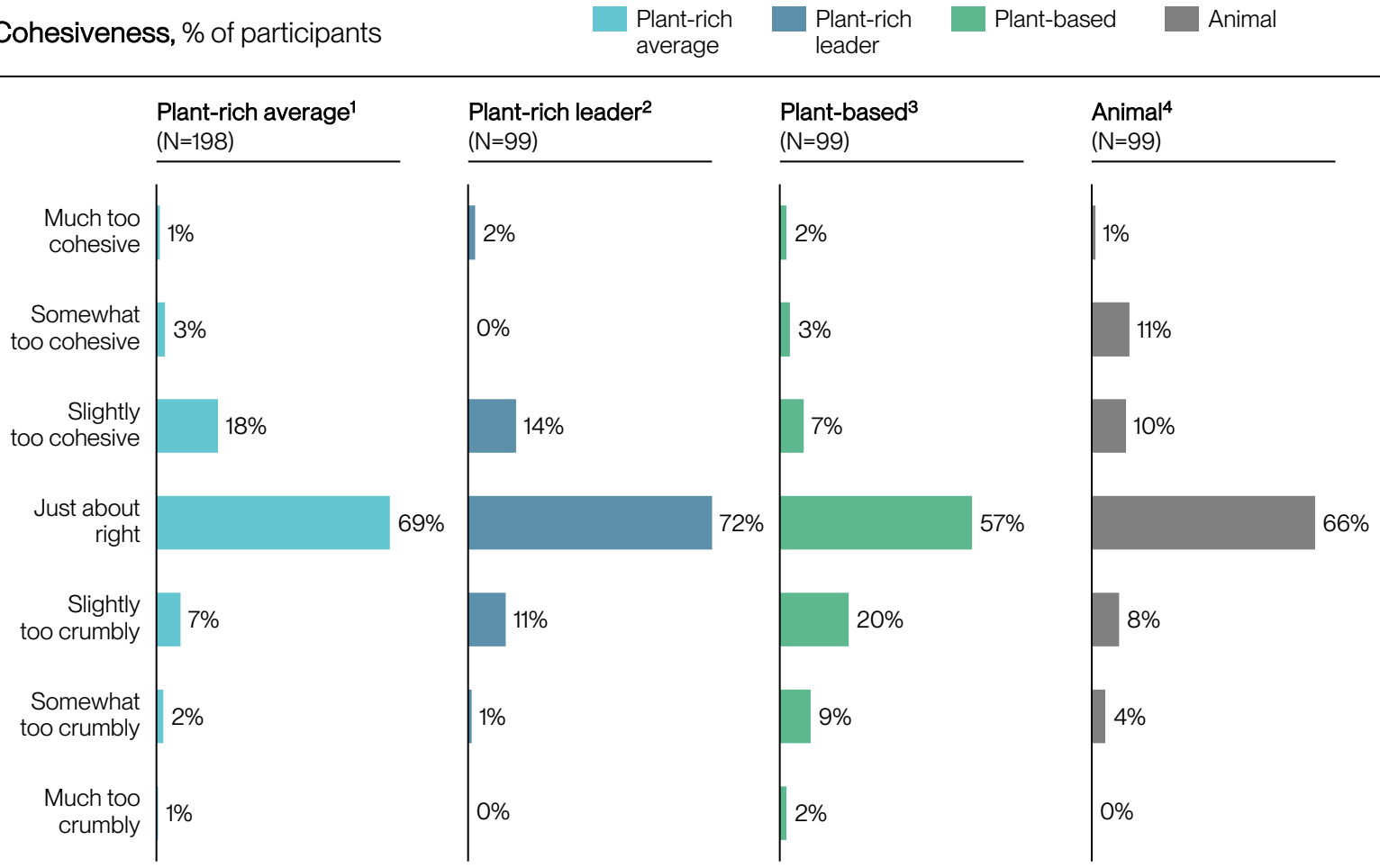
### Opportunity for plant-rich products to increase firmness

- Plant-rich products tended to be 'too soft' rather than 'too firm.'

1. Aggregated across 2 commercially available plant-rich nuggets products.
2. The plant-rich product with the highest mean liking of those included in this test.
3. The top-performing plant-based nugget identified by NECTAR during previous testing of plant-based nuggets (*Taste of Industry 2024*).
4. The highest retail sales volume animal nugget selected for its representativeness of the animal chicken nugget category.

# **Chicken Nugget:** Cohesiveness

**Cohesiveness,** % of participants




## Takeaways

### Plant-rich performs well in cohesiveness

- 72% rated plant-rich leader 'just about right' in cohesiveness (versus 66% for animal).

### Plant-rich leader doesn't differentiate itself on cohesiveness

- Only 3% more participants rated plant-rich leader 'just about right' in cohesiveness (72% for leader versus 69% for average).

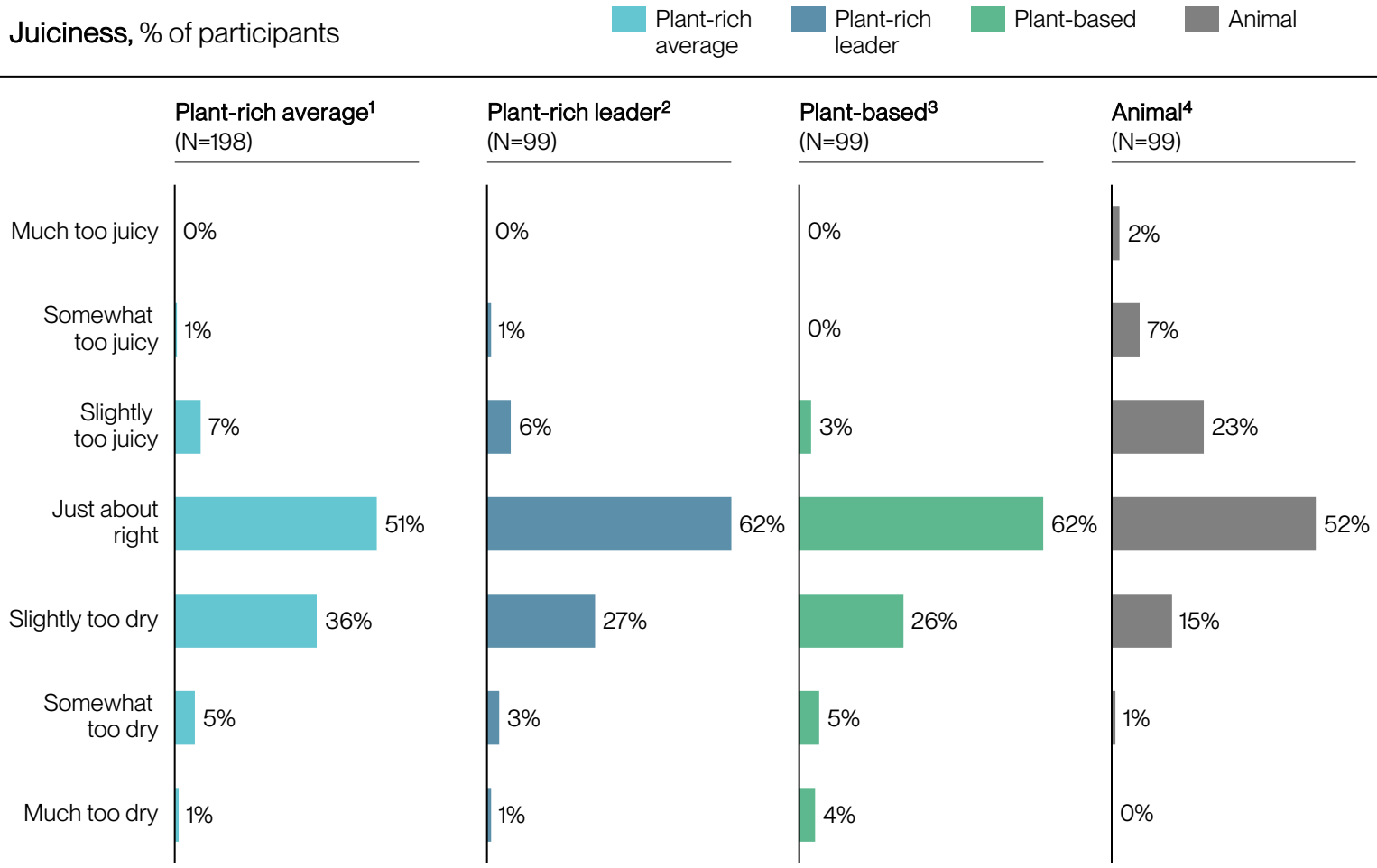
### Plant-rich products outperform plant-based

- 69% rated plant-rich average 'just about right' (versus 57% for plant-based).

1. Aggregated across 2 commercially available plant-rich nuggets products.
2. The plant-rich product with the highest mean liking of those included in this test.
3. The top-performing plant-based nugget identified by NECTAR during previous testing of plant-based nuggets (*Taste of Industry 2024*).
4. The highest retail sales volume animal nugget selected for its representativeness of the animal chicken nugget category.

# **Chicken Nugget:** Juiciness

**Juiciness,** % of participants




## Takeaways

### Plant-rich leader outperforms animal on juiciness

- 62% rated plant-rich leader 'just about right' on juiciness (versus 52% for animal).

### Plant-rich average slightly behind plant-rich leader

- 51% rated plant-rich leader 'just about right' on juiciness (versus 62% for plant-rich leader).

### Opportunity for plant-rich products to increase juiciness

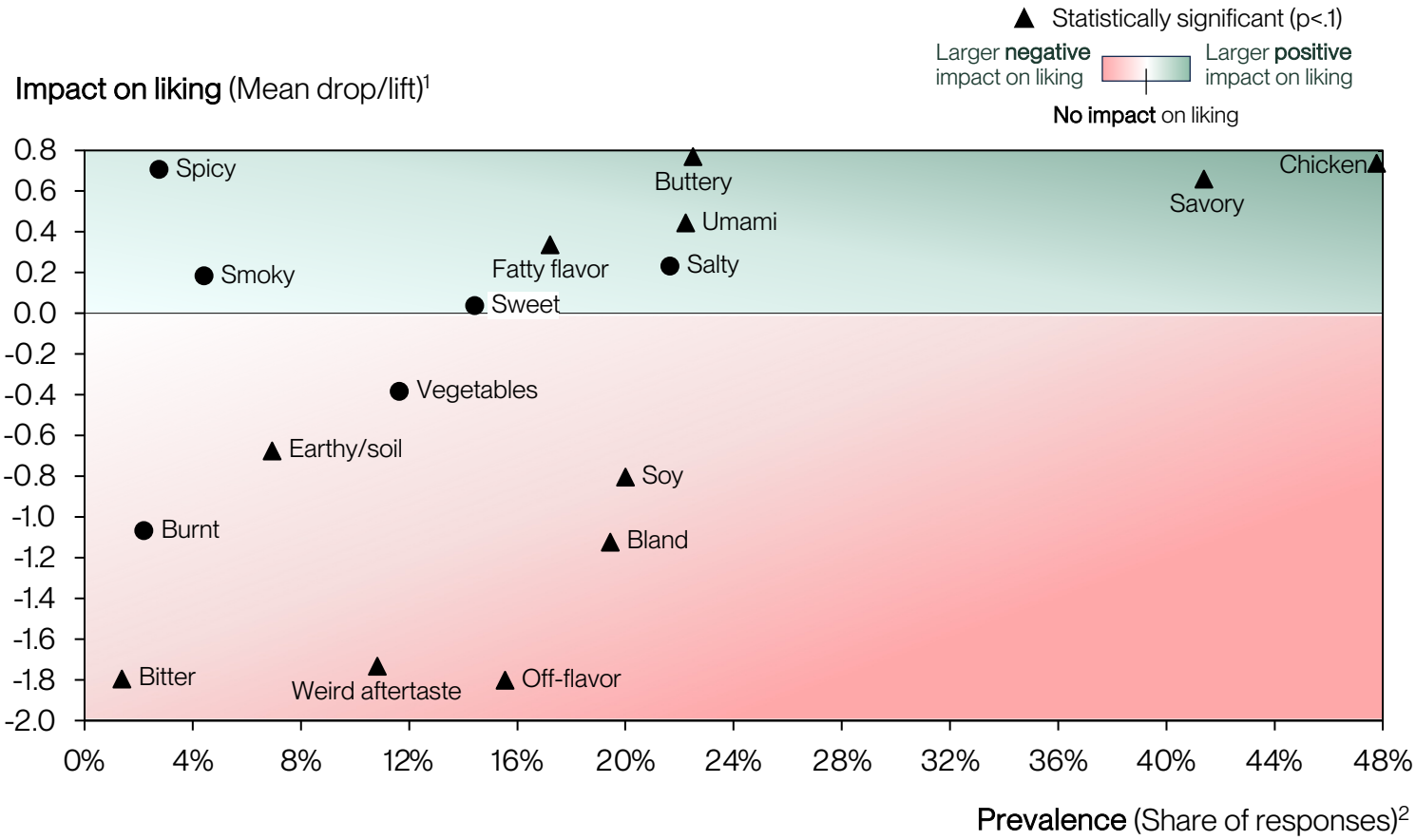
- Plant-rich products tended to be 'too dry,' which was associated with a 1.2pt impact to liking.

1. Aggregated across 2 commercially available plant-rich nuggets products.
2. The plant-rich product with the highest mean liking of those included in this test.
3. The top-performing plant-based nugget identified by NECTAR during previous testing of plant-based nuggets (*Taste of Industry 2024*).
4. The highest retail sales volume animal nugget selected for its representativeness of the animal chicken nugget category.

# **Chicken Nugget:** Top Flavor R&D Opportunities

Prioritization framework for identifying attributes with large impacts on liking

**Flavor,** Penalty analysis on flavor using check-all-that-apply responses, Mean drop/lift and Prevalence




## Takeaways

### Prioritize savory and chicken flavors

- 'Savory' and 'chicken' flavors were associated with a 0.6-0.8pt lift in liking.

### Avoid bitter, weird aftertaste, and off-flavors

- Each of these attributes was associated with a 1.8pt drop in liking.

### Incorporate more buttery, umami, and fatty flavors

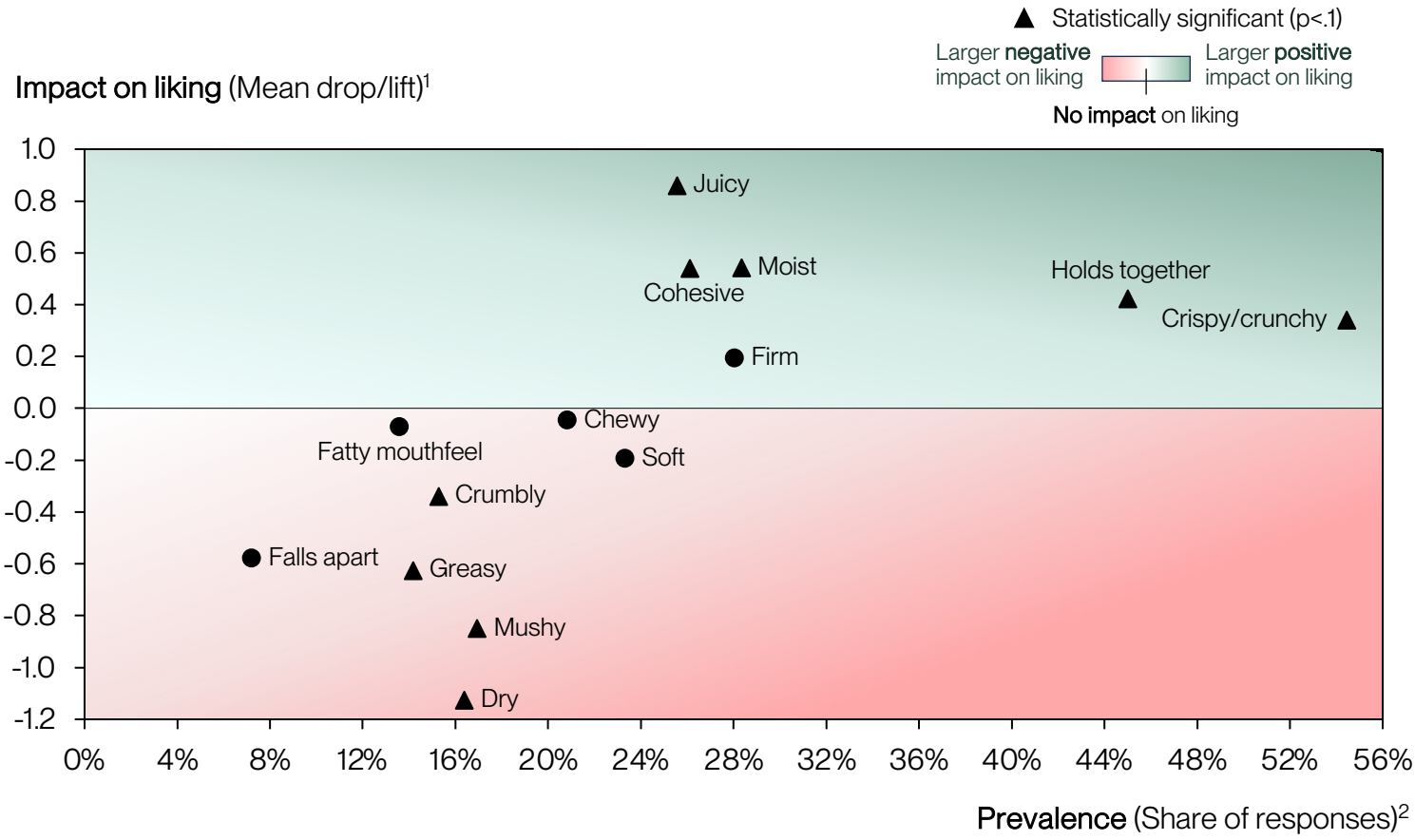
- Each was associated with a 0.4-0.8pt increase in liking.

1. Calculated as the average drop in overall liking for products with the associated response.
2. Share of responses for 4 products (animal and plant) in each direction for each trait.

# **Chicken Nugget:** Top Texture R&D Opportunities

Prioritization framework for identifying attributes with large impacts on liking

**Texture,** Penalty analysis on texture using check-all-that-apply responses, Mean drop/lift and Prevalence




## Takeaways

### Prioritize juiciness during product development process

- Juiciness was associated with a 0.9pt increase in liking (while dryness was associated with a 1.1pt drop in liking).

### Consumers noticed crispy/crunchy textures

- 54% of participants described the chicken nugget as 'crispy/crunchy,' which was associated with a 0.4pt increase in liking.

### Ensure products hold together well

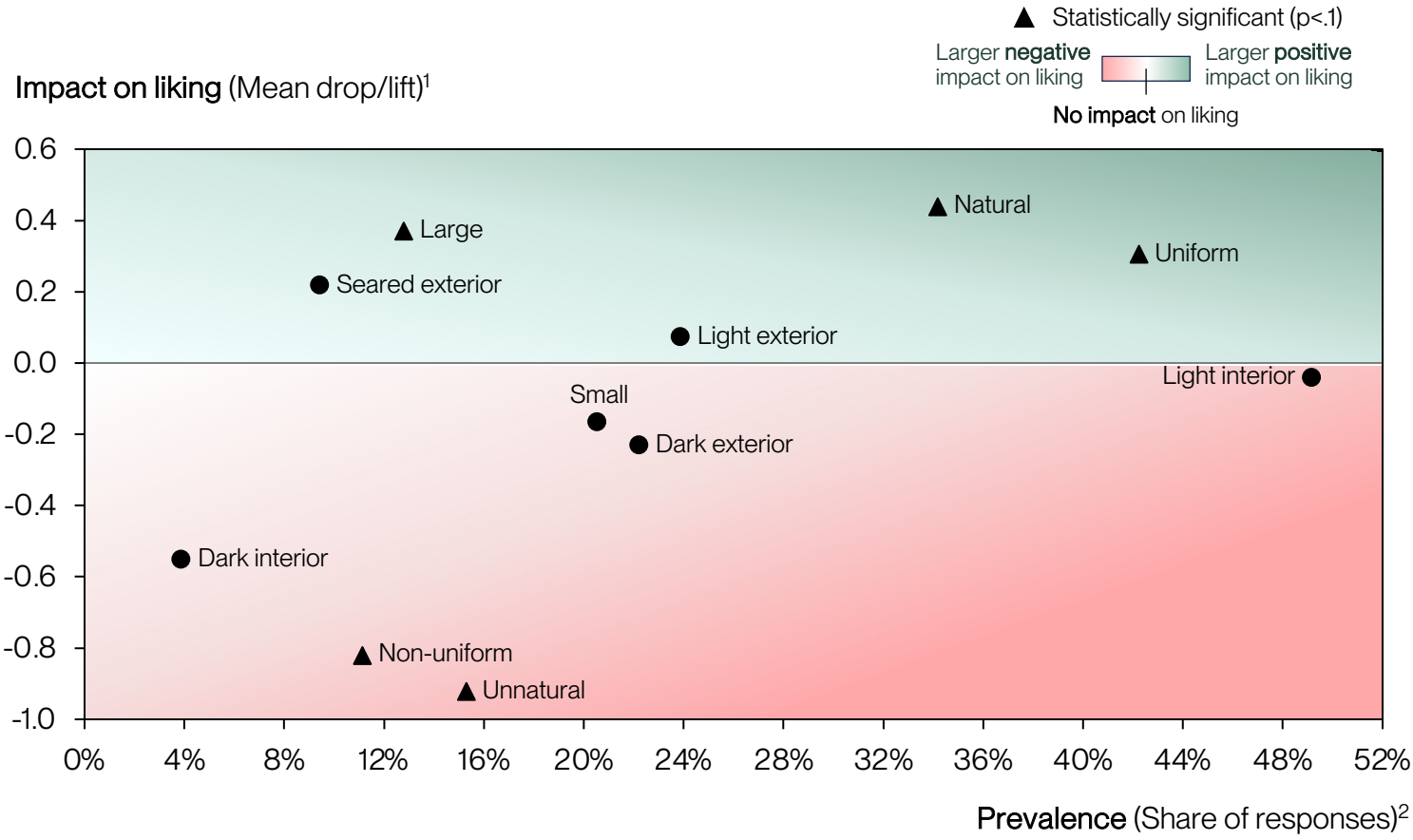
- 'Holds together' was associated with 0.5pt increase in liking and was reported by 46%.

1. Calculated as the average drop in overall liking for products with the associated response.
2. Share of responses for 4 products (animal and plant) in each direction for each trait.

# **Chicken Nugget:** Top Appearance R&D Opportunities

Prioritization framework for identifying attributes with large impacts on liking

**Appearance,** Penalty analysis on appearance using check-all-that-apply responses, Mean drop/lift and Prevalence




# Takeaways

## Prioritize natural appearance

- 'Natural' appearance was associated with 0.5pt increase in liking (while 'unnatural' was associated with 0.9pt decrease).

## Ensure appearance of chicken nugget is uniform

- 'Uniform' was associated with 0.4pt increase in liking (while 'non-uniform' was associated with 0.8pt decrease).

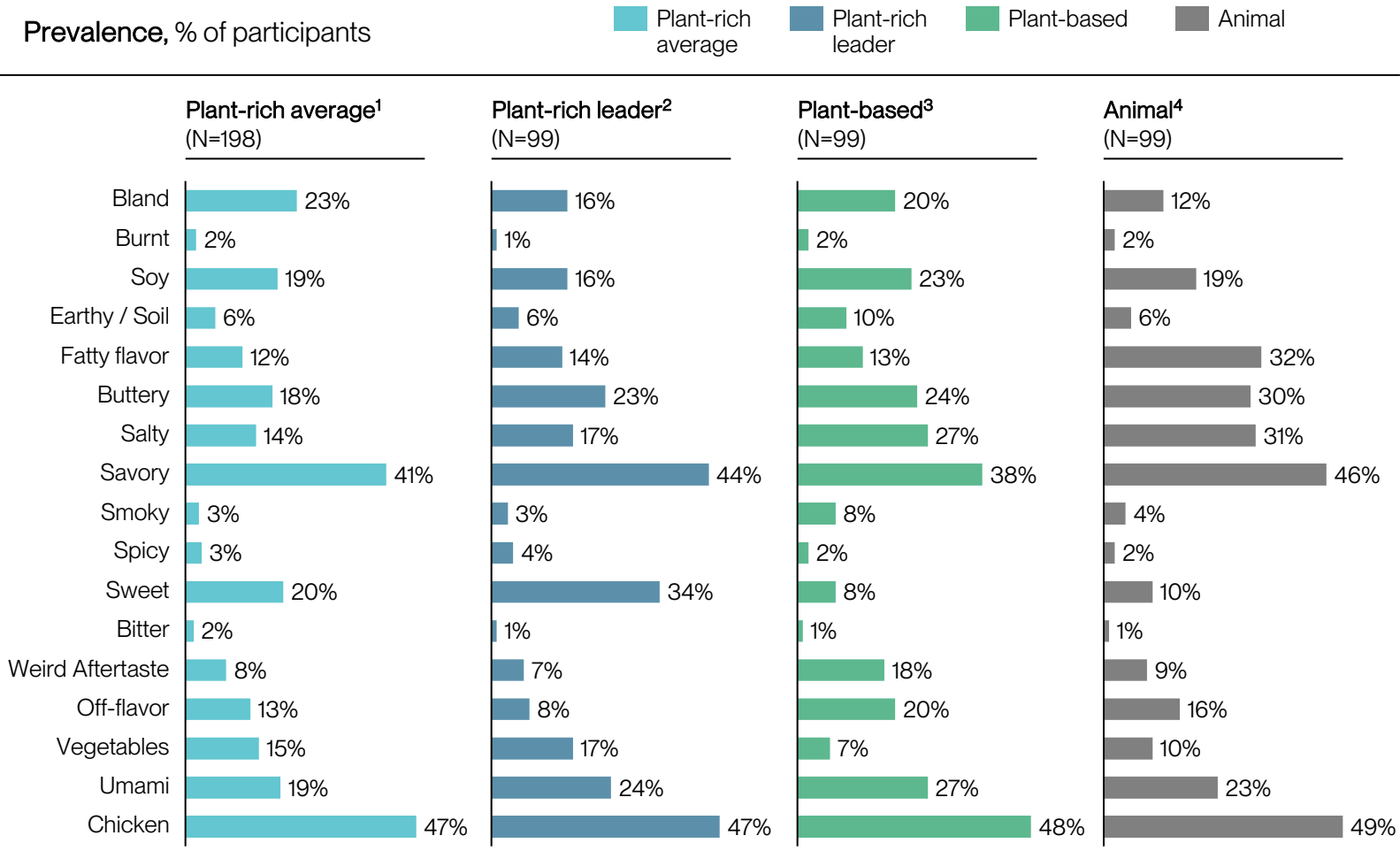
## Consumers prefer larger chicken nuggets to smaller ones

- 'Large' was associated with 0.4pt increase in liking (while 'small' was associated with a 0.1pt decrease).

1. Calculated as the average drop in overall liking for products with the associated response.
2. Share of responses for 4 products (animal and plant) in each direction for each trait.

# **Chicken Nugget:** Flavor – Prevalence

**Prevalence,** % of participants




## Takeaways

### Plant-rich products perform well on savory and chicken flavors

- 44% described plant-rich leader as ‘savory,’ and 47% as ‘chicken’ (versus 46% and 49% for animal, respectively).

### Opportunity for plant-rich products to increase fatty flavor

- Only 12% described plant-rich average as having ‘fatty flavor’ (versus 32% for animal). ‘Fatty flavor’ was associated with a 0.4pt increase in liking.

### Plant-rich leader successfully avoids off-flavor

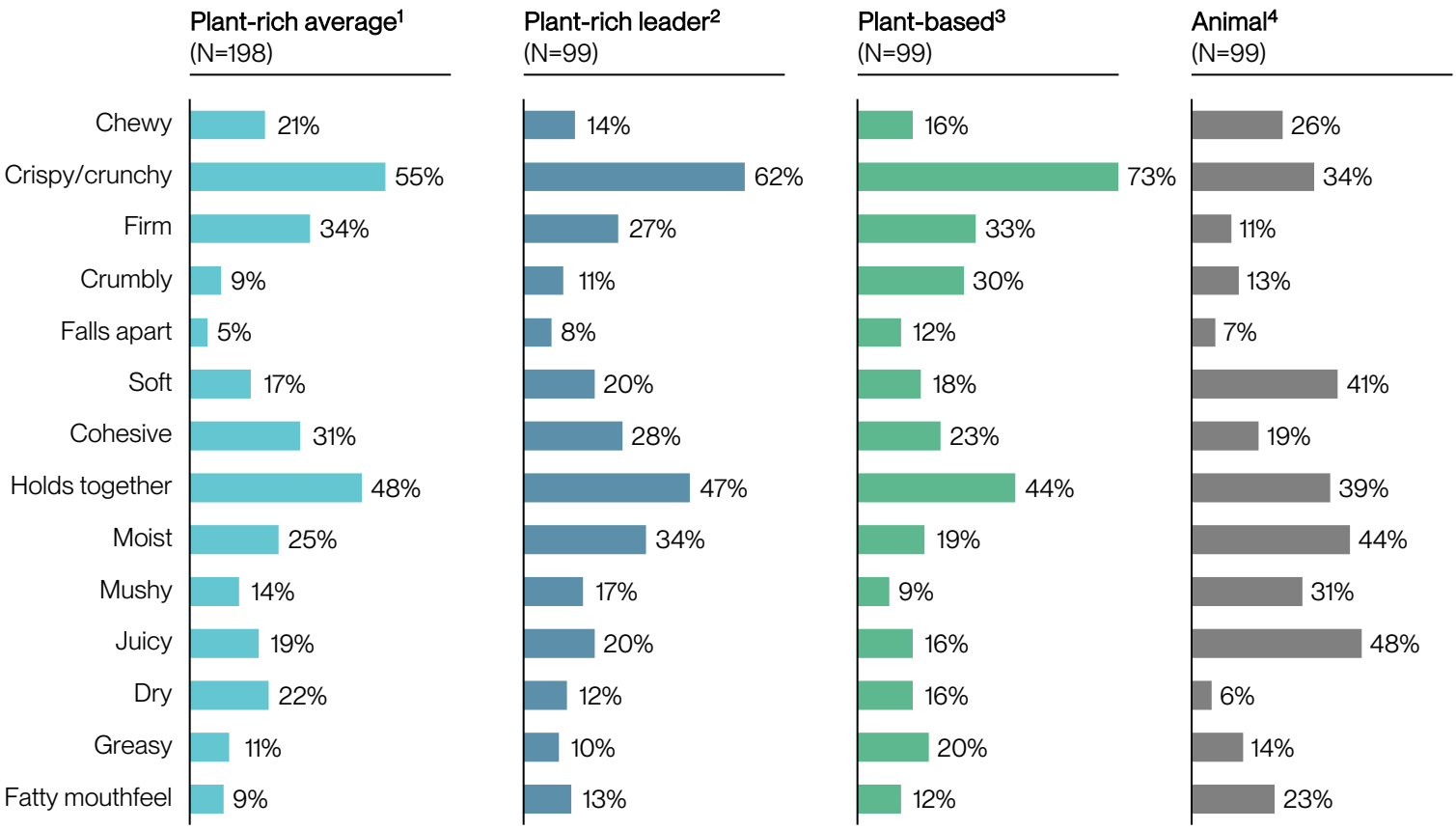
- 8% rated plant-rich leader as having ‘off-flavor’ (versus 13% for plant-rich average and 16% for animal). ‘Off-flavor’ is associated with 1.8pt decrease in liking.

1. Aggregated across 2 commercially available plant-rich nuggets products.
2. The plant-rich product with the highest mean liking of those included in this test.
3. The top-performing plant-based nugget identified by NECTAR during previous testing of plant-based nuggets (*Taste of Industry 2024*).
4. The highest retail sales volume animal nugget selected for its representativeness of the animal chicken nugget category.

# **Chicken Nugget:** Texture – Prevalence

**Prevalence,** % of participants

Plant-rich average | Plant-rich leader | Plant-based | Animal




## Takeaways

### Plant-rich products should increase juiciness

- Only 20% rated plant-rich leader as 'juicy' (versus 48% for animal).

### Plant-rich products hold together well

- 47% rated plant-rich leader as holding together (versus 39% for animal). 'Holds together' was associated with a 0.5pt increase in liking.

### Plant-rich products excel on crispiness and crunchiness

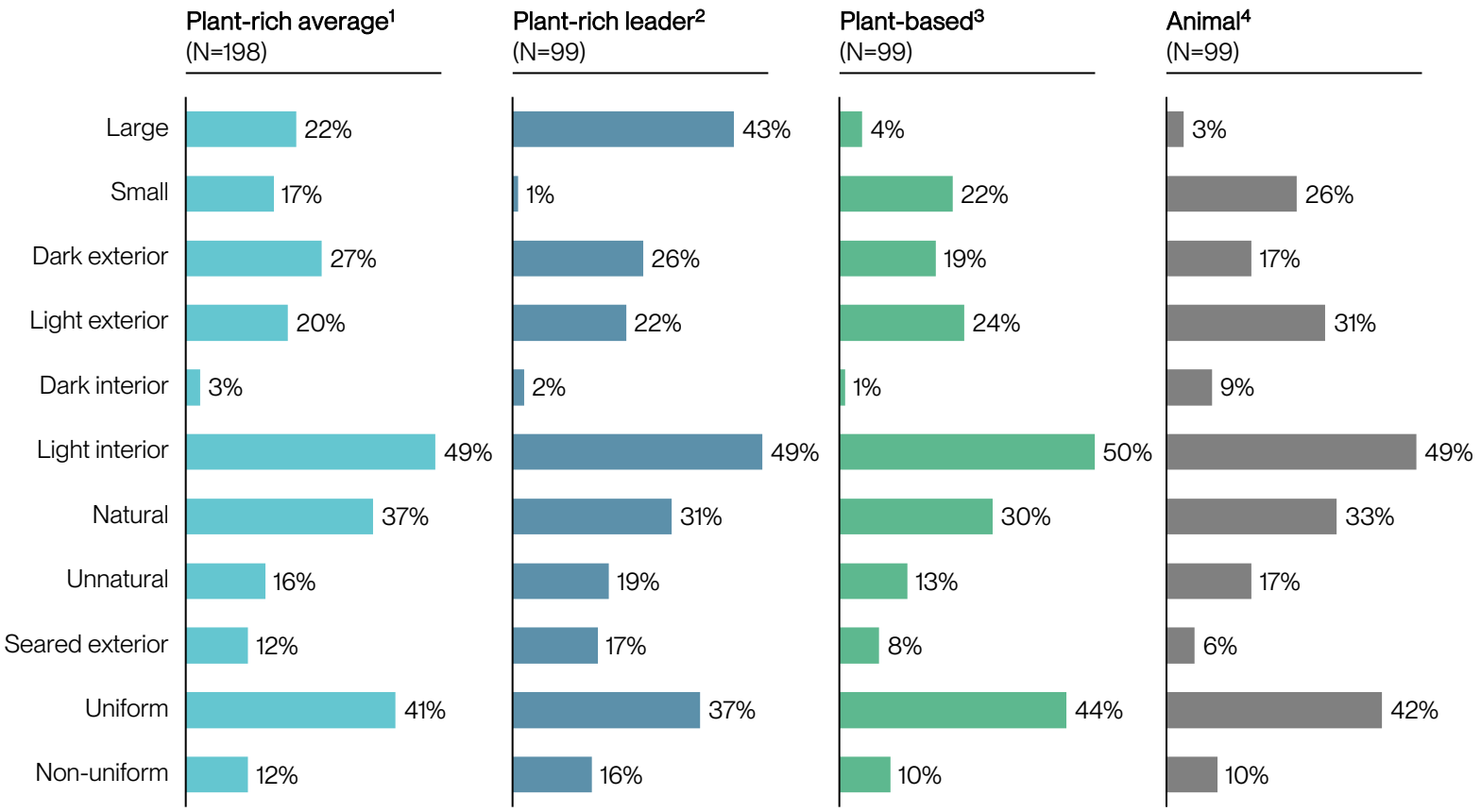
- 62% rated plant-rich leader as 'crispy/crunchy' (versus 34% for animal). 'Crispy/crunchy' was associated with a 0.4pt increase in liking.

1. Aggregated across 2 commercially available plant-rich nuggets products.
2. The plant-rich product with the highest mean liking of those included in this test.
3. The top-performing plant-based nugget identified by NECTAR during previous testing of plant-based nuggets (*Taste of Industry 2024*).
4. The highest retail sales volume animal nugget selected for its representativeness of the animal chicken nugget category.

# **Chicken Nugget:** Appearance – Prevalence

**Prevalence,** % of participants

Plant-rich average | Plant-rich leader | Plant-based | Animal




# Takeaways

## Plant-rich products are as natural and uniform as animal

- 31% rated plant-rich leader ‘natural’ and 37% ‘uniform’ (versus 33% and 42% for animal, respectively).

## Plant-rich leader does not differentiate itself on natural and uniform

- 37% rated plant-rich average ‘natural’ and 41% ‘uniform’ (versus 31% and 37% for plant-rich leader).

## Size of plant-rich leader better than animal

- 43% rated plant-rich leader ‘large’ (versus 3% for animal). ‘Large’ was associated with a 0.4pt increase in liking.

1. Aggregated across 2 commercially available plant-rich nuggets products.
2. The plant-rich product with the highest mean liking of those included in this test.
3. The top-performing plant-based nugget identified by NECTAR during previous testing of plant-based nuggets (*Taste of Industry 2024*).
4. The highest retail sales volume animal nugget selected for its representativeness of the animal chicken nugget category.

Category-Specific Deep Dive

# Unbreaded Chicken Patty

# Unbreaded Chicken Patty

## Executive summary of R&D opportunities

### Performance Overview

Plant-rich unbreaded chicken patties reached performance parity with animal and outperformed plant-based.

- **Overall, plant-rich performs similarly to animal** – Average liking 5.4pts (versus 5.5pts for animal). Driven by similarity, texture, and appearance.
- **Plant-rich outperforms plant-based** – 55% rated plant-rich as 'like' or 'like very much' (versus 33% for plant-based).
- **Plant-rich performs comparably to animal on flavor**– 58% rated plant-rich flavor 'like' or 'like very much' (versus 57% for animal).

### Top Sensory Opportunities

Plant-rich unbreaded chicken patties can further improve their products by adjusting flavor profiles, improving cohesiveness, and creating a more natural appearance.

- **Opportunity for plant-rich to increase chicken flavor** – Only 38% described plant-rich as having 'chicken' flavor (versus 81% for animal).
- **Make appearance more natural** – Only 18% described the plant-rich patty as appearing 'natural' (versus 61% for animal).
- **Improve cohesiveness** – Only 49% rated plant-rich 'just about right' (versus 78% for animal).
- **Plant-rich should decrease undesirable 'soy' and 'earthy/soil' flavors** – Plant-rich was 18% higher on 'soy' and 'earthy/soil' flavors than animal. Each of these flavor attributes was associated with a decrease in liking.

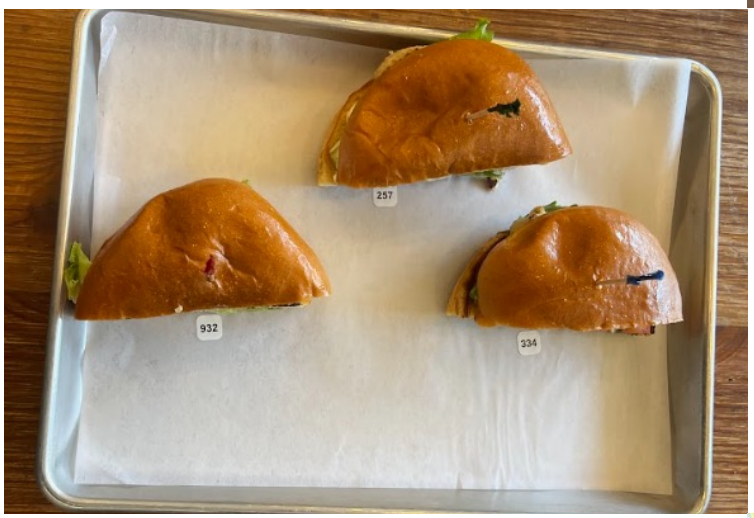
# Unbreaded Chicken Patties Tested

Unbreaded chicken patties from one commercially available plant-rich unbreaded chicken patty brand were prepared according to manufacturer instructions on a flat-top and compared against animal and plant-based unbreaded chicken patties.

Participants were screened to exclude consumers who do not eat animal-based meat and only include those who eat unbreaded chicken patties at least every 1-2 months.

## Testing Environment

Participants tried the unbreaded chicken patties at Flippin' Burger in San Francisco, a restaurant environment, in order to achieve an authentic, natural experience.




## Preparation

All unbreaded chicken patties were prepared by restaurant staff using a flat-top according to manufacturer instructions. Participants were allowed to add condiments to keep the eating experience natural but were required to apply condiments consistently across all unbreaded chicken patties.

## Dish Served

All participants were served three half unbreaded chicken patties in sandwiches. While they ate, participants filled out a survey via mobile phone detailing their experience with each product. Products were evaluated in a randomized order.

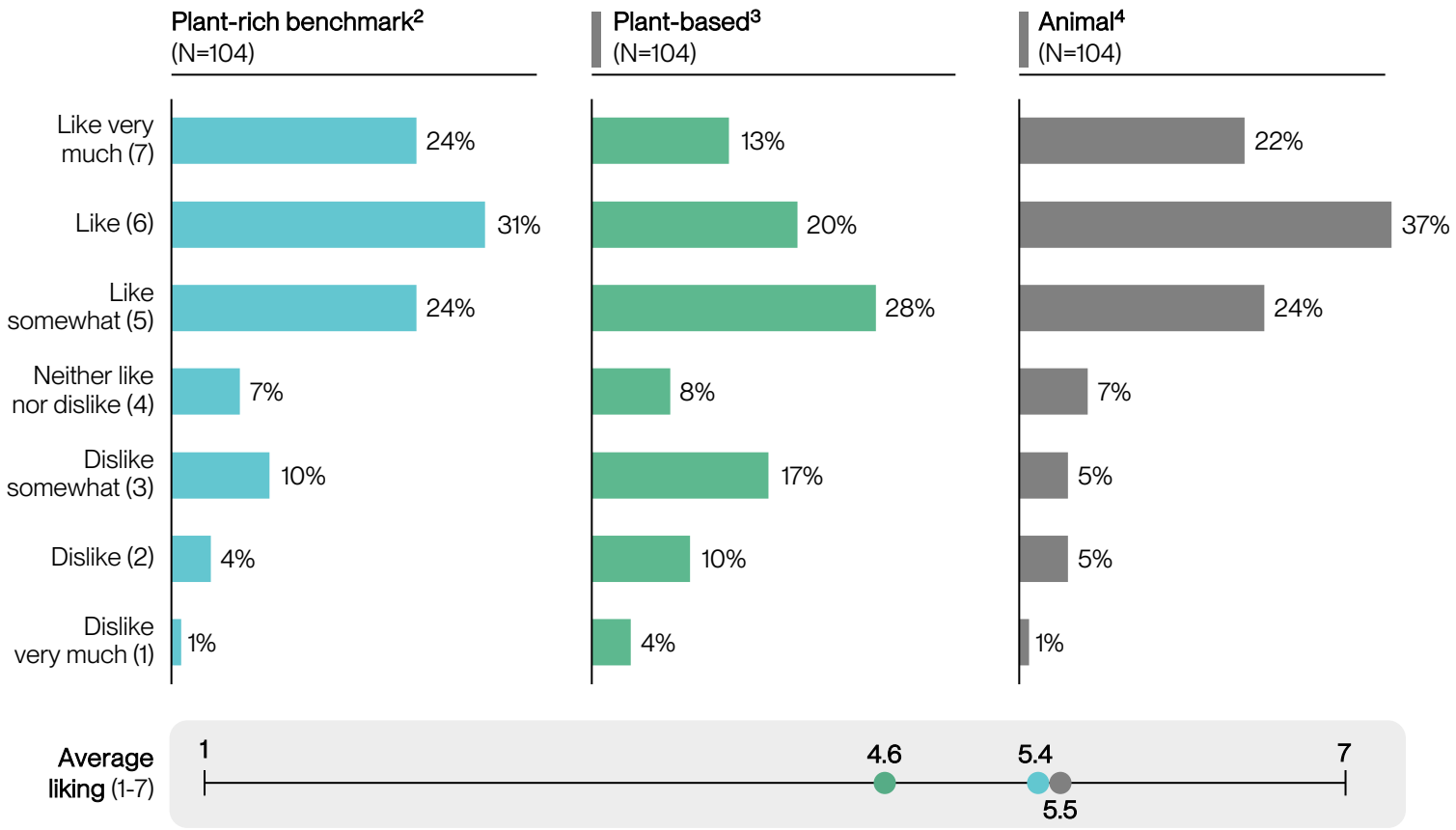
# **Unbreaded Chicken Patty:** Overall Liking

How would you rate your OVERALL LIKING of unbreaded chicken patty XXX?

**Overall liking,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)







# Takeaways

## Plant-rich performs similarly to animal on overall liking

- Average liking 5.4pts (versus 5.5pts for animal).

## Plant-rich excels compared to plant-based

- 55% rated plant-rich as 'like' or 'like very much' (versus 33% for plant-based).

1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. 1 commercially available plant-rich unbreaded chicken patty product.
3. Based on brand-level performance in previous rounds of sensory testing.
4. The highest retail sales volume animal unbreaded chicken patty selected for its representativeness of the animal unbreaded chicken patty category.

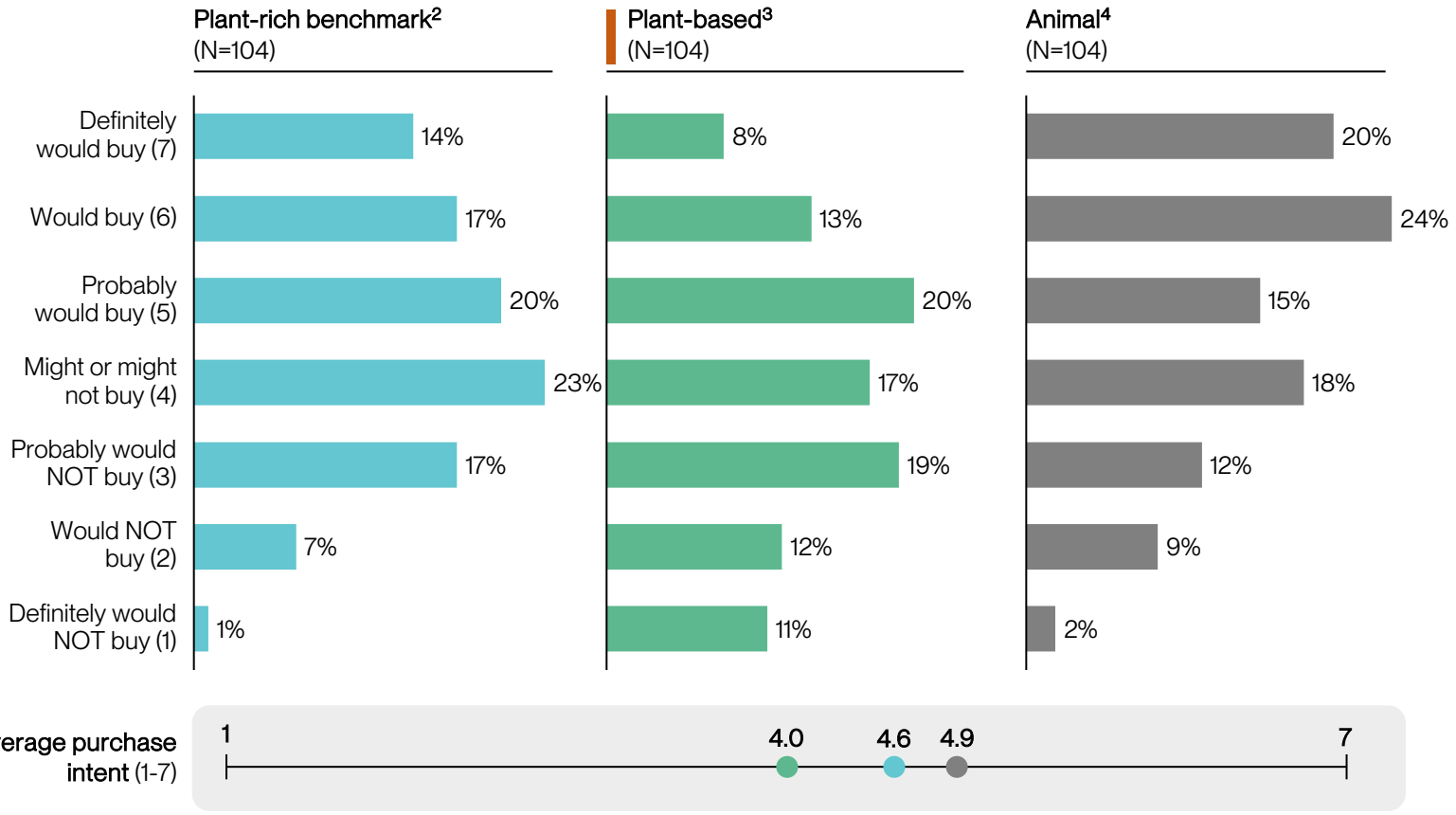
# **Unbreaded Chicken Patty:** Purchase Intent

How would you rate your PURCHASE INTENT of unbreaded chicken patty XXX?

**Purchase intent,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)







## Takeaways

### Plant-rich performs close behind animal on purchase intent

- Average purchase intent 4.6pts (versus 4.9pts for animal).

### Plant-rich has higher purchase intent than plant-based

- 31% rated plant-rich 'would buy' or 'definitely would buy' (versus 21% for plant-based).

1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. 1 commercially available plant-rich unbreaded chicken patty product.
3. Based on brand-level performance in previous rounds of sensory testing.
4. The highest retail sales volume animal unbreaded chicken patty selected for its representativeness of the animal unbreaded chicken patty category.

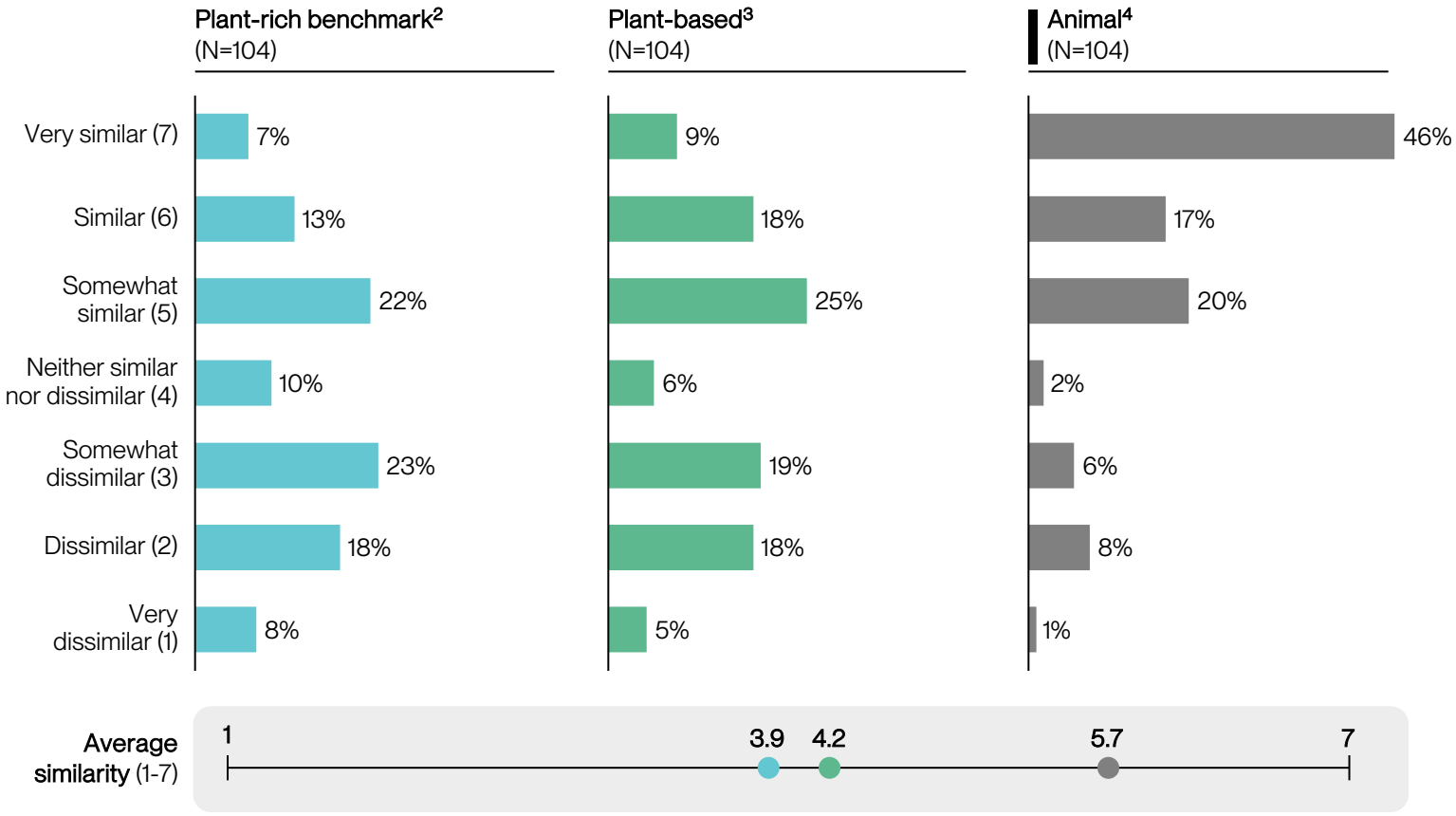
# **Unbreaded Chicken Patty:** Similarity

How would you rate your SIMILARITY of XXX to a typical unbreaded chicken patty?

**Similarity,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)







# Takeaways

## Plant-rich unbreaded chicken patty not considered similar to a typical product

- Only 20% rated plant-rich as ‘similar’ or ‘very similar’ to a typical unbreaded chicken patty (versus 63% for animal).

## Plant-rich unbreaded chicken patty performs slightly ahead of plant-based

- Average similarity rating 4.2pts for plant-rich (versus 3.9pts for plant-based).

1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. 1 commercially available plant-rich unbreaded chicken patty product.
3. Based on brand-level performance in previous rounds of sensory testing.
4. The highest retail sales volume animal unbreaded chicken patty selected for its representativeness of the animal unbreaded chicken patty category.

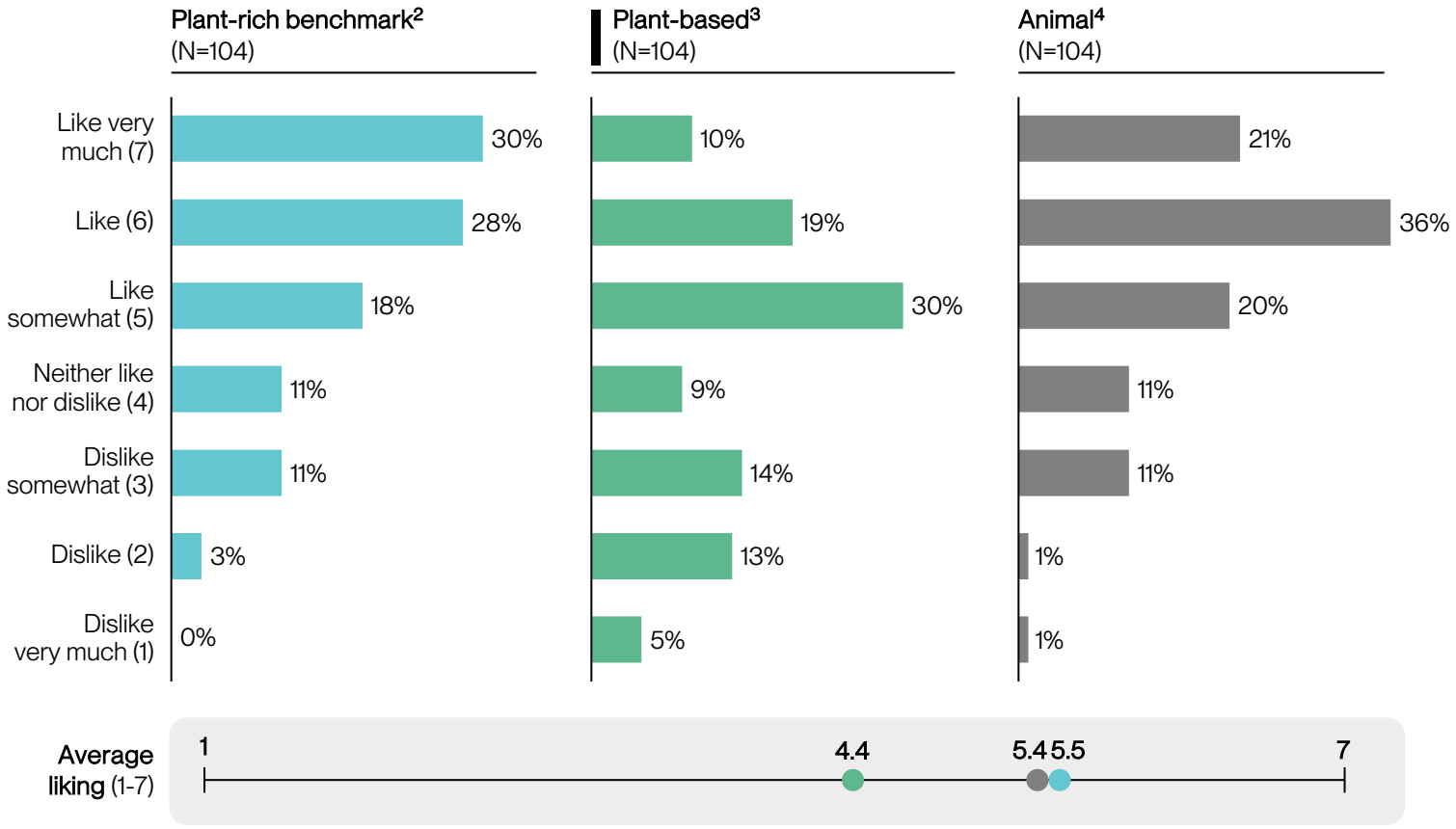
# Unbreaded Chicken Patty: Flavor

How would you rate your FLAVOR of unbreaded chicken patty XXX?

**Flavor,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)







## Takeaways

### Plant-rich narrowly beats animal on flavor

- 58% rated plant-rich flavor 'like' or 'like very much' (versus 57% for animal).

### Plant-rich outperforms plant-based on flavor

- Average flavor liking 5.4pts for plant-rich (versus 4.4pts for plant-based).

1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. 1 commercially available plant-rich unbreaded chicken patty product.
3. Based on brand-level performance in previous rounds of sensory testing.
4. The highest retail sales volume animal unbreaded chicken patty selected for its representativeness of the animal unbreaded chicken patty category.

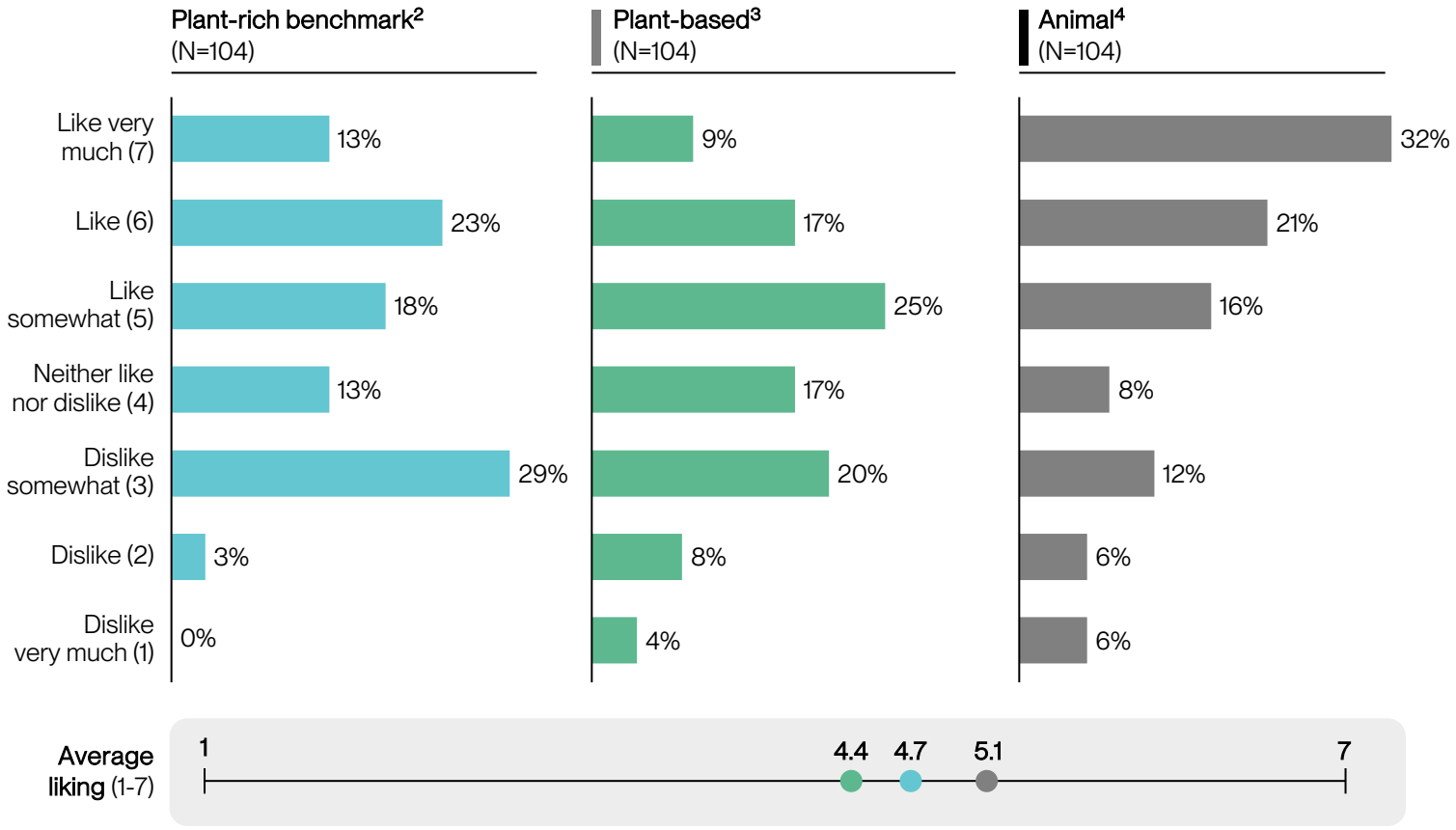
# Unbreaded Chicken Patty: Texture

How would you rate your TEXTURE of unbreaded chicken patty XXX?

**Texture,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)







## Takeaways

### Opportunity for plant-rich to improve texture

- Only 36% rated plant-rich 'like' or 'like very much' (versus 53% for animal).

### Plant-rich ahead of plant-based on texture

- Average liking 4.7pts for plant-rich (versus 4.4pts for plant based).

1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. 1 commercially available plant-rich unbreaded chicken patty product.
3. Based on brand-level performance in previous rounds of sensory testing.
4. The highest retail sales volume animal unbreaded chicken patty selected for its representativeness of the animal unbreaded chicken patty category.

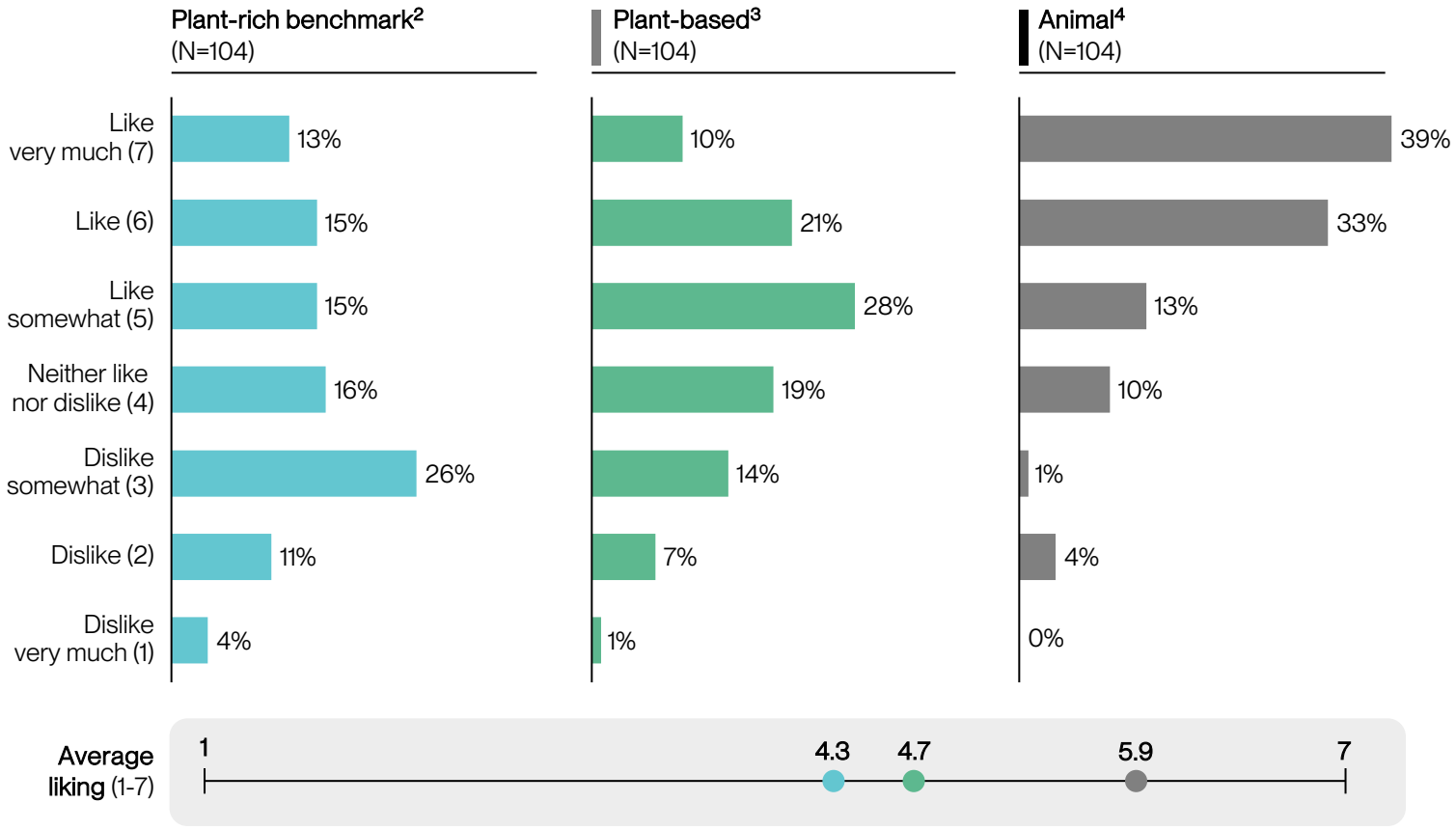
# **Unbreaded Chicken Patty:** Appearance

How would you rate your APPEARANCE of unbreaded chicken patty XXX?

**Appearance,** % of participants

Statistical Significance Testing against Plant-rich average[1]

Extremely significant (p<.01) | Very significant (p<.05) | Significant (p<.1)




# Takeaways

## Plant-rich is behind animal and plant-based on appearance

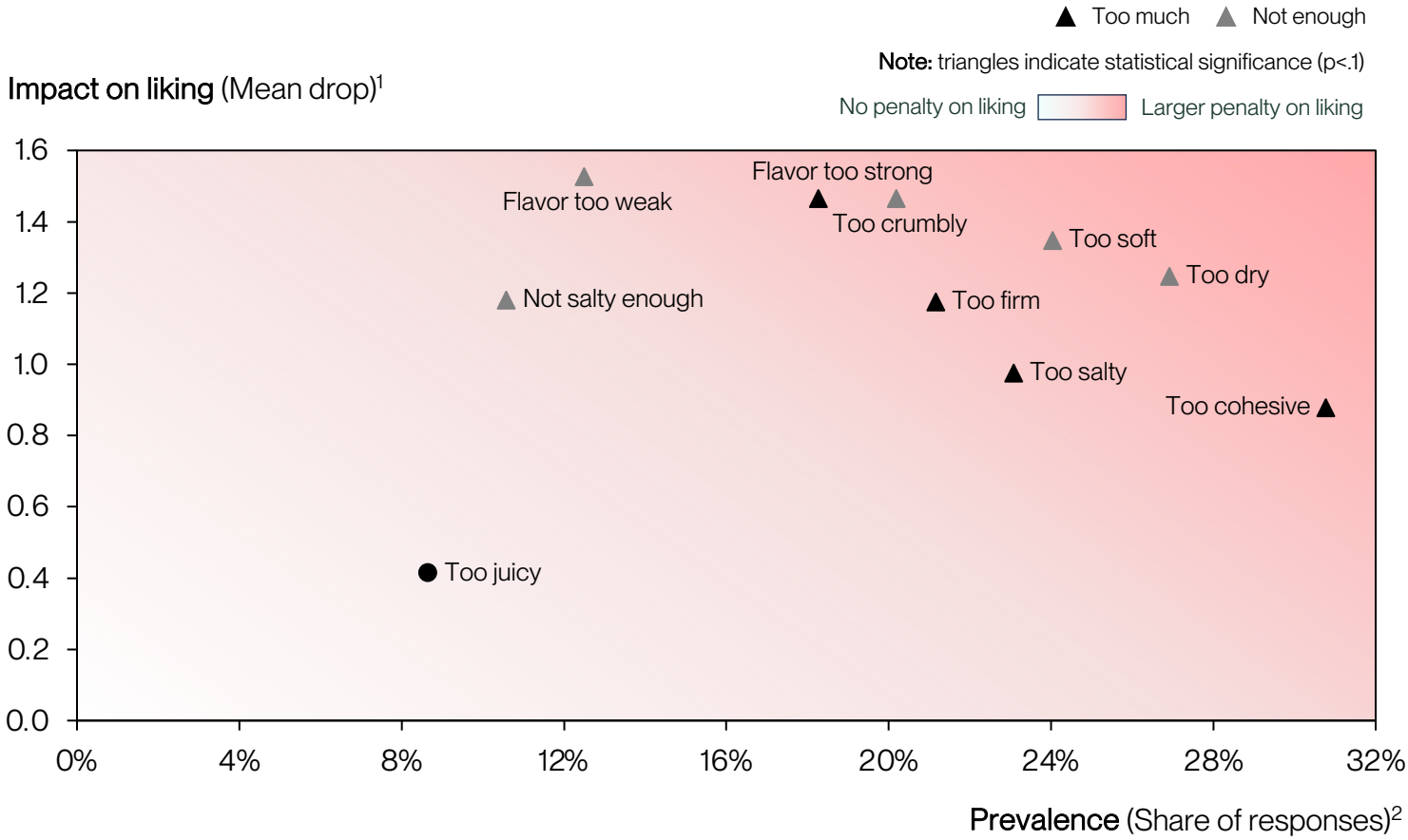
- Only 28% rated plant-rich 'like' or 'like very much' (versus 72% for animal).
- Average liking 4.3pts for plant-rich (versus 4.7pts for plant-based).

1. Calculated using Chi-Squared Test to measure whether two distributions are different.
2. 1 commercially available plant-rich unbreaded chicken patty product.
3. Based on brand-level performance in previous rounds of sensory testing.
4. The highest retail sales volume animal unbreaded chicken patty selected for its representativeness of the animal unbreaded chicken patty category.

# **Unbreaded Chicken Patty:** Top R&D Opportunities

Prioritization framework for identifying attributes with large impacts on liking

**Penalty analysis using responses on 'just-about-right' questions,** Mean drop and Prevalence




## Takeaways

### Prioritize flavor balance during product development

- 'Flavor too strong' and 'flavor too weak' each had high impacts to liking (~1.5pt drop).

### Avoid crumbly, soft, or dry textures

- 20-28% rated patties 'too crumbly,' 'too soft,' or 'too dry,' with a 1.2-1.4pt impact to liking.

### Balance cohesion

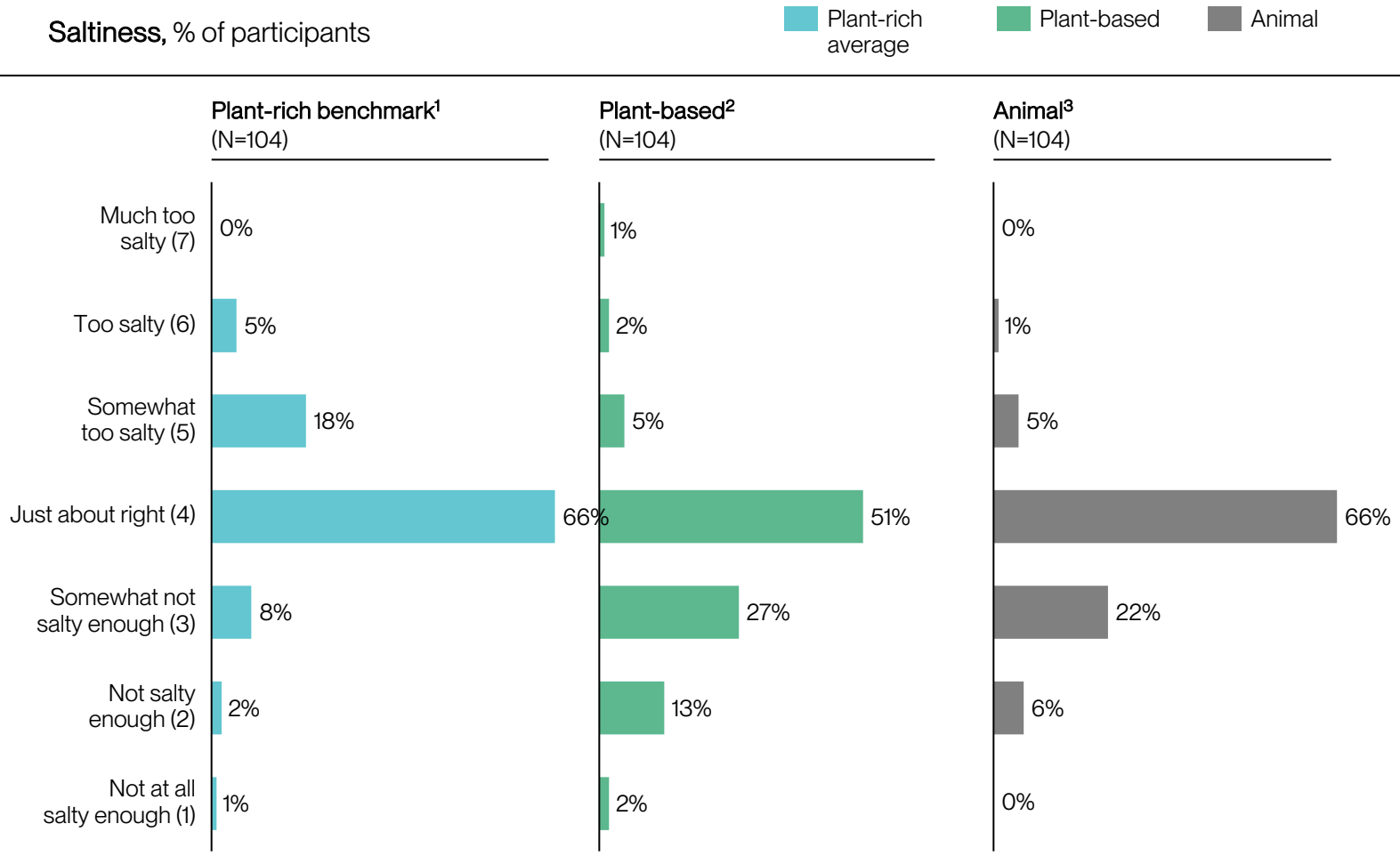
- Almost 33% of participants reported patties were 'too cohesive,' with a 0.9pt impact to liking.

1. The average change in overall liking on 7pt scale for products for all responses using the relevant attribute as a descriptor compared to the mean liking for all products rated 'just about right' on that attribute. Calculated as Mean Liking (JAR) minus Mean Liking (descriptor used).
2. Share of responses for all plant-rich products in this category in each direction for each attribute.

# **Unbreaded Chicken Patty:** Saltiness

How would you rate your SALTINESS of unbreaded chicken patty XXX?

**Saltiness,** % of participants




## Takeaways

### Plant-rich performs well on saltiness

- 66% rated saltiness of unbreaded chicken patty 'just about right' for both plant-rich and animal products.

### Plant-rich outperforms plant-based on saltiness

- 66% rated unbreaded chicken patty 'just about right' (versus 51% for plant-based).

### Plant-rich tended to be too salty

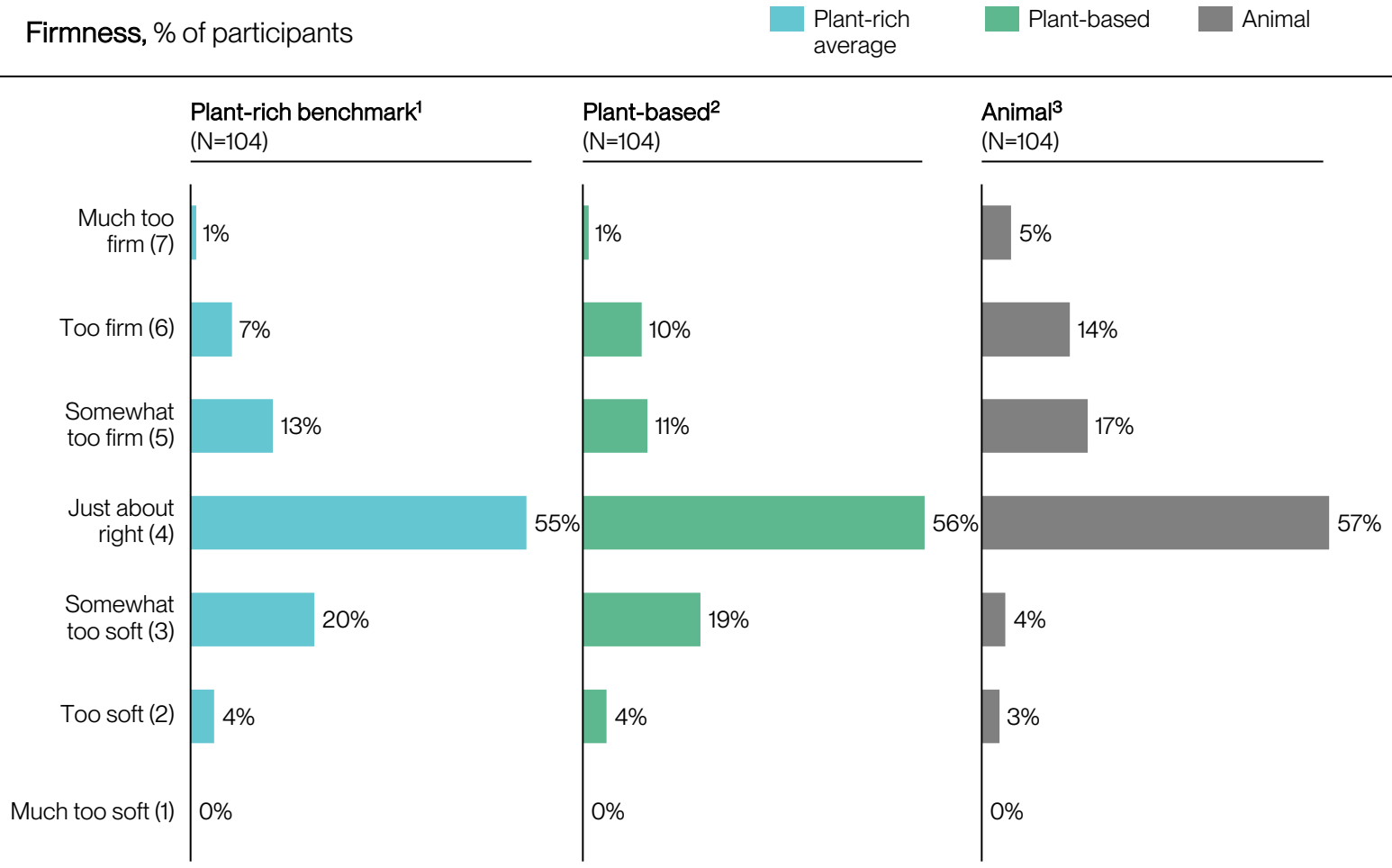
- 'Too salty' had a smaller negative impact to liking than 'not salty enough' (0.9pts versus 1.2pts).

1. 1 commercially available plant-rich unbreaded chicken patty product.
2. Based on brand-level performance in previous rounds of sensory testing.
3. The highest retail sales volume animal unbreaded chicken patty selected for its representativeness of the animal unbreaded chicken patty category.

# **Unbreaded Chicken Patty:** Firmness

How would you rate your FIRMNESS of unbreaded chicken patty XXX?

**Firmness,** % of participants




# Takeaways

## Plant-rich comparable to animal and plant-based on firmness

- 55% rated plant-rich 'just about right' firmness (versus 57% for animal and 56% for plant-based).

## Opportunity to adjust firmness

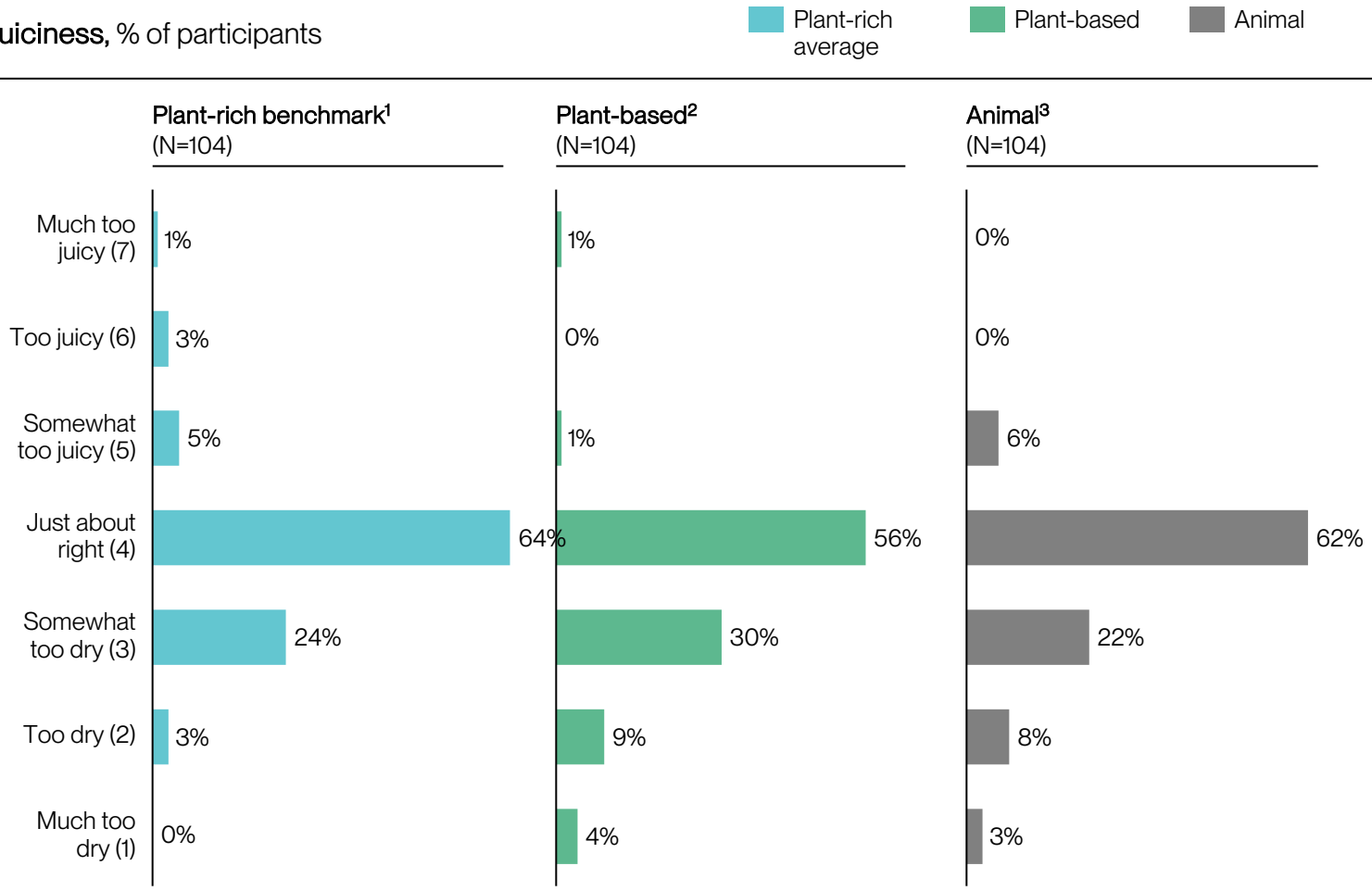
- 21% rated plant-rich as 'too firm' while 24% rated it as 'too soft.'

1. 1 commercially available plant-rich unbreaded chicken patty product.
2. Based on brand-level performance in previous rounds of sensory testing.
3. The highest retail sales volume animal unbreaded chicken patty selected for its representativeness of the animal unbreaded chicken patty category.

# **Unbreaded Chicken Patty:** Juiciness

How would you rate your JUICINESS of unbreaded chicken patty XXX?

**Juiciness,** % of participants




## Takeaways

### Plant-rich comparable to animal on juiciness

- 64% rated plant-rich 'just about right' juiciness (versus 62% for animal).

### Plant-rich outperforms plant-based on juiciness

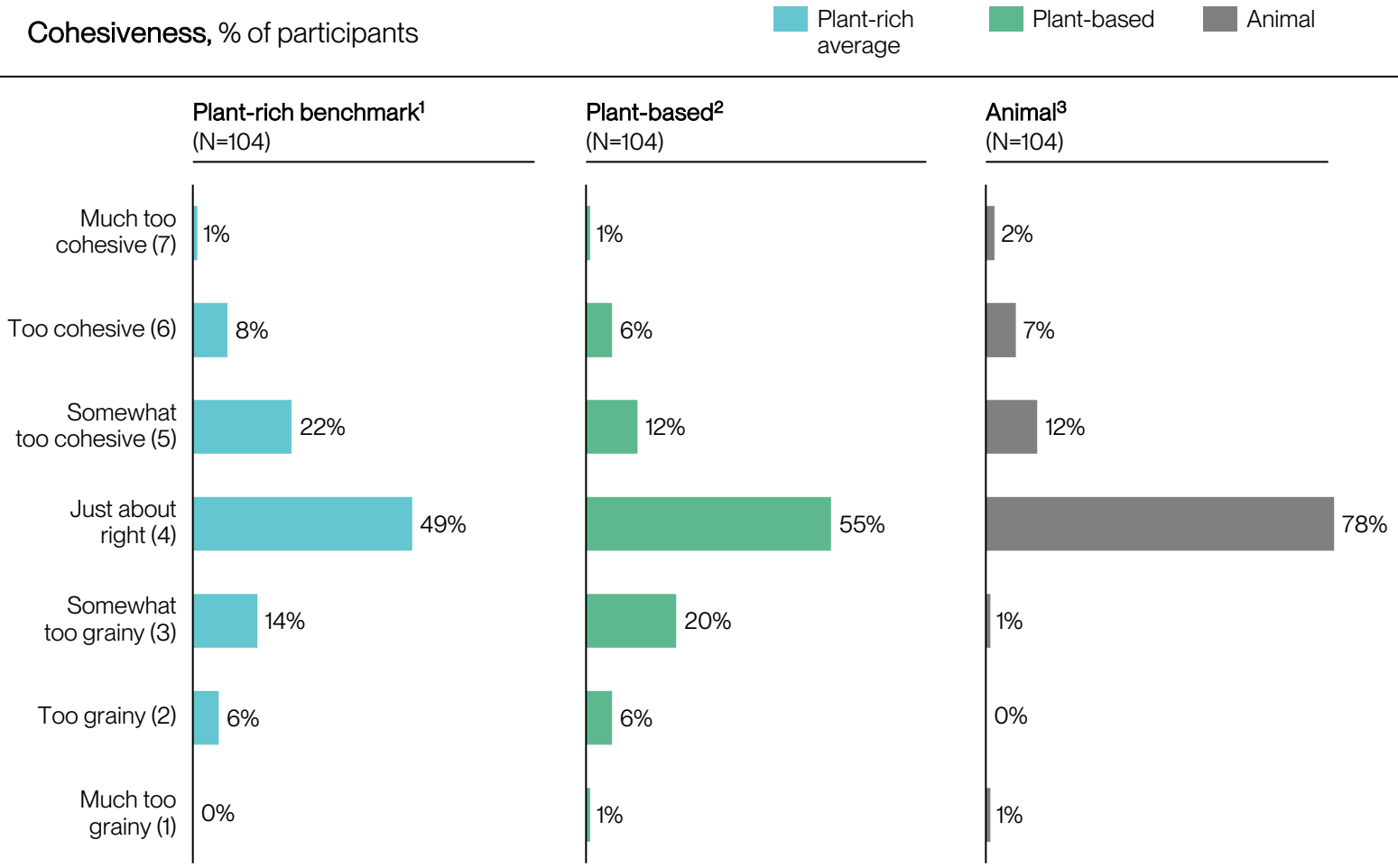
- 64% rated plant-rich 'just about right' juiciness (versus 56% for plant-based).

1. 1 commercially available plant-rich unbreaded chicken patty product.
2. Based on brand-level performance in previous rounds of sensory testing.
3. The highest retail sales volume animal unbreaded chicken patty selected for its representativeness of the animal unbreaded chicken patty category.

# **Unbreaded Chicken Patty:** Cohesiveness

How would you rate your COHESIVENESS of unbreaded chicken patty XXX?

**Cohesiveness,** % of participants




# Takeaways

## Opportunity for plant-rich to improve cohesiveness

- Only 49% rated plant-rich 'just about right' (versus 78% for animal).

## Plant-rich behind plant-based on cohesiveness

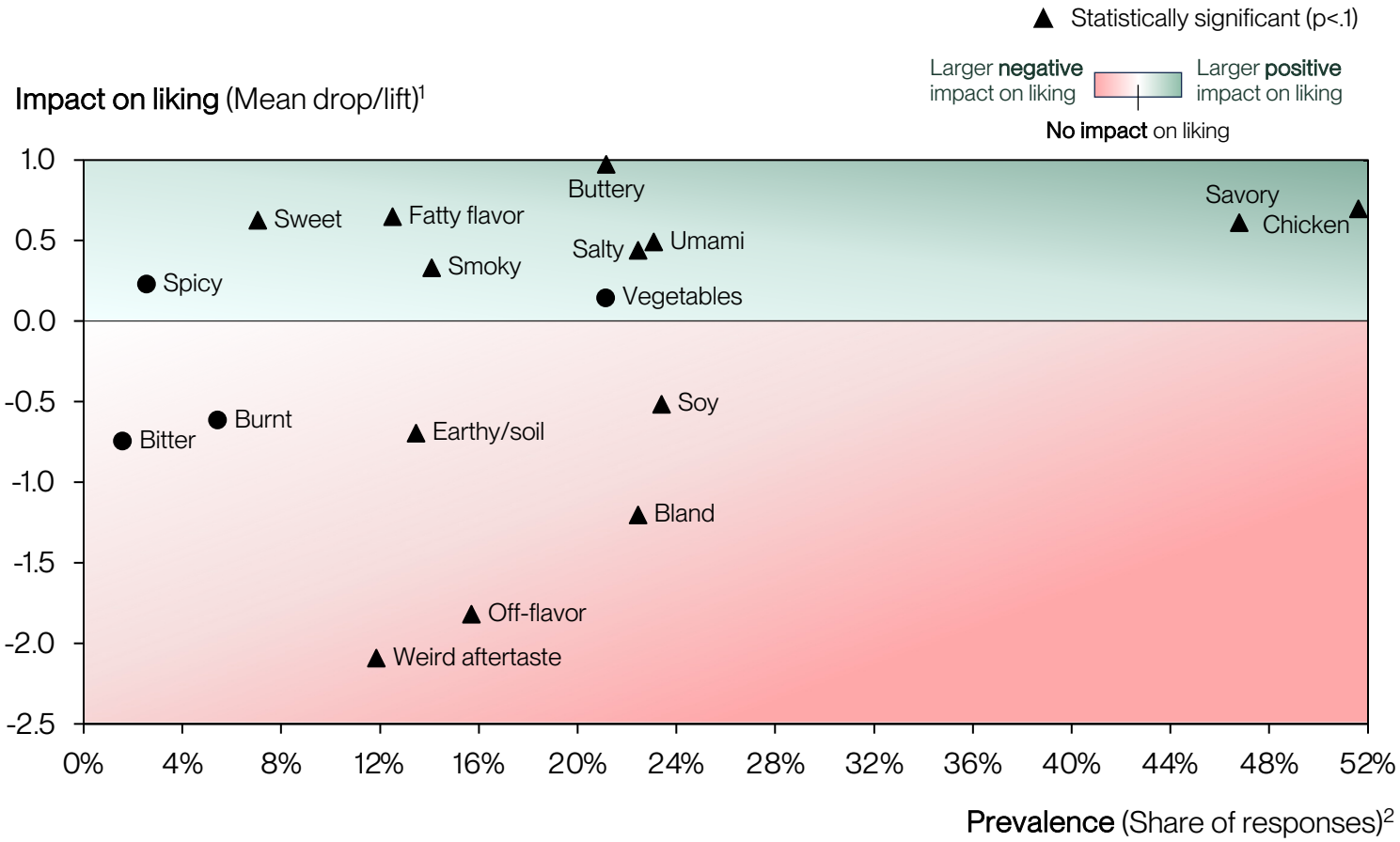
- Plant-rich 6% behind plant-based on 'just about right' cohesiveness rating.

1. 1 commercially available plant-rich unbreaded chicken patty product.
2. Based on brand-level performance in previous rounds of sensory testing.
3. The highest retail sales volume animal unbreaded chicken patty selected for its representativeness of the animal unbreaded chicken patty category.

# **Unbreaded Chicken Patty:** Top Flavor R&D Opportunities

Prioritization framework for identifying attributes with large impacts on liking

**Penalty analysis on flavor using check-all-that-apply responses,** Mean drop/lift and Prevalence




# Takeaways

## Focus on savory and chicken flavors during product development

- Over half of participants reported ‘savory’ and ‘chicken’ flavors, with a 0.6pt impact to liking.

## Avoid off-flavor and weird aftertaste

- ‘Off-flavor’ and ‘weird aftertaste’ caused the biggest drop in liking ~2.0pts.

## Enhance buttery, fatty, and sweet flavors

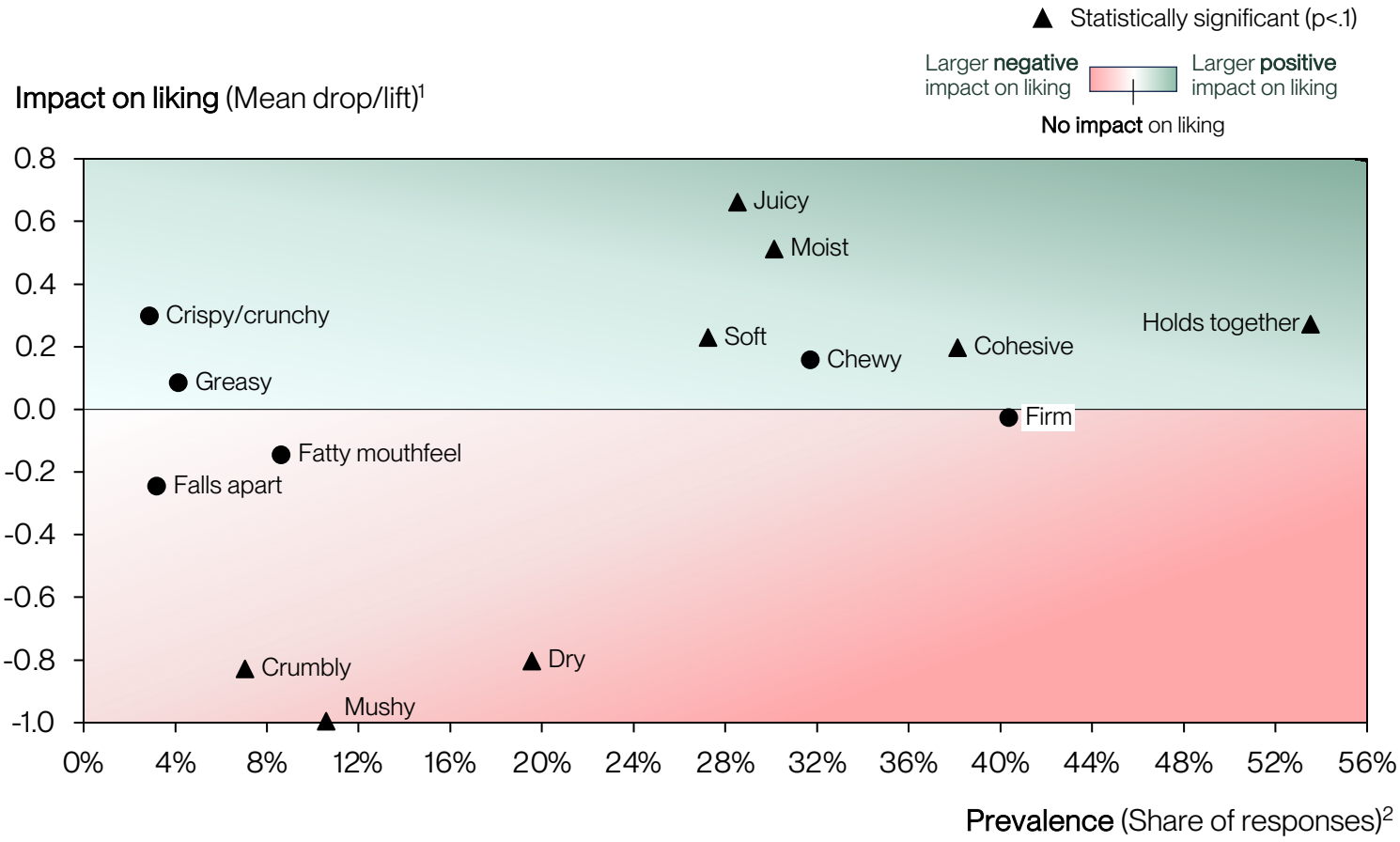
- ‘Buttery’ flavors had the highest impact to liking (1pt).
- ‘Fatty flavor’ and ‘sweet’ also had large positive impacts to liking (0.6pts)

1. The average change in overall liking on 7pt scale for products for all responses using the relevant attribute as a descriptor compared to the mean liking for all products rated ‘just about right’ on that attribute. Calculated as Mean Liking (JAR) minus Mean Liking (descriptor used).
2. Share of responses for all products in this category (including animal, plant-rich, and plant) in each direction for each attribute.

# **Unbreaded Chicken patty:** Top Texture R&D Opportunities

Prioritization framework for identifying attributes with large impacts on liking

**Penalty analysis on texture using check-all-that-apply responses,** Mean drop/lift and Prevalence




## Takeaways

### Prioritize juicy and moist textures

- Each was associated with a ~0.6pt increase in liking.

### Avoid mushiness, crumbliness, and dryness

- These texture attributes were associated with a -0.8-1.0pt decrease in liking.

### Participants noticed if patties held together

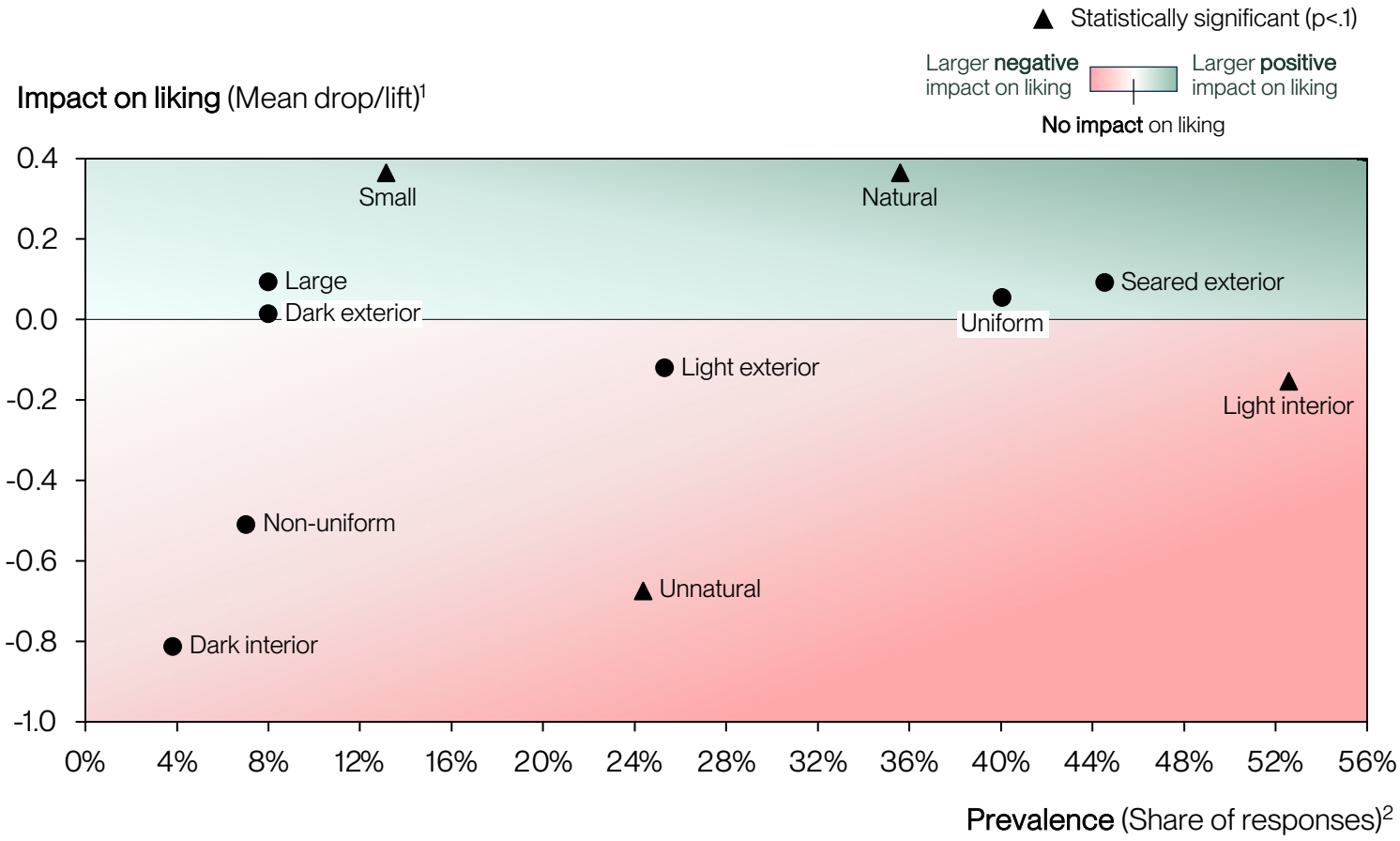
- 53% described unbreaded chicken patties as 'holds together,' which was associated with a 0.2pt increase in liking.

1. The average change in overall liking on 7pt scale for products for all responses using the relevant attribute as a descriptor compared to the mean liking for all products rated 'just about right' on that attribute. Calculated as Mean Liking (JAR) minus Mean Liking (descriptor used).
2. Share of responses for all products in this category (including animal, plant-rich, and plant) in each direction for each attribute.

# **Unbreaded Chicken Patty:** Top Appearance R&D Opportunities

Prioritization framework for identifying attributes with large impacts on liking

**Penalty analysis on appearance using check-all-that-apply responses,** Mean drop/lift and Prevalence




# Takeaways

## Prioritize natural appearance during product development

- 'Natural' appearance was associated with a 0.4pt lift in liking (versus 'unnatural' appearance associated with a 0.7pt decrease).

## Participants prefer a seared and darker exterior

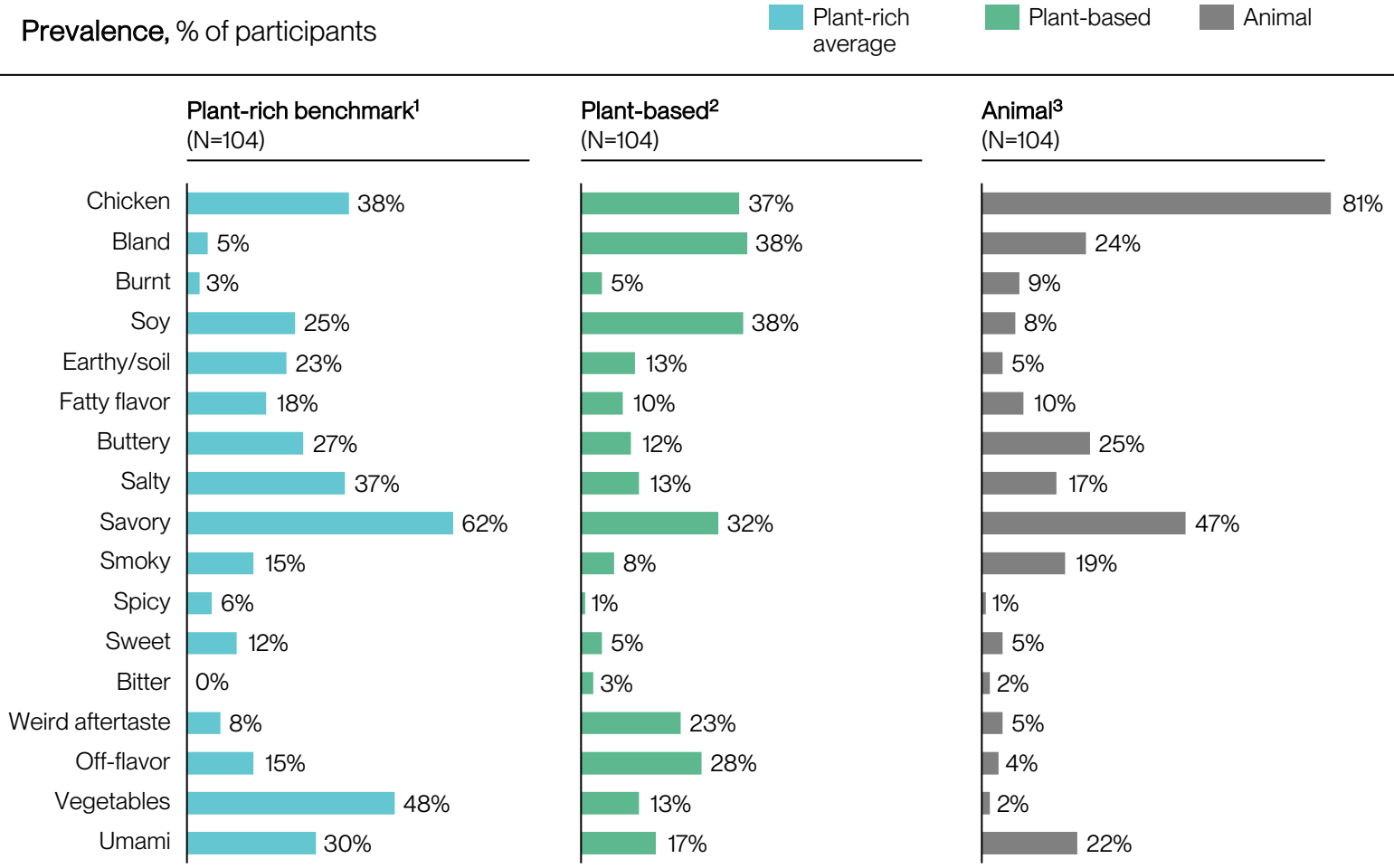
- These attributes led to small lifts in liking versus negative impacts for 'light exterior.'

1. The average change in overall liking on 7pt scale for products for all responses using the relevant attribute as a descriptor compared to the mean liking for all products rated 'just about right' on that attribute. Calculated as Mean Liking (JAR) minus Mean Liking (descriptor used).
2. Share of responses for all products in this category (including animal, plant-rich, and plant) in each direction for each attribute.

# **Unbreaded Chicken Patty:** Flavor Profile

Please check all words or phrases that describe the flavor of XXX.

**Prevalence,** % of participants




## Takeaways

### Plant-rich succeeding at savory flavors

- 62% described plant-rich as ‘savory’ (versus 47% for animal and 32% for plant-based).

### Opportunity for plant-rich to increase chicken flavor

- Only 38% described plant-rich as ‘chicken’ (versus 81% for animal). Performance was comparable to plant-based at 37%.

### Plant-rich should decrease soy and earthy/soil flavors

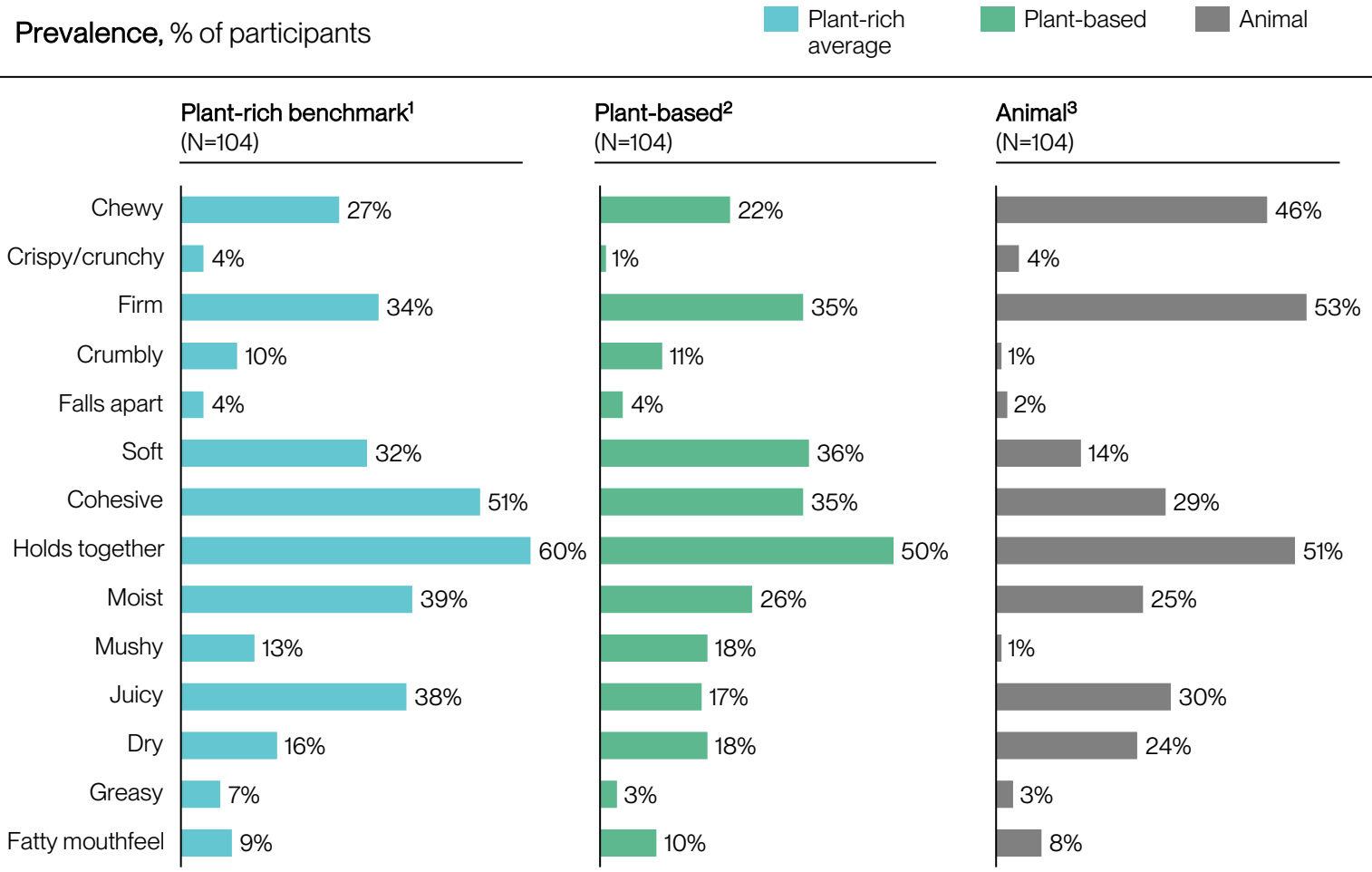
- Plant-rich was 18% higher on ‘soy’ and ‘earthy/soil’ flavors than animal. Each of these flavor attributes was associated with a decrease in liking.

1. 1 commercially available plant-rich unbreaded chicken patty product.
2. Based on brand-level performance in previous rounds of sensory testing.
3. The highest retail sales volume animal unbreaded chicken patty selected for its representativeness of the animal unbreaded chicken patty category.

# **Unbreaded Chicken Patty:** Texture Profile

Please check all words or phrases that describe the texture of XXX.

**Prevalence,** % of participants




## Takeaways

### Plant-rich outperforms animal on moist and juicy

- 39% described plant-rich as ‘moist’ (versus 25% for animal) and 38% described plant-rich as ‘juicy’ (versus 30% for animal).

### Plant-rich more cohesive than animal

- 51% described plant-rich as ‘cohesive’ (versus 29% for animal), which was associated with a 0.5pt uptick in liking.

### Opportunity for plant-rich to decrease crumbliness and mushiness

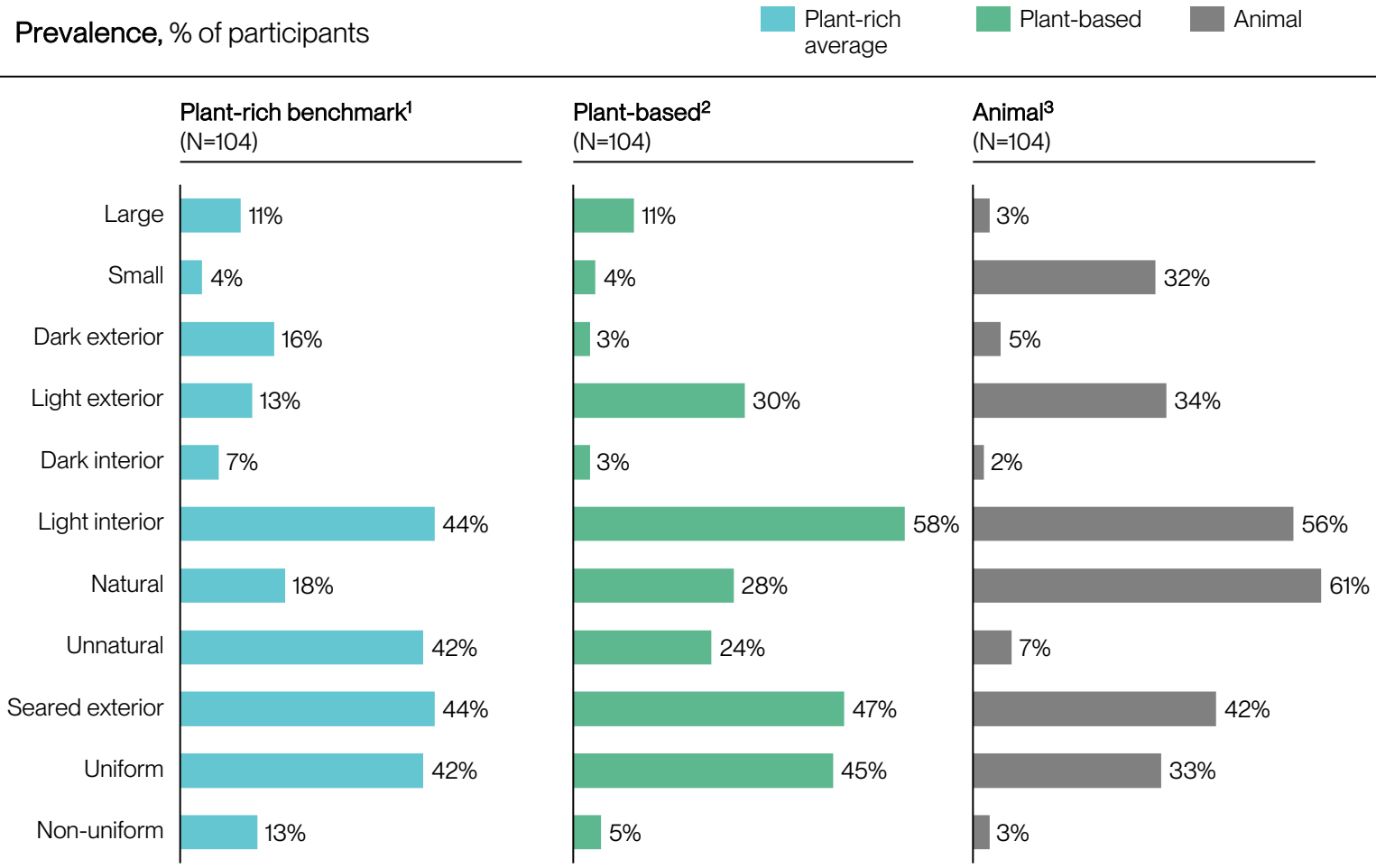
- Participants were more likely to described plant-rich product as ‘crumbly’ or ‘mushy’ than the animal product.

1. 1 commercially available plant-rich unbreaded chicken patty product.
2. Based on brand-level performance in previous rounds of sensory testing.
3. The highest retail sales volume animal unbreaded chicken patty selected for its representativeness of the animal unbreaded chicken patty category.

# **Unbreaded Chicken Patty:** Appearance Profile

Please check all words or phrases that describe the appearance of XXX.

**Prevalence,** % of participants




## Takeaways

### Opportunity for plant-rich to improve natural appearance

- Only 18% described plant-rich as appearing ‘natural’ (versus 61% for animal). Similarly, 42% described plant-rich as ‘unnatural’ (versus 7% for animal).

### Plant-rich succeeds in creating a seared exterior

- 44% described plant-rich as having a ‘seared exterior’ (versus 47% for plant-based and 42% for animal).

1. 1 commercially available plant-rich unbreaded chicken patty product.
2. Based on brand-level performance in previous rounds of sensory testing.
3. The highest retail sales volume animal unbreaded chicken patty selected for its representativeness of the animal unbreaded chicken patty category.

# Conclusions

## Making Sense of the Present

Plant-rich products hold potential as a taste-forward climate solution.

- **The data is clear: new category innovation is imperative to hitting our food system's climate goals.** While there is no silver bullet solution for sustainable food system transformation, we need more consumer-driven tools in our decarbonization toolkit.
- **With significant consumer interest and measurable sensory benefits**, **plant-rich meat is primed to help.** Plant-rich meat can help the food industry meet consumers where they are and reduce reliance on traditional animal agriculture without compromising taste.

## Taking Action for the Future

Further R&D and consumer trials are necessary to maximize the potential of the plant-rich category.

- **Adding animal-based ingredients to plant-based products is not enough to win consumers.** Thoughtful, iterative R&D with taste-centric design will be essential to the success of the plant-rich category.
- **Plant-rich meat producers must work hard to highlight key product benefits** that resonate with consumers, namely health and sustainability.
- **Consumers rely on restaurants and food service establishments as venues to try new product innovations.** Plant-rich meat companies should prioritize distribution through these channels to meet consumers where they are and drive mainstream adoption.

**Reach out to Tim Dale** (tim@fsi.org) to learn more about how to support the emerging category beyond sensory research.

**Reach out to Caroline Cotto** (caroline@nectar.org) to learn more about leveraging NECTAR's data to make sensory-informed decisions across the value chain.

# NECTAR

nectar.org