Seaweed Consumer Preferences in the U.S.

Survey Report

April, 2025

MAINE AQUACULTURE ASSOCIATION

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This study was supported by funding from the National Sea Grant Program through the Maine Aquaculture Hub (project number #NA18OAR4170103).

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Prepared by: Christian Brayden

Geography: U.S. nationwide, nationally representative sample

n=2,035

Executive Summary

Maine's farmed seaweed sector has grown exponentially over the last 10 years, with the vast majority of its seaweed being consumed in a value-added format. This study reports on a nationally representative survey (n=2,035) to learn more about which consumers are more likely to buy seaweed products, which types of products they would like to purchase, and why they would like to purchase them. This survey builds on top of the prior research on seaweed consumer preferences carried out by the Maine Aquaculture Innovation Center.

After extensive conversations with seaweed growers, harvesters, and processors, ten seaweed-containing products were included in the survey. Each product was included with questions asking how likely a respondent is to purchase that product, and why or why not they would purchase that product. This section, in addition to other questions, revealed that the most important factor driving respondent likelihood to purchase a product with seaweed in it is if the seaweed is in a product that the respondent is familiar with and enjoys. More specifically, respondents indicated that they are drawn to products where they already know that they like the base product (e.g. teriyaki sauce or potato chips), and then seaweed is included as an addition (e.g. teriyaki sauce with seaweed or potato chips dusted with seaweed).

The second-most important factor to respondents is that they want food that is ready-to-eat, including snacks that contain seaweed. Health benefits rank as the third-most important factor and are a stronger consideration amongst those who have previously consumed seaweed. Age was also revealed to be a driver for future seafood consumption, as those under 45 indicated a higher likelihood to purchase seaweed products. Although roughly half of the respondents have not previously consumed seaweed, many of them still indicated an interest in trying seaweed. These respondents suggested that they would need to try seaweed, likely for free, before they could commit to purchasing a new product on their limited grocery budget.

The data collected from this survey show that those interested in creating new products with seaweed should keep top of mind, in order, the familiarity and draw of the base product to which seaweed is added, followed by the form of the product (e.g. ready-to-eat snacks), and then its health benefits.

Introduction

This survey builds on top of the research on seaweed consumer preferences carried out by the Maine Aquaculture Innovation Center. This work focuses more on specific seaweed products and consumer motivation as to why a consumer would or would not buy a certain seaweed product.

The products included in this survey were selected after two phases of development. The first phase included conducting research on previous seaweed recipe development, consumer preferences work, and new products. The research was focused on work in the U.S., but also explored seaweed market development efforts in Asia and Europe. Following the research phase, the second phase included a series of meetings carried out with seaweed growers and processors across Maine and the U.S. to learn more specifically what they would like to learn from the survey, and what product forms they would like to be included. The products included were a combination of the two phases, with more emphasis placed on what growers and processors sought from this survey.

The survey administration was led by Christian Brayden at the Maine Aquaculture Association. The survey garnered responses from a U.S. nationwide, representative sample where n=2,035. Brayden worked with Centiment, a research platform who provided the audience panel for the survey.

Respondents were asked a series of questions about their seaweed consumption habits, purchasing habits, levels of familiarity, and their motivation and interest in purchasing seaweed in the future. Next, they were asked whether or not they would purchase 10 specific products containing seaweed, and why they would or would not purchase each product. Last, respondents were asked about their sociodemographic information.

Methods

Consumer Survey

This work was launched upon requests from within the Maine aquaculture sector to learn more about who is buying seaweed, and more importantly, *why* they are buying seaweed. This builds on top of the Maine Aquaculture Innovation Center's previously mentioned work on seaweed consumer preferences. Christian Brayden, Project Manager at the Maine Aquaculture Association, worked with an advisory panel of six companies representing seaweed growers, harvesters, processors, and culinary experimenters. The advisory panel guided Brayden in developing the survey format and questions to be included. Consensus landed on including 10 specific products for respondents to (a) rate the likelihood that they would purchase the product and (b) explain why they gave each product such a rating (e.g. health benefits, I like seaweed, it does/does not sound good, etc.). The survey also included questions regarding respondents' seafood consumptions patterns, motivation for purchasing seafood, where they would like to see seaweed, seaweed product forms, seaweed marketing terms, and demographic information.

The findings in this report detail responses from a nationwide consumer survey. A total of 2,035 completed responses were received. The survey was administered by the Maine Aquaculture

Association, led by Christian Brayden. Centiment, a research platform, provided the audience panel for the survey. The survey was administered via Centiment's online survey platform in September of 2023. Following initial review and analysis of the data in Microsoft Excel, Brayden shared the preliminary findings with the advisory panel, who provided feedback. Brayden then made corresponding edits, and included the requested, additional analyses. This process was then repeated. Upon satisfactory drafts from the advisory panel, Brayden then reviewed the draft within the Maine Aquaculture Association and continued to apply edits and additional analysis.

Findings

The first section of findings, shown below, represent the findings across all survey respondents. In following sections, survey responses are broken down across different variables including gender, age, and whether or not respondents previously consumed seaweed.

Specific Product Ratings

Respondents were asked to indicate whether or not they would purchase ten specific products (named below) with a brief, 1-2 sentence description. After indicating (from 1 [would not purchase] to 10 [would purchase]) whether or not they would purchase a product, they were asked why they would, or would not, purchase the product. The products are listed in order of preference by respondents' average rating in Figure 1:

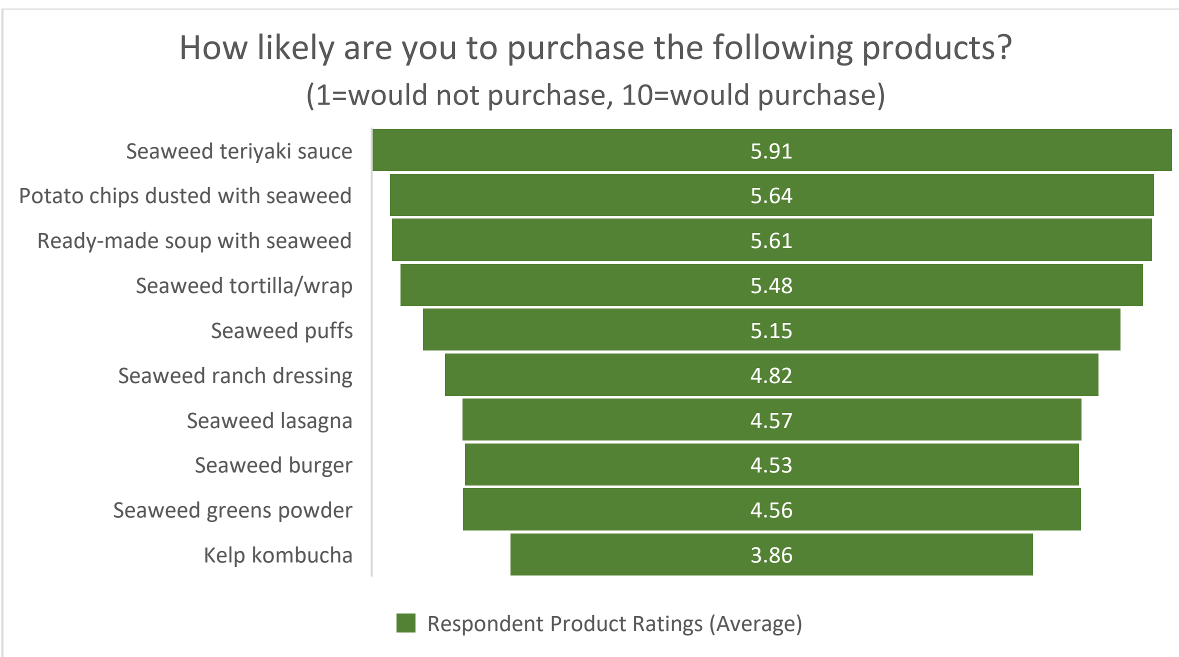

Figure 1. Seaweed product ranking

While Figure 1 may show how respondents ranked the products, it does not reveal *why* respondents selected these products in this order. To answer this question, respondents were asked "Why would you purchase this product [e.g. seaweed teriyaki sauce, seaweed burger, etc.]?" They were encouraged to select all options that applied. While responses may vary on a product-by-product basis, across all products a clear winner emerged and can be seen in Figure 2, below. Respondents rated highest the products where they liked the base product into which seaweed was added. This indicates, for example, that the chips, teriyaki sauce, and ready-made soup were rated highly because people already liked the products before seaweed was added. Health benefits received the second-most selections, but preference for the base product still received 41% more selections. A notable number of respondents chose the given products because they already like seaweed or because they are seeking culinary diversity. Umami flavor, novel and/or trendy, environmental sustainability, and artisanal/gourmet appeal all received a similar, smaller number of selections.

For each individual product, liking the base product (e.g. teriyaki sauce) remained the primary motivation. However, two items varied from the trend – seaweed greens powder and kelp kombucha. For these products, which overall ranked as the least likely to be purchased, health benefits were ranked as the number one reason. It is expected that the ranking is due to association between greens powder, kombucha, and "health," as opposed to items such as potato chips or seaweed puffs – which are often not considered "health"-focused foods. The full set of responses for individual products can be found in the appendix at the end of this document.

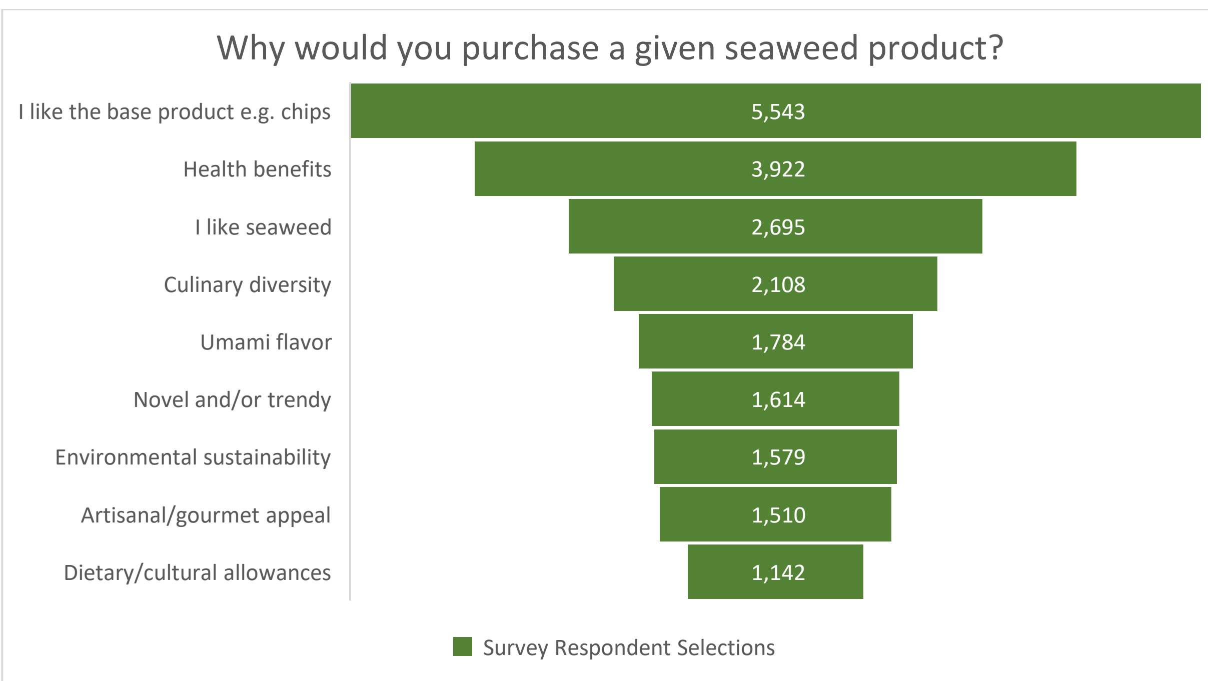

Figure 2. Seaweed product purchase motivation

Respondents were also asked "Why would you not purchase this product?" They were again encouraged to select all answers that applied to them. The most-selected answer remained the simplest, as shown below in Figure 3 – the product does not sound good. The next most likely reason to not buy a given product is because the respondent either does not like seaweed, or does not know if they like/have ever had seaweed. Last, texture, cost, allergies and sensitivities, and dietary and/or cultural restrictions were selected as the lowest reasons for not purchasing a given product. The top three combined responses seem to indicate that the biggest barrier to consuming seaweed is a lack of knowledge or familiarity.

Unfortunately, due to a survey coding error, it is not known exactly how many people chose not to purchase a product because they did not know how to use the product. Extrapolating from the data from the one product on which the 'do not know how to use' option appeared, it is expected that this category would have ranked between texture and not liking the base product for all products.

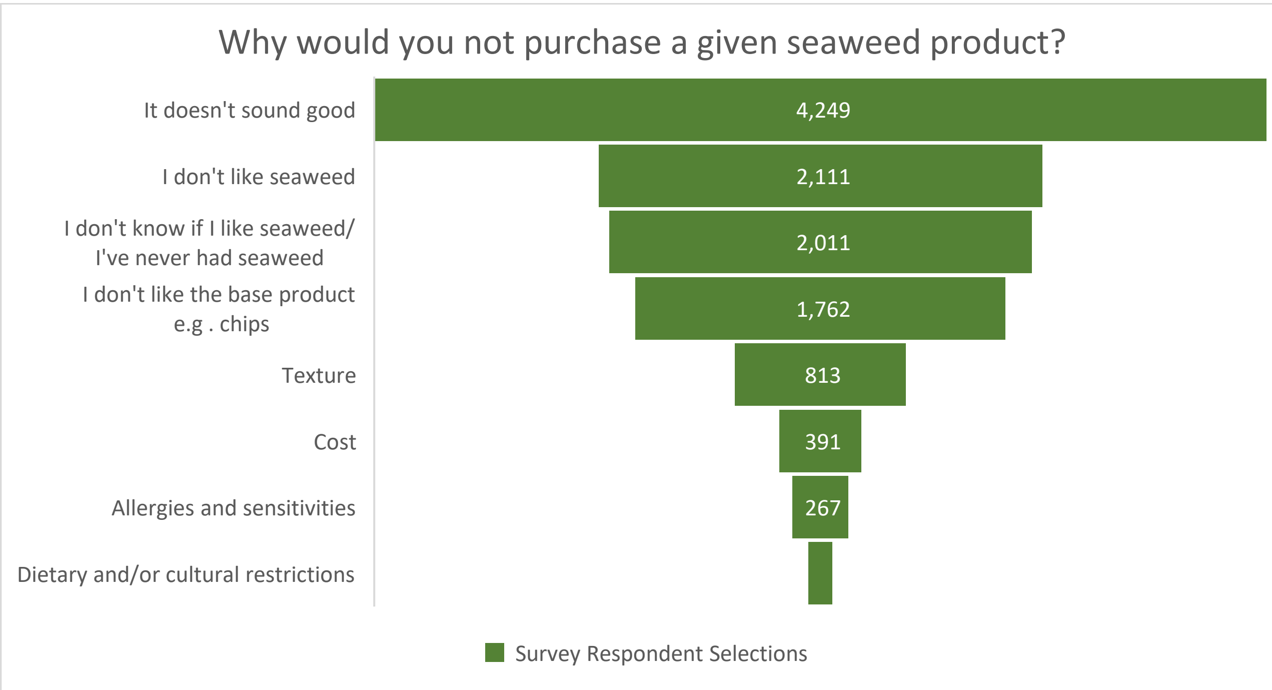

Figure 3. Rationale for not selecting a seaweed product

Consumption Patterns, Product Form, and Motivation

The following section reports on the respondents' current and future patterns of seafood and seaweed consumption. The responses also touch on participants' desired product forms, names, and more. The section includes responses on participant motivation to purchase seaweed, and addresses what could potentially increase future purchases.

The survey audience panel was chosen to consist of both seafood consumers and non-seafood consumers to learn more about how to increase the appeal of seaweed products across both populations. Respondents were asked "How often do you consume seafood?" As shown in Figure 4, respondents indicated that they consume seafood, on average, slightly less than once per week and more than once per month, which falls in line with national trends.

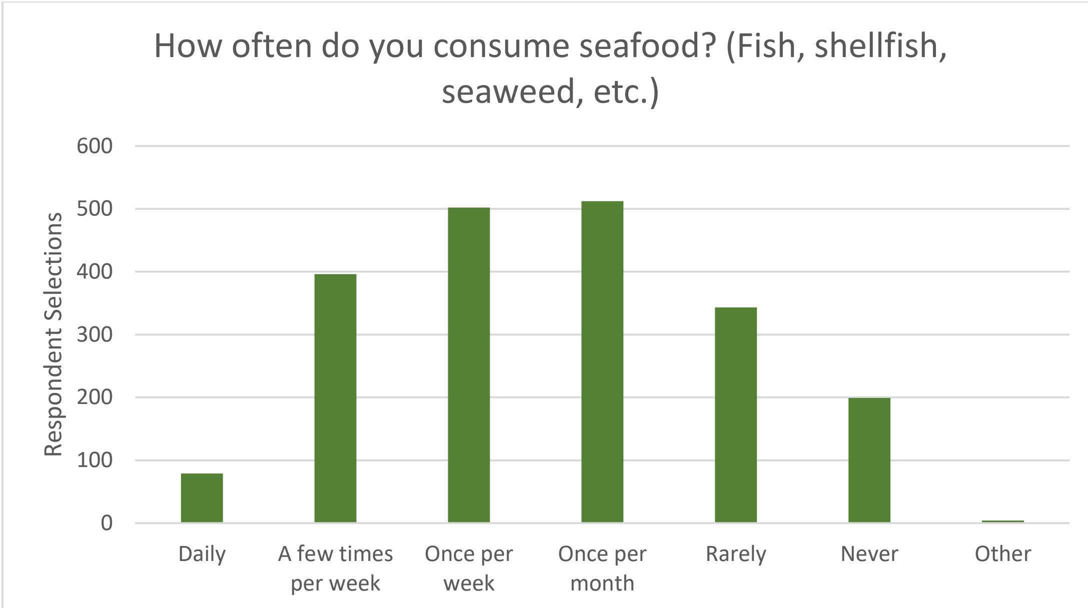

Figure 4. Respondent seafood consumption patterns

To gain more knowledge about respondent consumption and shopping habits, they were asked "Which of the following most accurately describes your eating habits?" Findings can be found below in Figure 5. The Standard American Diet makes up the vast majority of eating habits of respondents. The Standard American Diet, or sometimes called the Western pattern diet, is characterized by high intake of pre-packaged foods, refined grains, red meat, and processed meat, and is low in fish, fruits, nuts, and vegetables, amongst other factors. The second largest category is flexitarian, or semi-vegetarians who occasionally eat meat or fish. This has been identified as an increasing category. It is worth noting that flexitarians *do* consume other types of seafood on occasion, not only seaweed. This category was closely followed by vegetarian. A mediterranean diet, often high in seafood, follows vegetarian. Amongst all of the categories, nearly all do include seafood in their diet, with the exceptions of vegetarian and vegan. That being said, seaweed can still be a part of any of the diets listed. The prior work provided by the Maine Aquaculture Innovation Center showed that their respondents were motivated to purchase seaweed due to members of their household adhering to the following diets: keto, paleo, pescatarian, vegan, and vegetarian diets, along with those who "do not adhere to a particular diet."

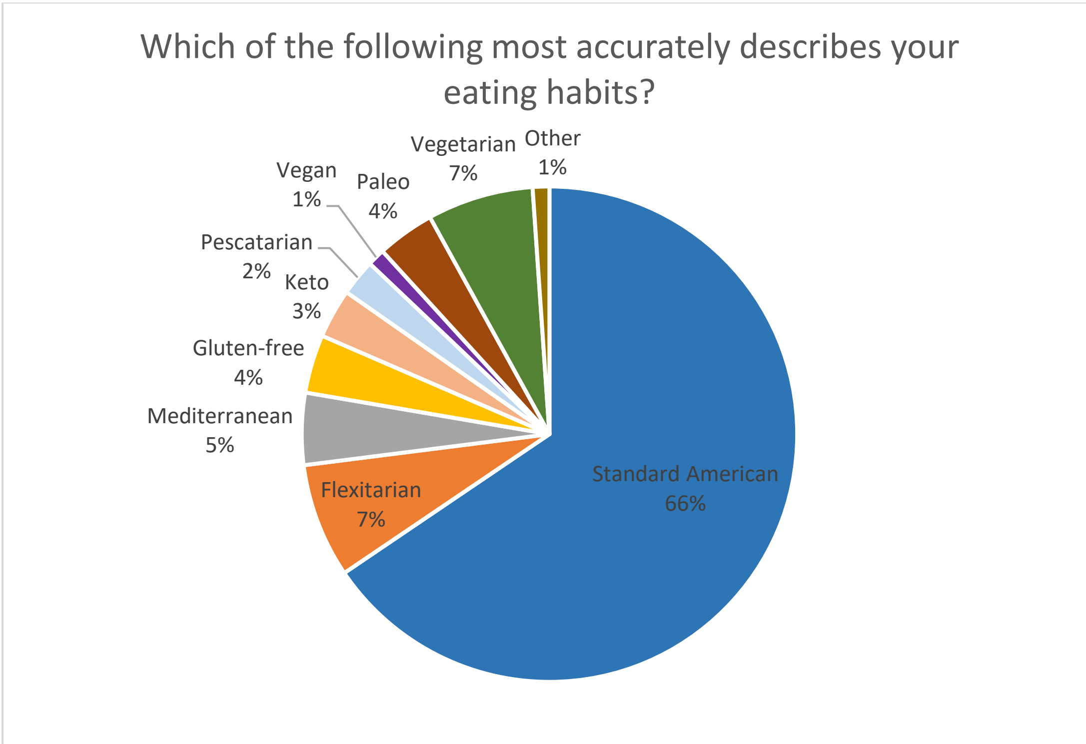

Figure 5. Eating habits of respondents

Respondents were asked "Where do you primarily shop for food?" Findings are shown below in Figure 6. As expected, the vast majority of respondents primarily shop for their food at a grocery store. However, a notable number of respondents also shop at both an online grocery and in-person natural foods stores – both of which could be strong markets for seaweed products, especially the latter.

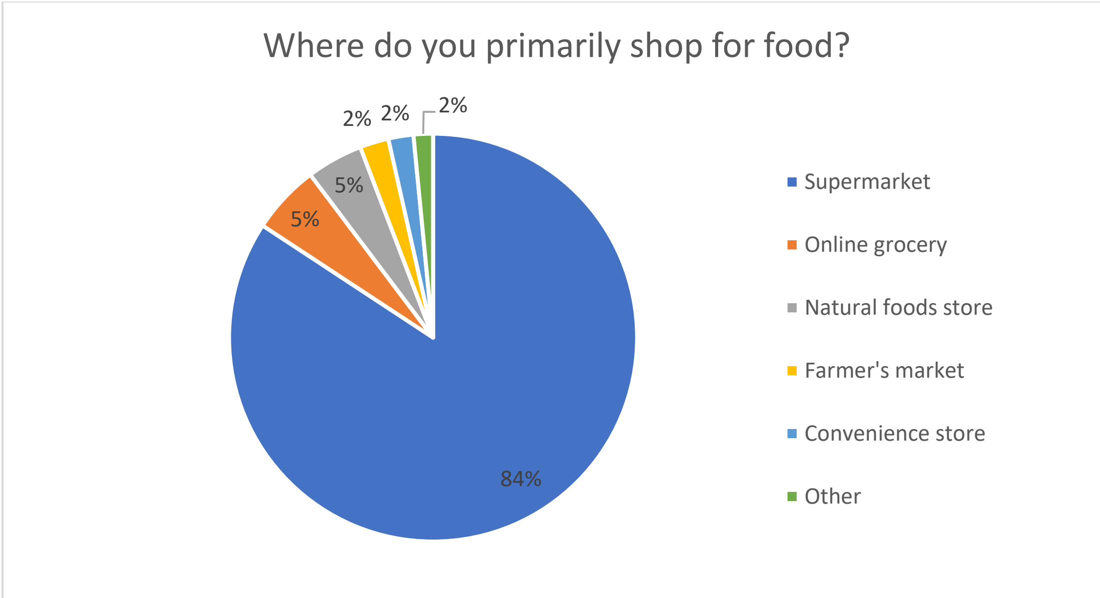

Figure 6. Primary location of food shopping for respondents

Respondents were asked “What are your biggest barriers to purchasing seaweed products?” They were encouraged to select all that apply. Taste and lack of familiarity proved to be the biggest barriers for survey respondents to purchasing seaweed products, as shown below in Figure 7. Interestingly, 279 (33%) of respondents who identified lack of familiarity as one of their biggest barriers also selected taste as a barrier, which could indicate that their lack of familiarity leads to them thinking that they do not or will not like seaweed products. This corroborates the findings in Figure 3, which highlighted that the top three responses for why respondents did not want to purchase a seaweed product were linked to a lack of knowledge or familiarity of seaweed.

Unsure how to prepare is the next largest barrier, which also correlates with lack of familiarity, as the majority of respondents who selected unsure how to prepare also selected lack of familiarity.

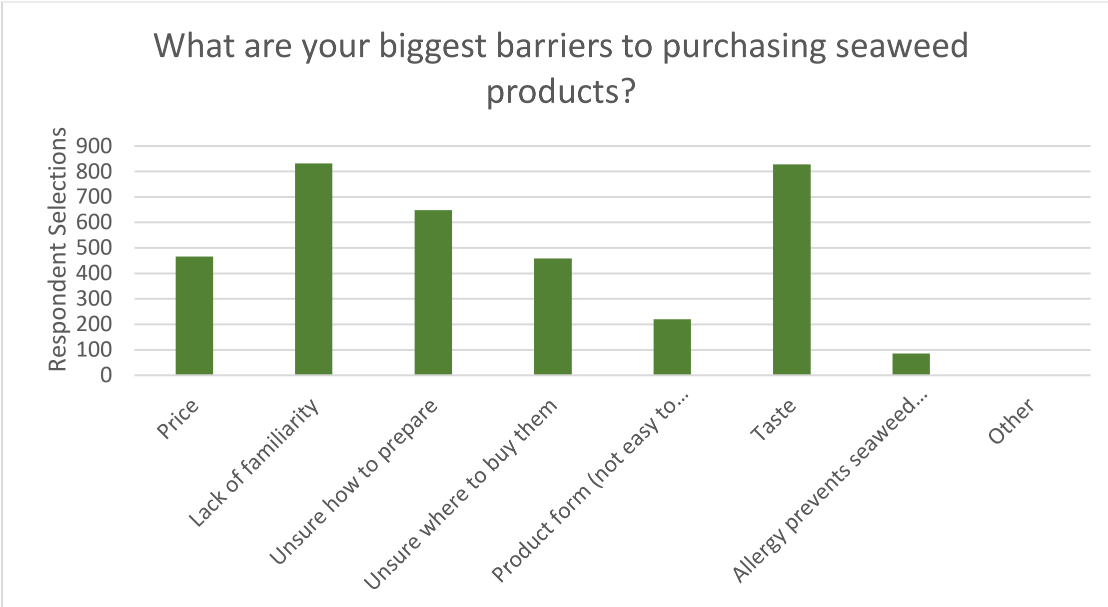

Figure 7. Barriers to purchasing seaweed products

Respondents were asked “Have you previously consumed seaweed products?” A slight majority of respondents (53%) indicated, as shown below in Figure 8, that they have not, at least knowingly, consumed seaweed products.

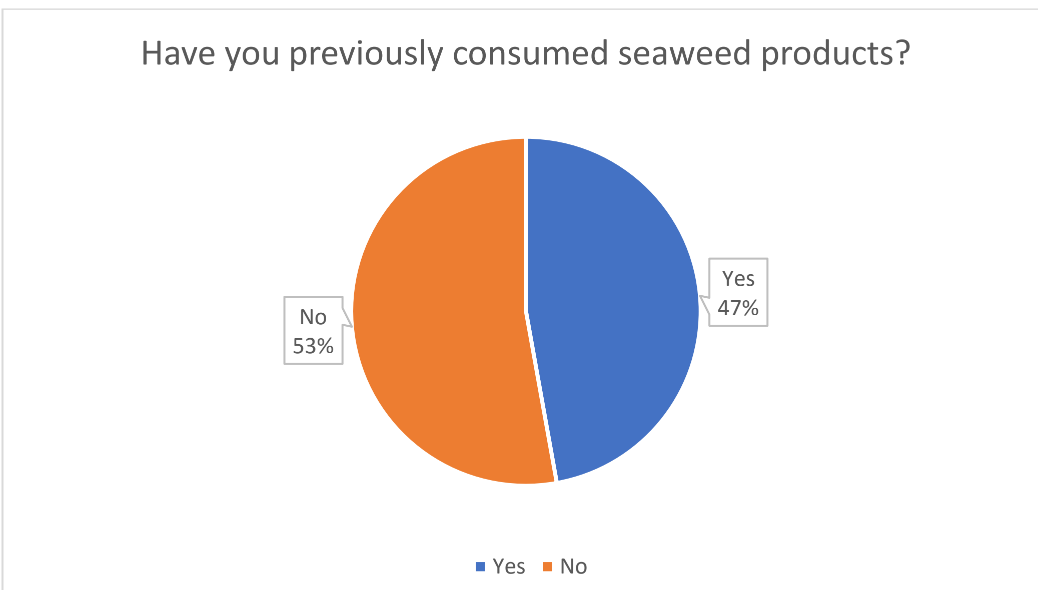

Figure 8. Prior seaweed consumption levels

Respondents who answered "Yes" to "Have you previously consumed seaweed products?" were then asked "What is your primary motivation for consuming seaweed products?" Findings are shown below in Figure 9. Respondents who indicated that they have not previously consumed seaweed were not asked the question. It should be noted that "I like the base product" – which was the top answer across the whole survey panel in Figure 2 - was not included as an answer to be selected in Figure 9, complicating direct comparisons with answers from the 10 seaweed products in Figure 2. For this question, which only targets those who have consumed seaweed, health benefits are listed as the primary reason for consuming seaweed (note: "I like the base product" was not included as an option), followed by taste/flavor preference. The figure shows that those who have consumed seaweed do so foremost because of health benefits, followed by flavor and taste, again, when "I like the base product" is not included as an option. This is further explored across seaweed consumers and non-seaweed consumers in the diving deeper section, which the reader is encouraged to view. That analysis shows that even those who have previously consumed seaweed most often indicated that they would purchase a product first and foremost if they like the base product – an aspect closely related to taste/flavor preference. This preference is then followed by purchasing a product for its health benefits.

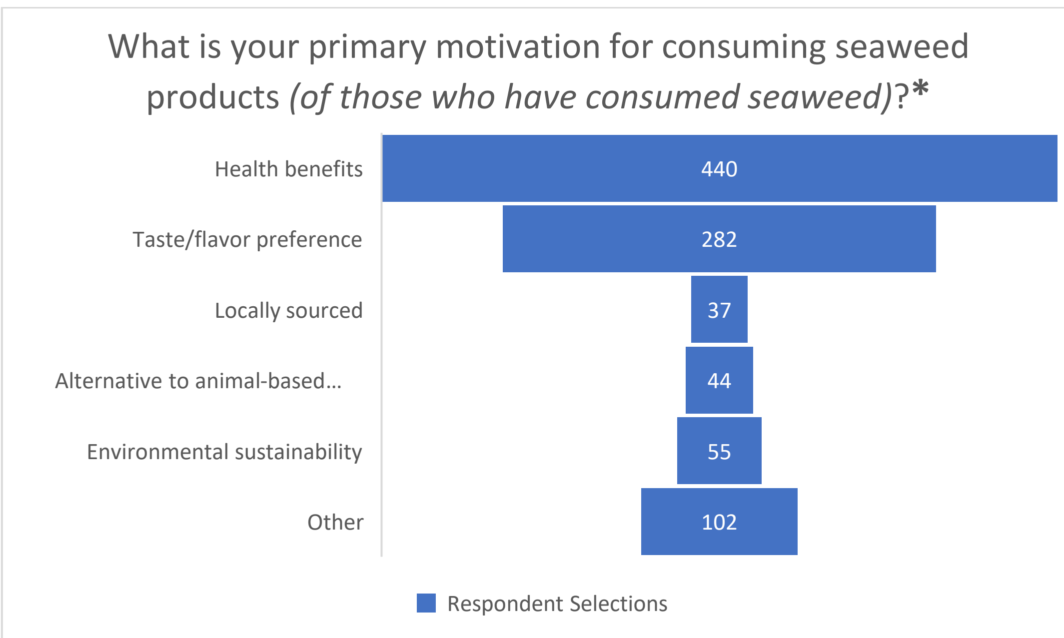

Figure 9. Motivation for consuming seaweed for those who have previously consumed it

*"I like the base product" was not included as an answer to be selected – complicating comparisons between this figure and those reflecting answers based on the 10 seaweed products. Please see the Diving Deeper section for more information on motivation for consuming seaweed across seaweed consumers and non-seaweed consumers.

All respondents were asked "What would influence your decision to purchase more seaweed products?" As shown below, in Figure 10, they most often selected taste/flavor preferences as a reason to influence their decision to purchase more seaweed. This is similar to the findings in the individual seaweed products, where respondents noted that liking the base product into which seaweed is added is the most likely reason to purchase a seaweed product. Health benefits still maintain a notable, second-highest number of selections from respondents. When "I like the base product" was not included, as shown in figure 9, a distinction occurred between prior seaweed consumers (47% of respondents), who cite health benefits as their primary motivation for purchasing seaweed, compared to the entire panel of respondents, which most selected taste/flavor preferences as a factor that would influence their decision to purchase more seaweed. However, this is contradicted by prior seaweed consumers still choosing "I like the base product" most, likely influenced by their taste and flavor preferences, over health benefits (Figure 18). This topic, amongst others, is further explored in the "Diving Deeper" section, which directly compares responses to across those who have and have not consumed seaweed, amongst other categories.

Next, we found that respondents would like improved knowledge on how to prepare/consume seaweed products as a method to influence their decision to purchase more seaweed. This aligns with the largest barrier to purchase seaweed being identified as a lack of familiarity.

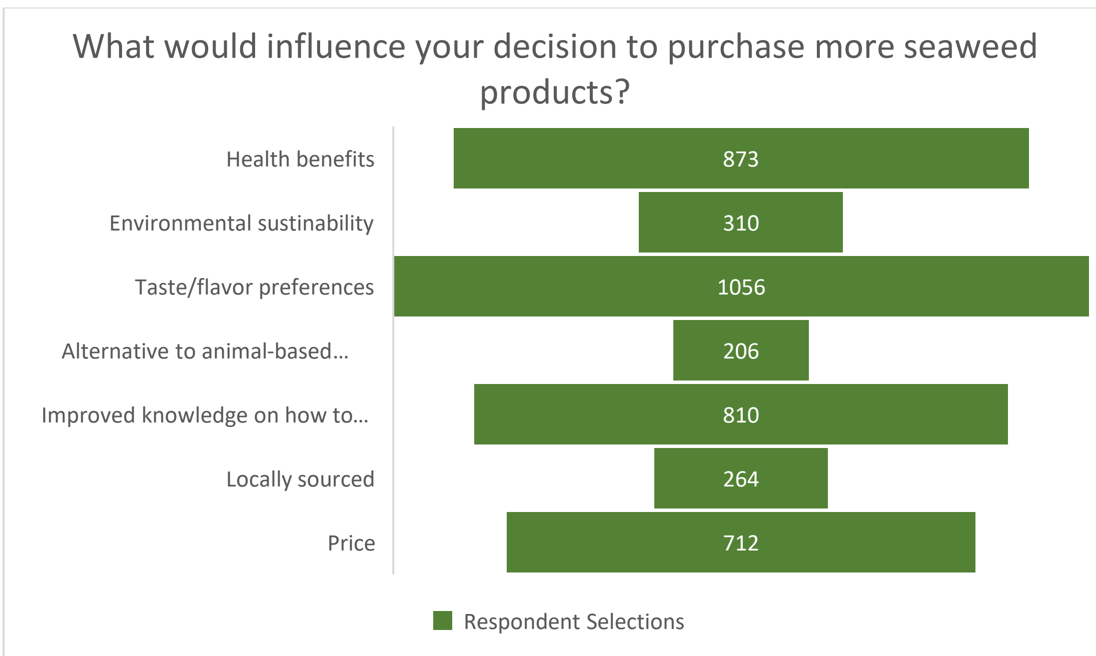

Figure 10. Factors that influence the purchase of more seaweed

Respondents were asked "Where would you like to see seaweed?" They selected, as highlighted below in Figure 11, that they want to see seaweed in formats that they can eat now – "ready to eat" and "snacks." The top category of ready to eat follows growth trends in this market segment. Snacks, which received the second most selections, are also typically ready or are at least almost-ready to eat. The other categories received a lower number of selections. The low rating for center of plate protein, which would include seaweed burgers, could align with a Bloomberg analyst calling plant-based meats "just a fad," with a reduction in consumer appetite for plant-based meat substitutes (Vox, Bloomberg). However, the conclusion remains to be seen, as some seaweed center of plate protein options could instead fill a void in the non-meat consuming market segment where, similar to veggie burgers, they remain different from plant-based foods trying to replicate and replace meat. In either case, the center of plate protein option received fewer than half as many selections as snacks.

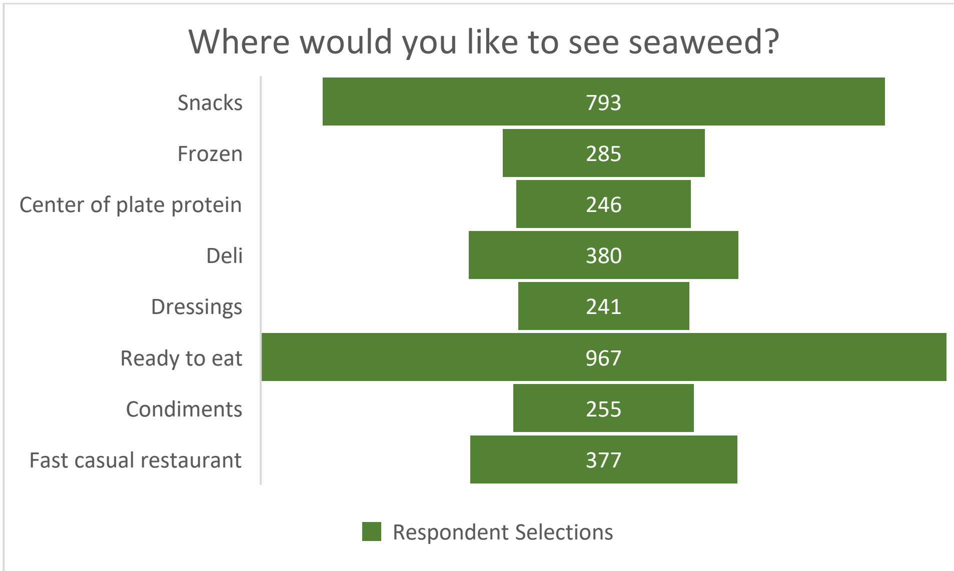

Figure 11. Product forms in which respondents would like to see seaweed

Respondents were asked "What types of seaweed are you familiar with?" The majority of respondents were not familiar with any types of seaweed, as shown in Figure 12. However, some stated that they were familiar with sea lettuce above all others, followed by nori/laver, sugar kelp, and Irish moss. Given the very limited market share of sea lettuce, it is expected that participants selected the term because "sea" and "lettuce" are both familiar words. It is highly unlikely that respondents would be more familiar with sea lettuce than a product that is widespread in the U.S., such as nori. Given that the majority of Americans have tried sushi, it is likely that most have consumed nori, whether or not they know it. Others may eat seaweed snacks, or other forms or nori, yet know it as 'seaweed' and not 'nori' (Kelton).

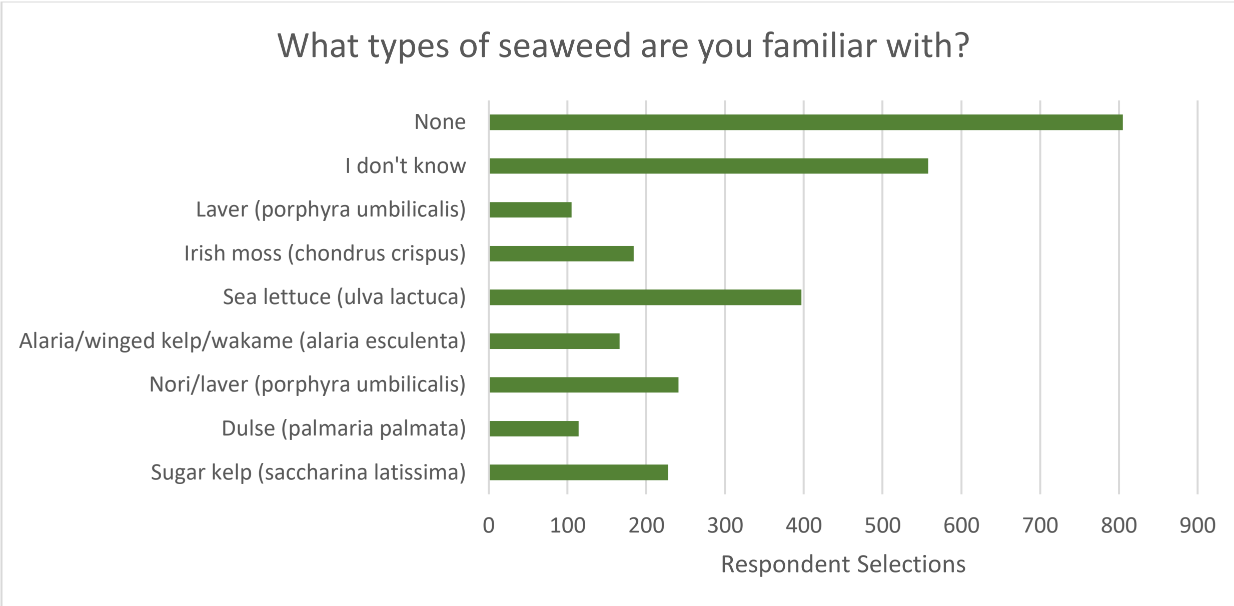

Figure 12. Respondent familiarity with seaweed species

Respondents were asked "What percentage of the time you make decisions based on prioritizing your health?" The majority of respondents indicated that they make decisions based on prioritizing their health less than 50% of the time (Figure 13). Only about 40% of respondents indicated that they make decisions based on prioritizing their health the majority of the time.

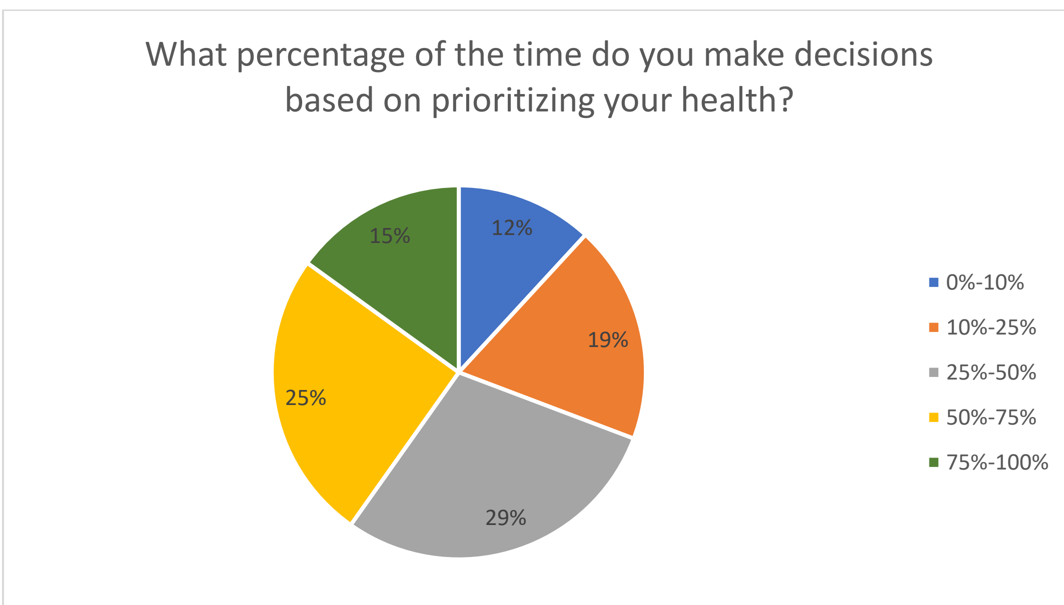

Figure 13. Respondent health prioritization in decision-making

Respondents were asked “How important is environmental sustainability to you?” The vast majority of respondents identified environmental sustainability as important, as can be seen in Figure 14. When sustainability was included amongst other factors, e.g. in the product attribute labels, sustainability remained one of the more-selected attributes for respondent desire to purchase products, but it was never selected as the top reason. In the figure, the X indicates a mean of 6.93, the line above it the median at 7, the upper edge of the box the upper quartile at 9, and the maximum above it at 10. The lower edge of the box indicates a lower quartile of 5 and, below it, a minimum of 1.

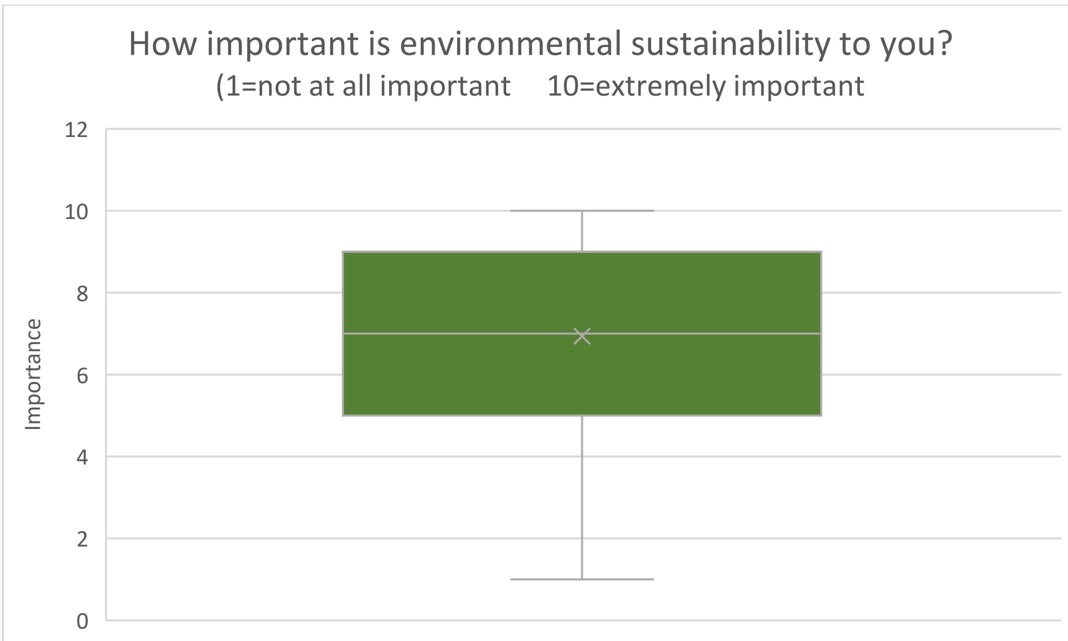

Figure 14. Importance of environmental sustainability (details in text above)

Respondents were asked “If seaweed products were labelled with the following attributes, which would make you more interested in buying them?” Consistent with previous findings around ready-to-eat foods, respondents were by far more interested in buying seaweed products labelled as ready to eat (Figure 15). Organic and sustainable labels then followed, respectively. Grown by family farmers and domestic also received a notable number of selections.

Figure 15. Seaweed product attributes that garner interest in additional purchases

Respondents were asked “Given that all of the following choices refer to the same product, which term would make you most likely to purchase it?” Overwhelmingly, status quo seems to provide the best answer – as respondents strongly noted that it does not matter to them what seaweed is called, or that they are okay with it simply being called seaweed. Other options received fewer than half as many selections (Figure 16).

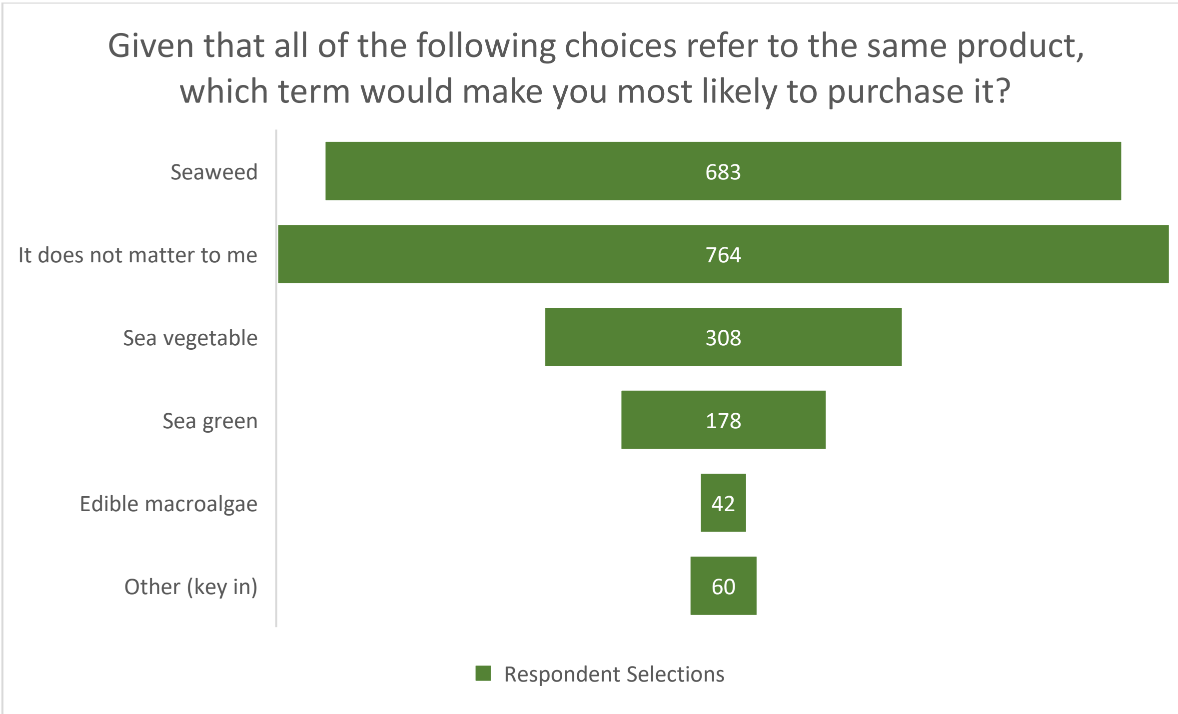

Figure 16. Seaweed terminology preferences

Diving Deeper – Response Breakdown Across Variables

Prior Seaweed Consumption

While the prior section provides an overview of responses from the full survey panel, the following section provides comparisons across different segments of the survey panel.

Following the initial analysis, data were regrouped by whether respondents answered "Yes" or "No" to the question "Have you previously consumed seaweed products?" Since nearly half of respondents answered "Yes" (47%), it provides a relatively equal division of the survey sample. The survey responses were also divided in this manner in order to provide further information on two market segments – those who are current customers or who could potentially be customers (those who have previously consumed seaweed) versus new customers (those who have never consumed seaweed).

Product preferences for seaweed products, seen below in Figure 17, remained mostly consistent in their order between both segments, with seaweed teriyaki sauce topping the list, and kelp kombucha in last. Those who have previously consumed seaweed products indicated a higher likelihood to purchase the products across the board. It is worth noting that amongst those who have not previously consumed seaweed, none of the products received an average rating higher than 5 out of 10 in response to "How likely are you to purchase the following product?". Conversely, all products, with the exception of kelp kombucha, received an average rating of 5 or higher amongst those who have previously consumed seaweed.

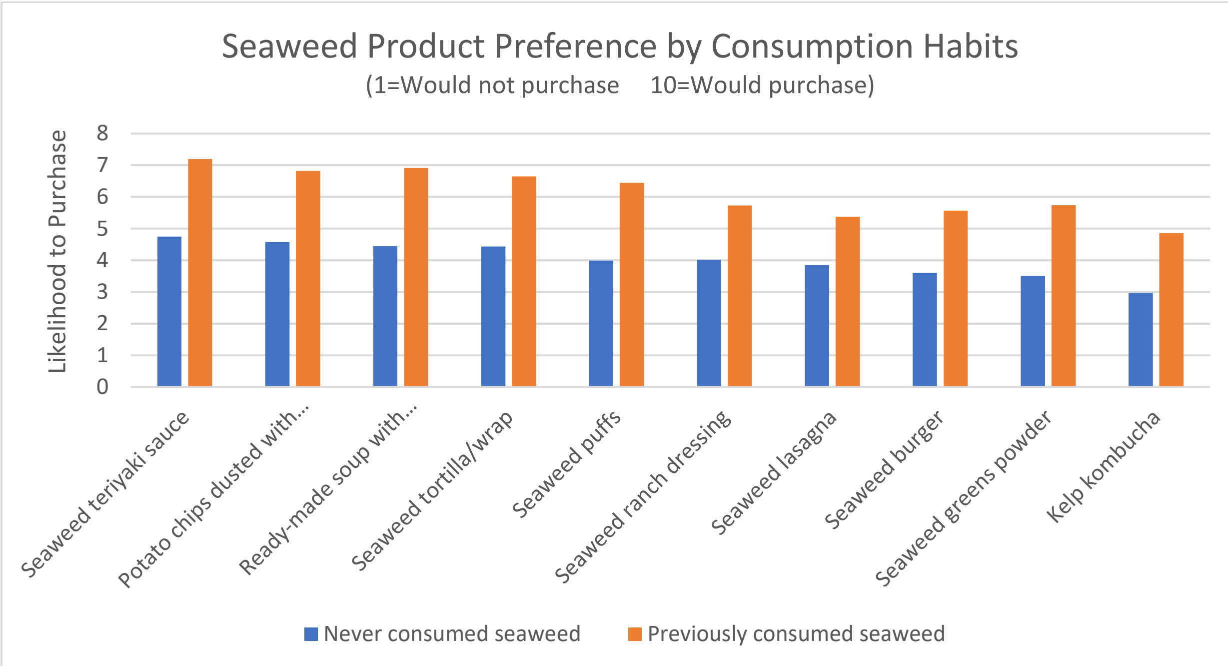

Figure 17. Product preference based on prior seaweed consumption

While exploring why respondents would choose the products shown, two factors became notably elevated above the rest (Figure 18) – "I like the base product" and health benefits. Proportionally, "I like seaweed" and "umami flavor" showed the largest change between the two survey segments. In either case, "I like the base product" still remained as the most selected reason to choose the product, followed by health benefits.

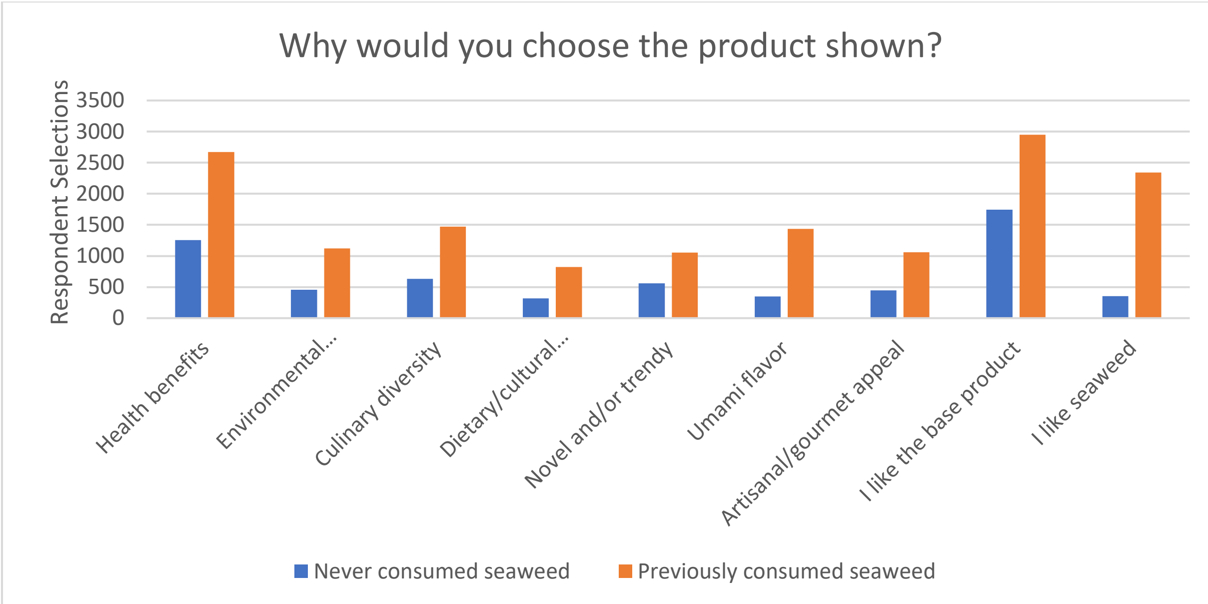

Figure 18. Rationale for purchase based on prior seaweed consumption

As was noted in the prior section, and shown below in Figure 19, ready-to-eat seaweed products remain a priority for both groups in both questions in which it appeared on the survey. Additionally, previous seaweed consumers showed elevated interest in sustainable and organic attributes when selecting which attributes would make them more interested in buying seaweed products. Given that many consumers purchase organic foods due to perceived health benefits (Gundala & Singh, 2022), this preference towards sustainable and healthy food follows other research, which suggests connecting health and sustainability "as an onboarding ramp to get consumers engaged" (Globescan, 2023). There is a statistically significant difference between those who have and those who have not consumed seaweed across all attributes shown ($p<0.01$). This highlights the significantly increased likelihood for those who have previously consumed seaweed to purchase it again.

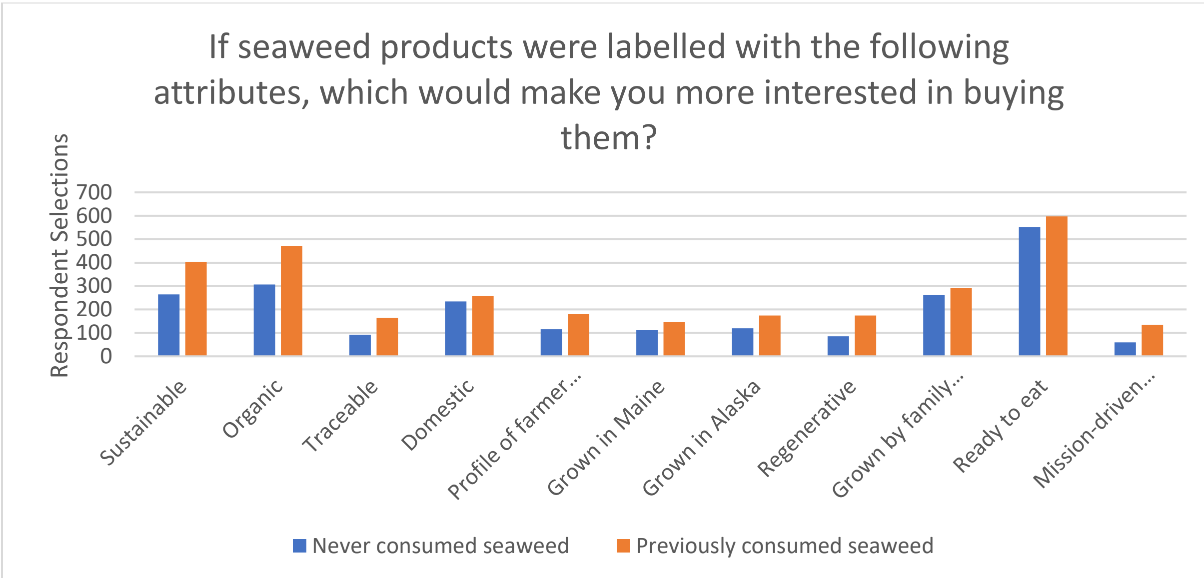

Figure 19. Interest in product attributes based on prior seaweed consumption

The Standard American Diet made up a larger proportion of those who have never consumed seaweed, while those who previously consumed seaweed showed a larger proportion of people who adhere to nearly all other types of eating habits listed. There exists a statistically significant difference between these groups ($p<0.05$) for flexitarian, gluten-free, macrobiotic, pescatarian, standard American, vegan ($p<0.1$), and vegetarian eating habits. Given that pescetarian, vegetarian, flexitarian, macrobiotic, gluten-free, and vegan eating habits were higher among those who previously consumed seaweed, these non-Standard American Diets could potentially be associated with higher levels of seaweed consumption (Figures 20 a&b).

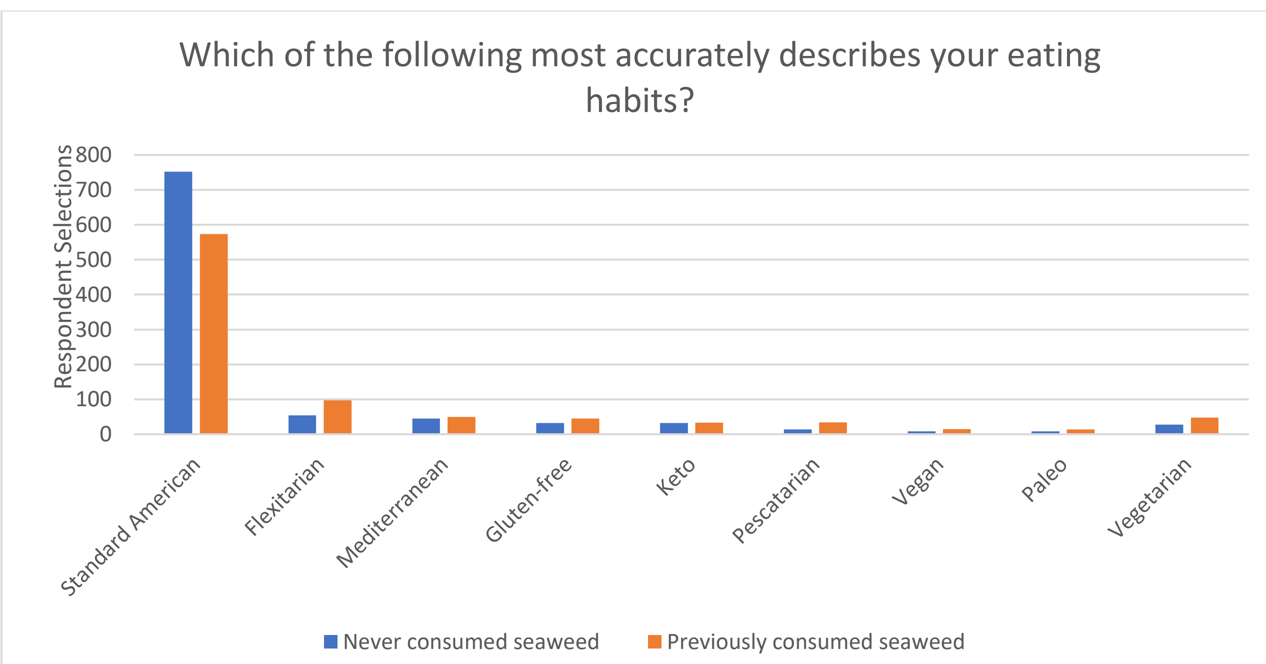

Figure 20.a. Eating habits based on prior seaweed consumption

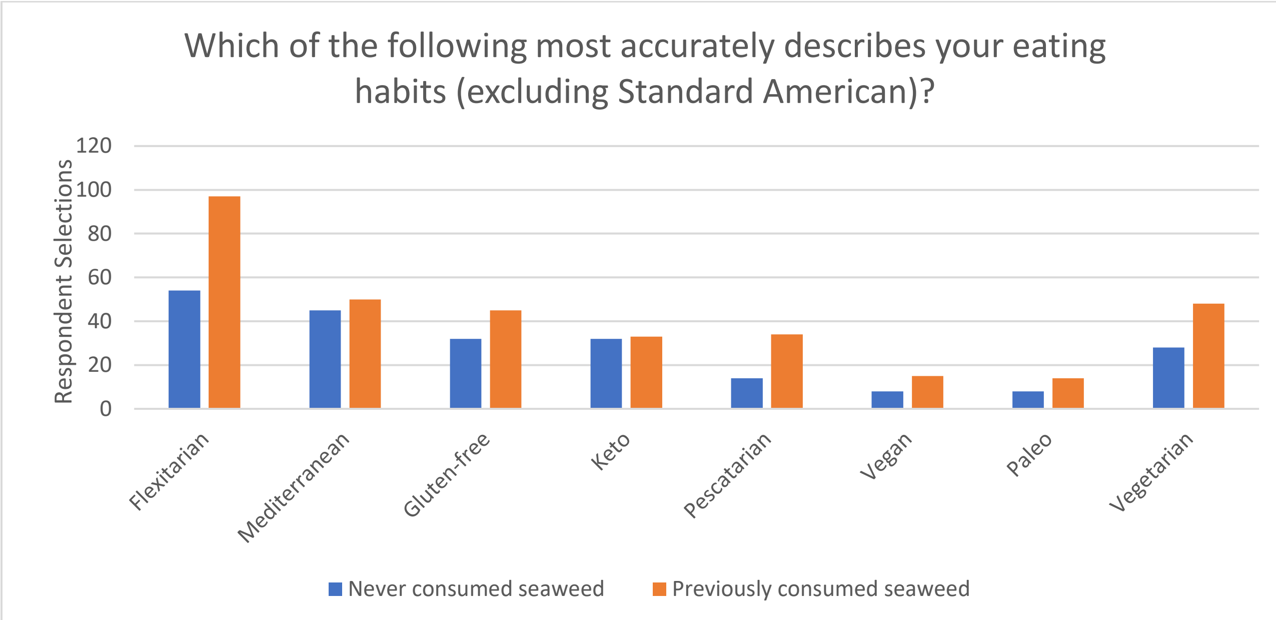

Figure 20.b. Eating habits based on prior seaweed consumption, excluding standard American

Both groups shop primarily at the supermarket, as shown below in Figure 21. A notable discrepancy occurs between the groups at the natural foods store and farmer's market, where prior seaweed consumers tend to primarily shop for food more. This shows that these venues could present an opportunity to reach a higher proportion of those who have previously consumed seaweed. But, the sheer volume of supermarket shoppers who have previously consumed seaweed, when compared to all other options, shows that the supermarket is still the most likely place to encounter shoppers who have previously consumed seaweed, and to find those shoppers in greater numbers.

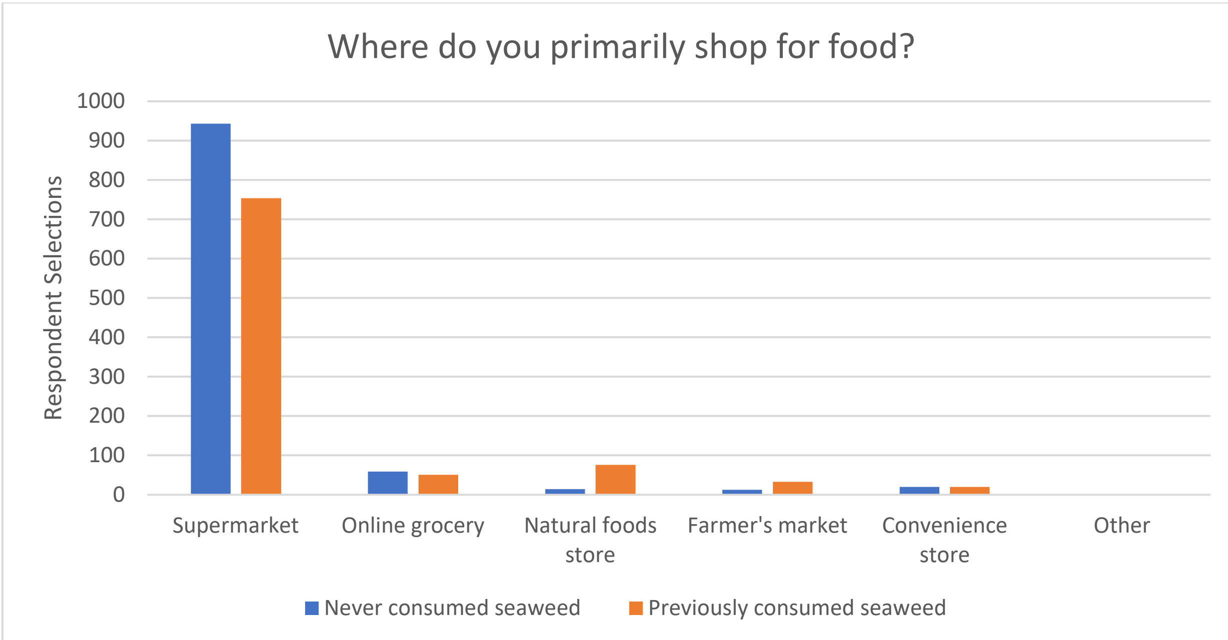

Figure 21.a. Primary food shopping location based on prior seaweed consumption

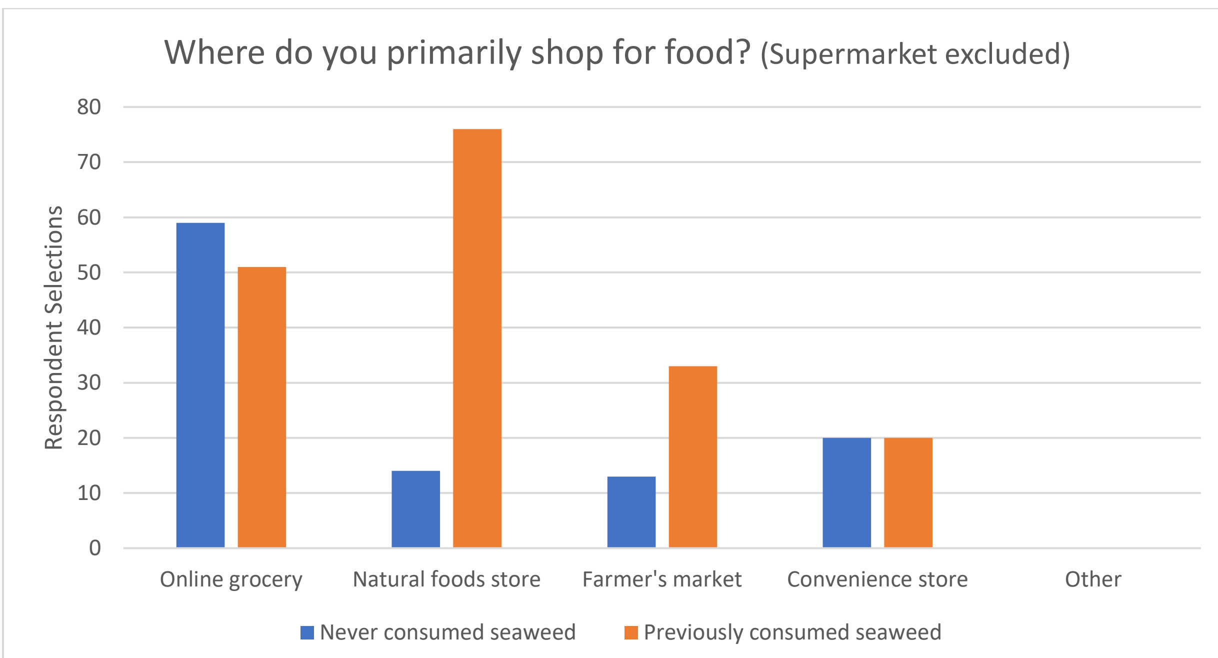

Figure 21.b. Primary food shopping location based on prior seaweed consumptions (supermarket excluded)

Those who have never consumed seaweed cite a lack of knowledge – lack of familiarity, unsure how to prepare, and taste (since they have never consumed seaweed) – as the largest barriers to purchasing seaweed (Figure 22). These rates are also higher than for those who have previously consumed seaweed – highlighting how the lack of experience with seaweed presents a notable barrier. To further explore price as a barrier – amongst those who identified price as a barrier, only about 23% of those respondents identified price as one of their biggest barriers for seaweed. Amongst those who selected price as a barrier, they then most selected taste as a barrier, followed by lack of familiarity. For those who did not identify price as a barrier, they most often selected lack of familiarity as a barrier, followed closely by taste. It is worth noting that at 23% of respondents, concerns about price were not too high, especially given that respondents were encouraged to select all barriers that applied. Since only 23% of respondents identified price as a barrier, it would not be helpful to compare the total number of barriers selected with those who did not identify price as a barrier, as those who did not select price would total higher in every category. Instead, the percentage of respondents who selected each category was calculated across those who did and who did not select price as a barrier for more helpful comparison. While Figure 23.a. shows barriers proportional to the number of respondents in each group, Figure 23.b. visualizes the comparatively small number of selections from those who identified price as a barrier. Figure 22 highlights that, at least in this study, lack of familiarity/how to prepare foods, combined with taste, provided the largest barriers for respondents – regardless of prior seaweed consumption. Even amongst those who have previously consumed seaweed, who tallied more selections for price – price remains their fifth-highest barrier, as shown in Figure 22.

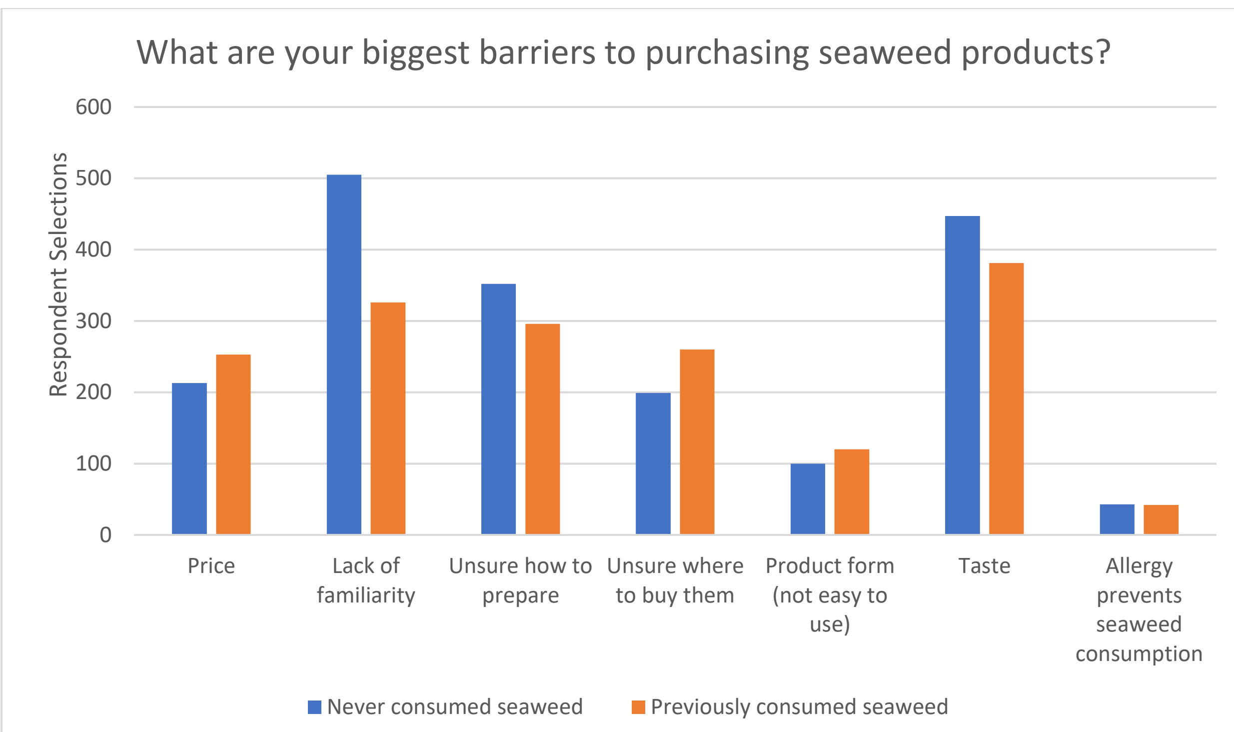

Figure 22. Barriers to purchasing seaweed based on prior seaweed consumption

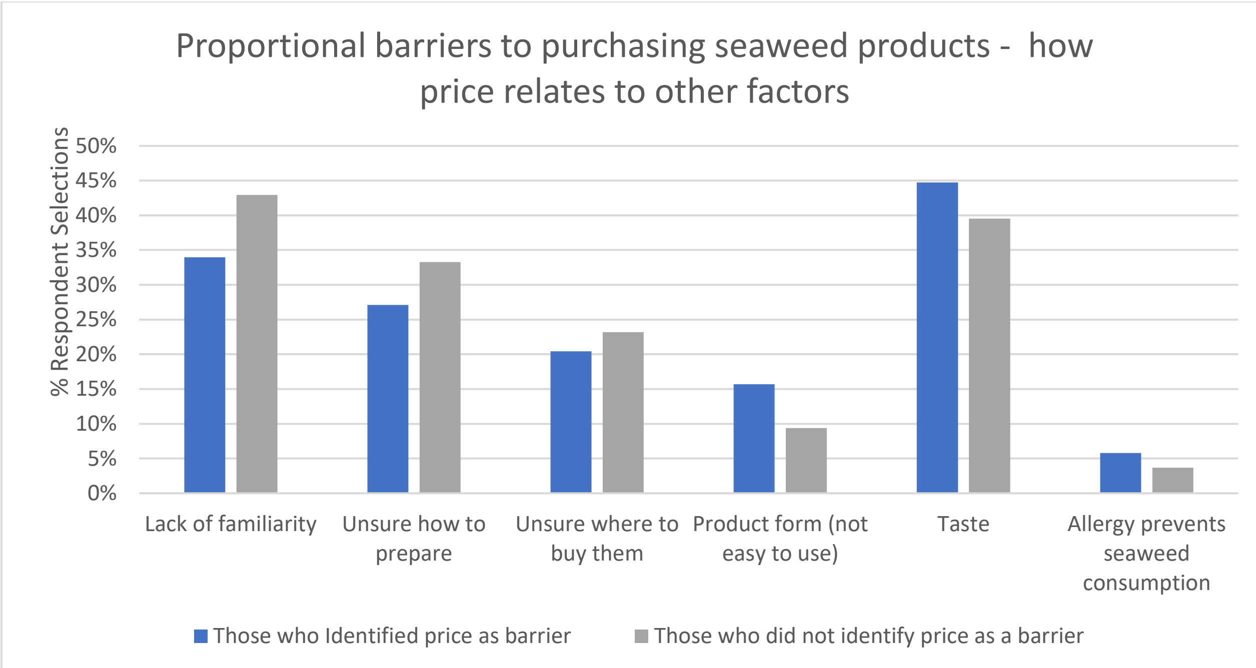

Figure 23.a. Proportional barriers to purchasing seaweed based on price identified as a barrier

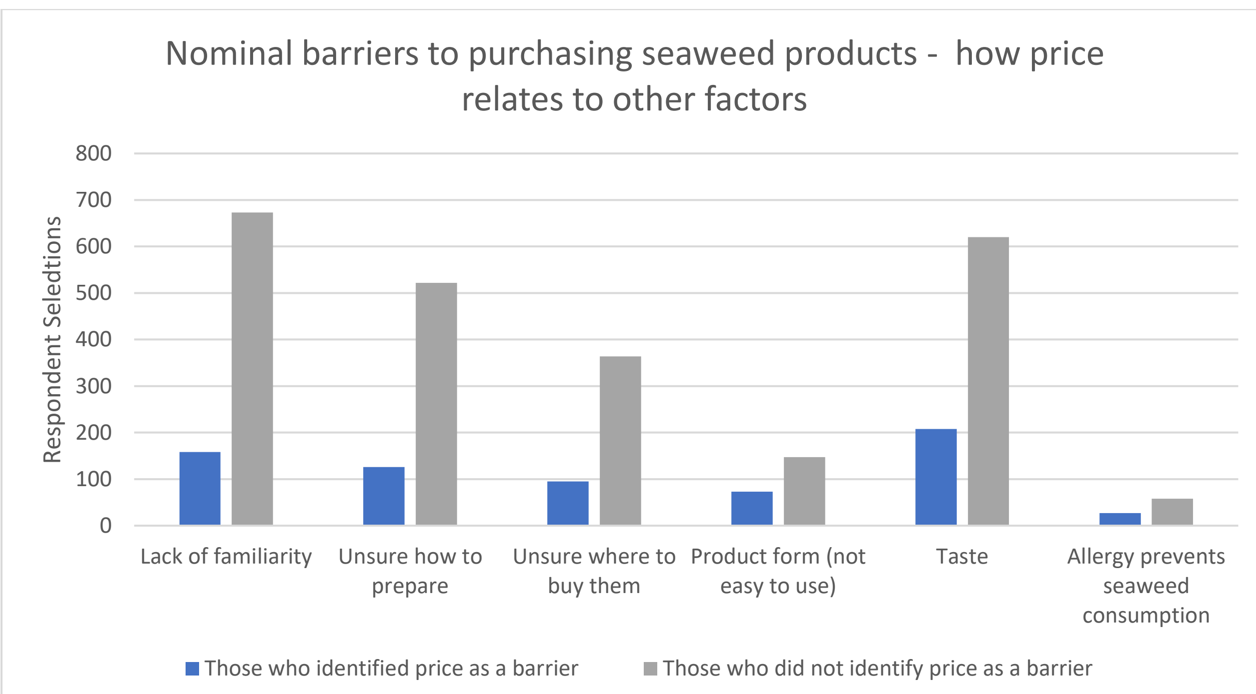

Figure 23.b. Nominal barriers to purchasing seaweed based on price identified as a barrier

Although ready to eat and snacks remained the most selected categories across both groups, those who have previously consumed seaweed selected these two categories notably more than those who have not consumed seaweed (Figure 24). Given that there is a strong desire for instant food products (Chaudhury, 2010), this does not necessarily come as a surprise. Some studies have named such desires as linked to convenient usage, comfortable availability, less time consumed, and a more satisfying taste (Chaudhury, 2010). A limitation of this study is that the motivation is unclear as to why those who have previously consumed seaweed have stronger preferences towards ready to eat and snack product forms. It could be possible that those are the forms in which they are already familiar with consuming seaweed. Figure 22 shows similar response levels between those who have and have not consumed seaweed regarding barriers of being unsure how to prepare and the product form not being easy to use. It is also worth noting that those who have previously consumed seaweed selected every category more than those who have not consumed seaweed in Figure 24 – showing their higher desire to see any and all seaweed products.

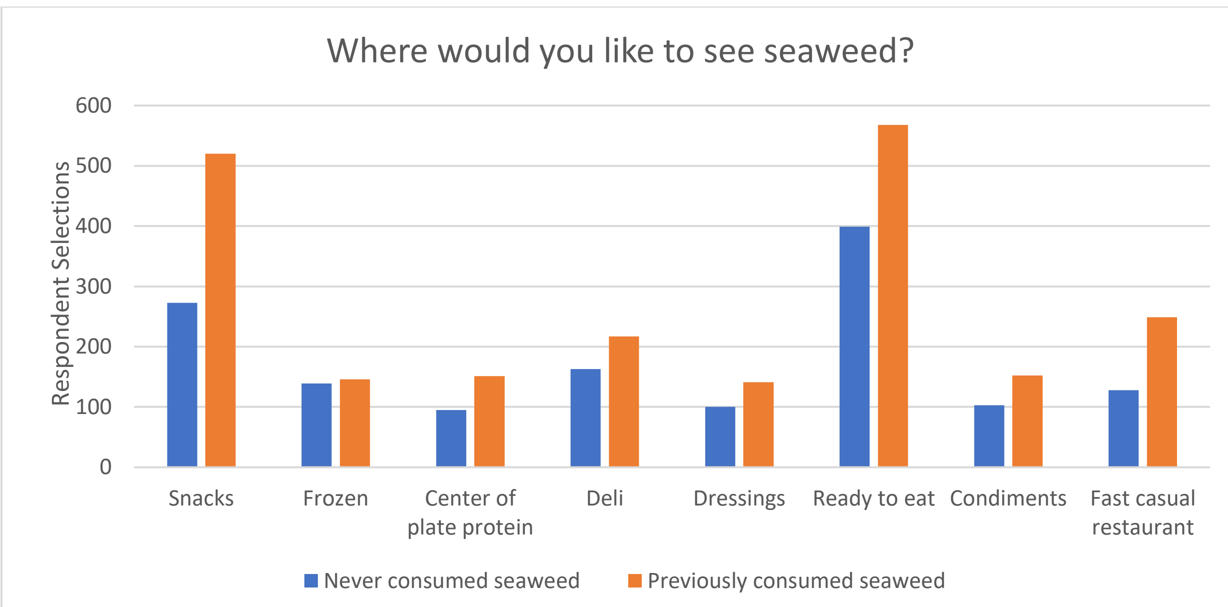

Figure 24. Seaweed product form based on prior seaweed consumption

Age

This section views survey responses through the lens of age. In other words, how does age influence respondents' views, patterns, and habits related to seaweed? Overall, we found age to be one of the most important factors in determining who is most likely to purchase seaweed products.

Given that an unequal percentage of responses were received in each category (Figure 41), the totals in the section below were adjusted to show the responses proportionally. For example, given that 18 to 24 age range comprised 10% of respondents, each figure, was divided by 10% (0.1). The same occurred for each age group given its percentage of the total survey sample. This allows for a more proportional comparison across age groups, as both number of years and number of responses in each age group were not equal.

Figure 25 details prior seaweed consumption based on age ranges indicated by respondents. There is a near-mirror image presented that shows the imbalance in prior seaweed consumption based on age. Almost two-thirds of those under 34 have consumed seaweed, while almost two-thirds of those over 55 have not knowingly consumed seaweed. Respondents between 35 and 54 are relatively balanced in their prior seaweed consumption. The figures above, such as Seaweed Product Preference by Consumption Habits (Figure 17), show the propensity of those who have previously consumed seaweed to purchase it when compared to those who have not previously consumed seaweed. Given that industry insiders have shared that millennials and younger (~40 and under) are now major purchasers in grocery, this presents a huge opportunity for seaweed. This highlights the opportunity to market and cater products to those under 44, the majority of whom have previously consumed seaweed and thus have a higher likelihood of purchasing seaweed in the future. The 45 to 54 age range also provides a notable percentage of respondents who have consumed seaweed and may potentially purchase more seaweed in the future.

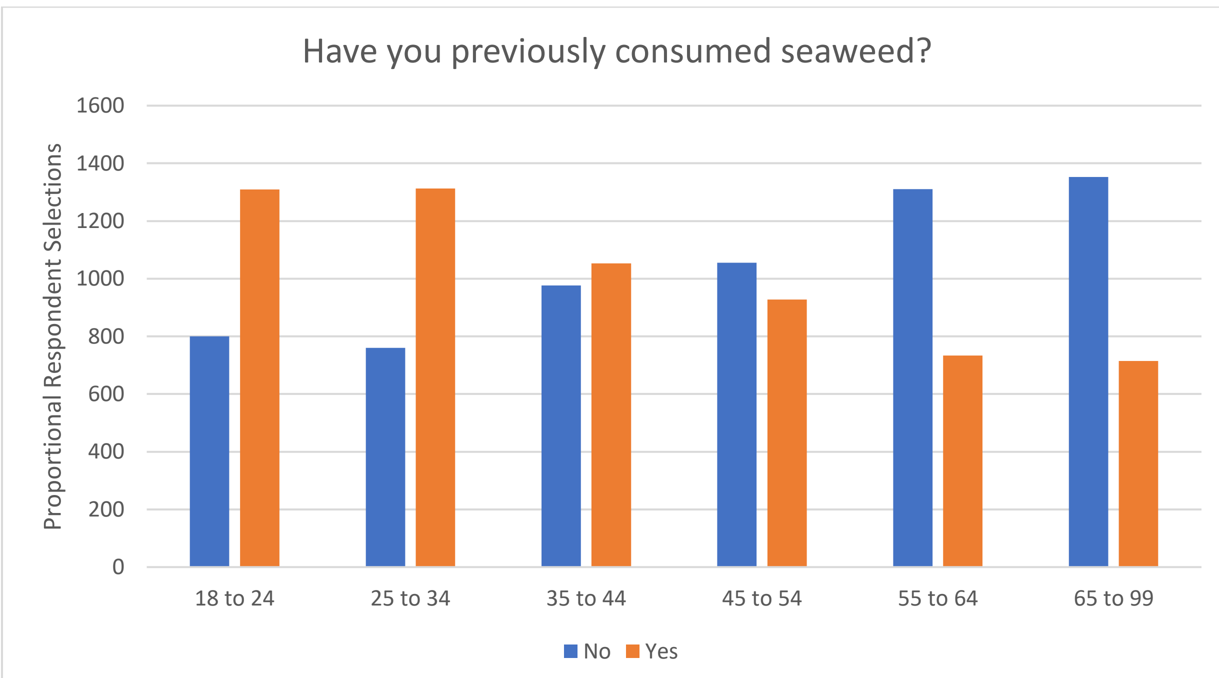

Figure 25. Prior seaweed consumption based on age

Figure 26, below, confirms that younger people are more likely to purchase seaweed products. Gen Z and millennials (18 to 44) indicated the strongest likelihood to purchase all of the products. This takes the findings from Figure 25, where younger people have the highest levels of prior seaweed consumption, and shows that these same young people would be more likely to purchase seaweed products. Notable gaps exist in likelihood to purchase nearly all of the products between different age groups, especially when comparing the 18 to 34 (most prior seaweed consumption and most likely to purchase) and 55 to 99 (least prior seaweed consumption and least likely to purchase) age groups. This complements the figure above to highlight the market potential for future seaweed sales to younger Americans.

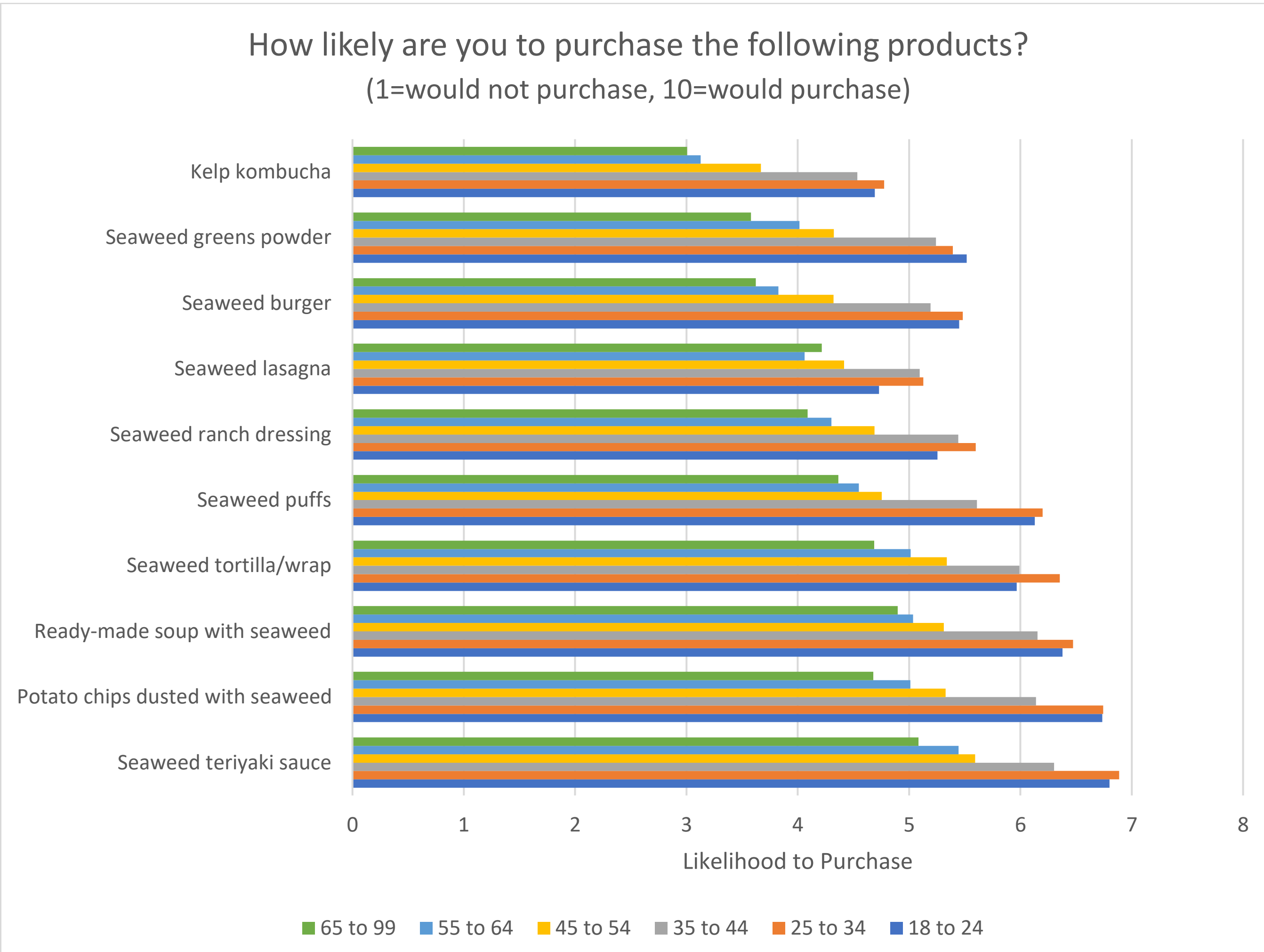

Figure 26. Likelihood of purchasing products based on age

When asked 'Why would you purchase a given seaweed product?' I like the base product remained the top selected category below, with health benefits following for all groups except respondents aged 18 to 24 (Figure 27). The popularity of seaweed amongst 18- to 24-year-old respondents was strong enough that 'I like seaweed' ranked as their second-highest reason for purchasing a given seaweed product, above health benefits. Could this be the new generation of seaweed eaters – those who eat seaweed not only because of its health benefits, but just because they like it? This begs further exploration into the preferences of younger consumers – uncovering *how* and *why* they want to eat seaweed.

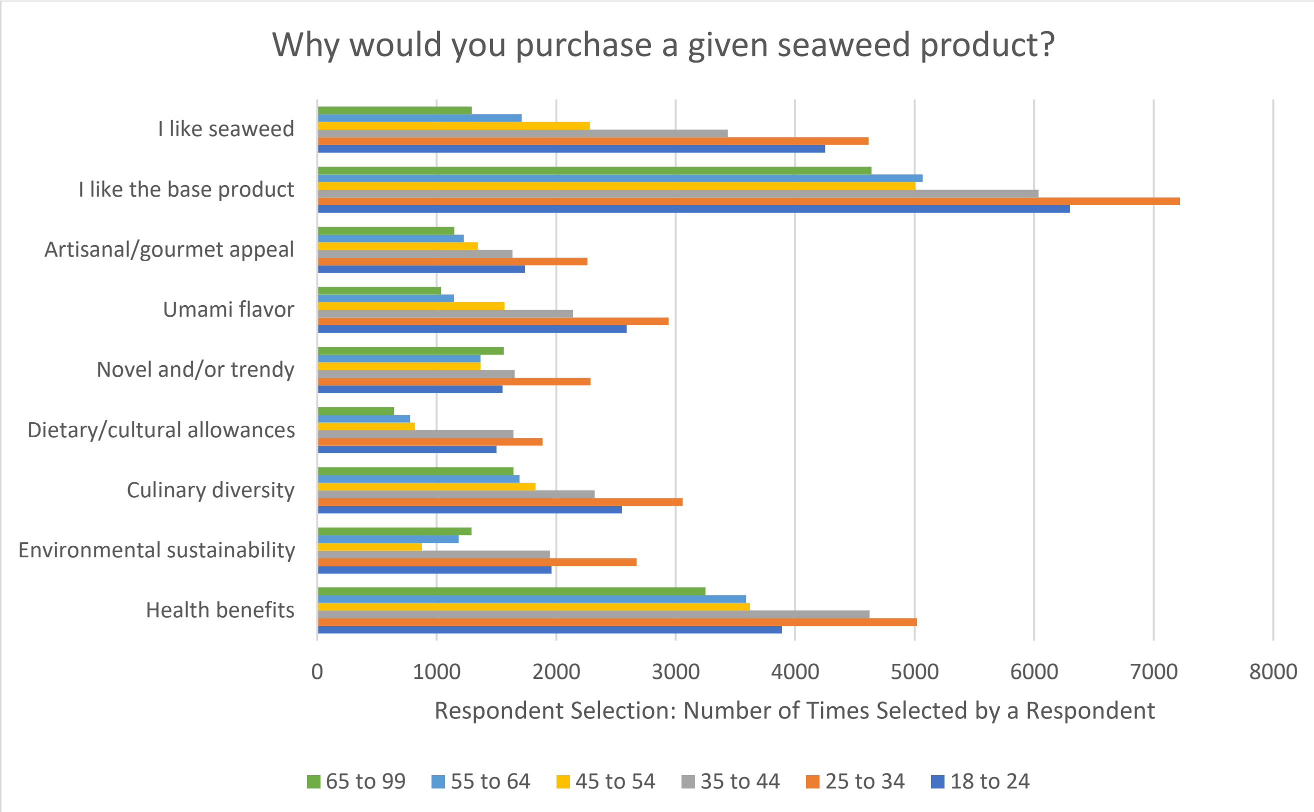

Figure 27. Rationale for seaweed purchase based on age

When asked 'Why would you *not* purchase a given seaweed product?' respondents overall cited taste and lack of familiarity as their largest factors to not purchase (Figure 28). Anecdotally, while some people may be adventurous eaters, others indicate that they do not like a food before ever having tried it. For those over 55, lack of familiarity was the most cited factor to not purchase a product, which coincides with that age group's lower levels of seaweed consumption. For all age groups, taste was highly noted as a dissuading factor, although some of this could coincide with lack of familiarity. As for younger respondents, they reported similar levels of lack of familiarity and unsure how to prepare seaweed. Younger respondents also identified price and unsure where to purchase seaweed at higher levels than the older survey respondents.

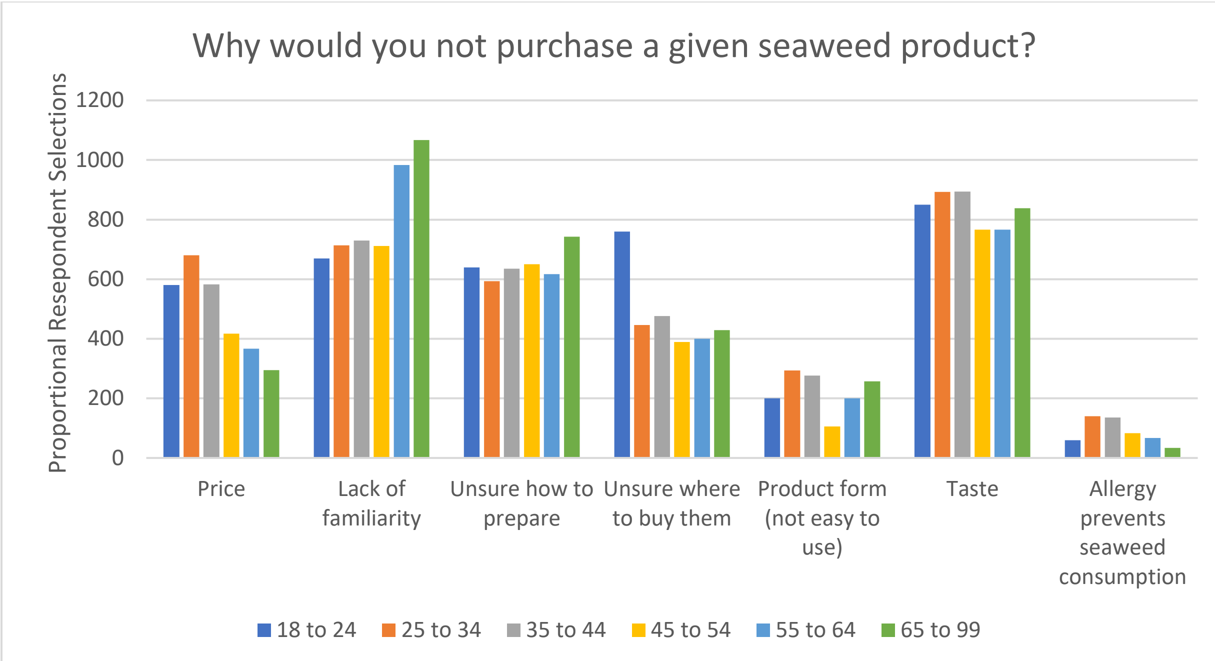

Figure 28. Why not to purchase a product, based on age

Supermarkets remained, by far, the primary location where respondents shop for food (Figures 29 a&b). However, online grocery, natural foods stores, farmer's markets, and even convenience stores make up a larger proportion of where respondents under 44 purchase food. While, again, supermarkets reign supreme, it also opens questions about methods and places to target younger market segments, who appear more willing to purchase seaweed.

Figure 29.a. Primary grocery shopping location based on age

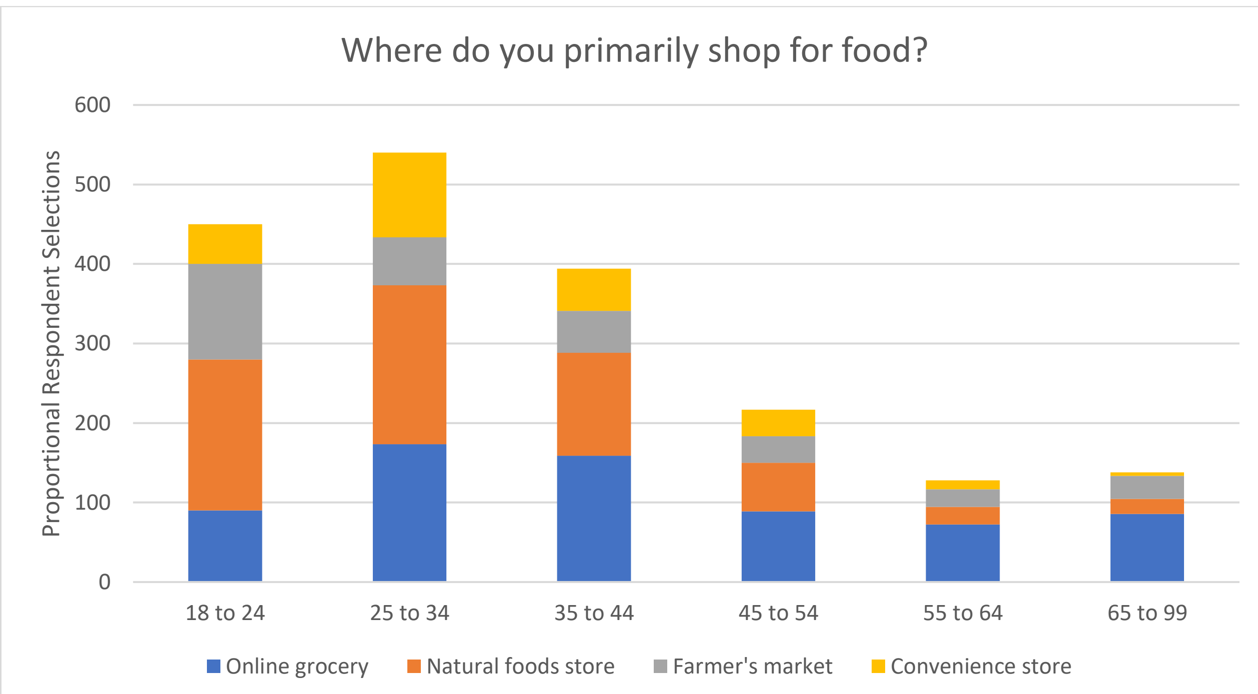

Figure 29.b. Primary grocery shopping location based on age (excluding supermarket)

When further asked about where they would like to see seaweed, there is a notable increase for Millennials and Gen Z on seaweed that is in the form of snacks and ready to eat (Figure 30). It should be noted that snacks are typically also ready to eat, highlighting the fact that they want food that is quick, easy, and convenient to eat. Fast casual rated third for the younger age groups, especially when compared to the lower fast casual selections for respondents over 45. This also follows trends for quick, easy, and convenient foods as mentioned in snack and ready to eat foods.

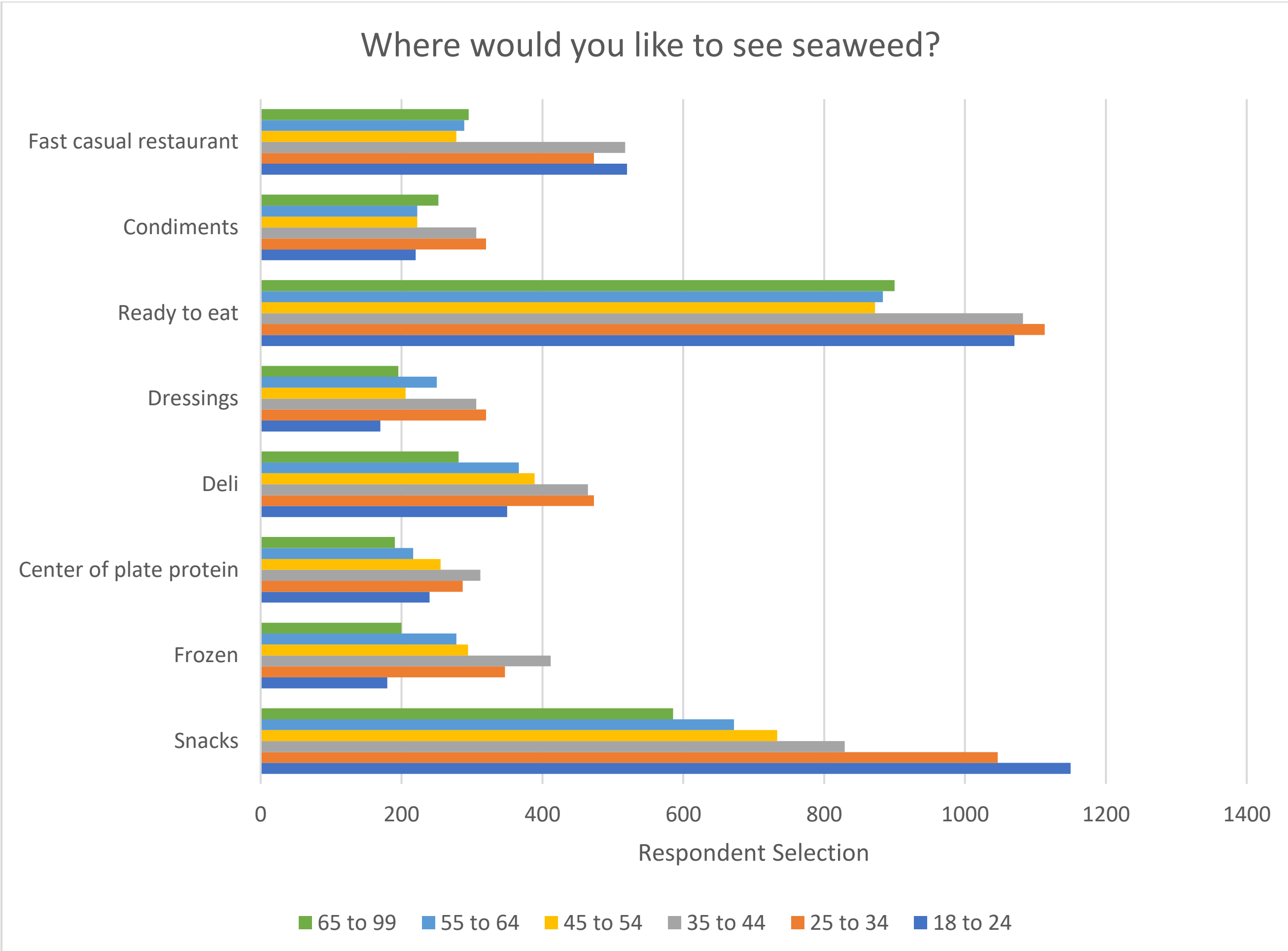

Figure 30. Seaweed product form preferences based on age

Eating habits remained relatively similar across age groups, aside from an increase in vegetarian for Millennial and Gen Z. Even still, the proportion of Millennials and Gen Z eating vegetarian remains very small (Figures 31 a&b).

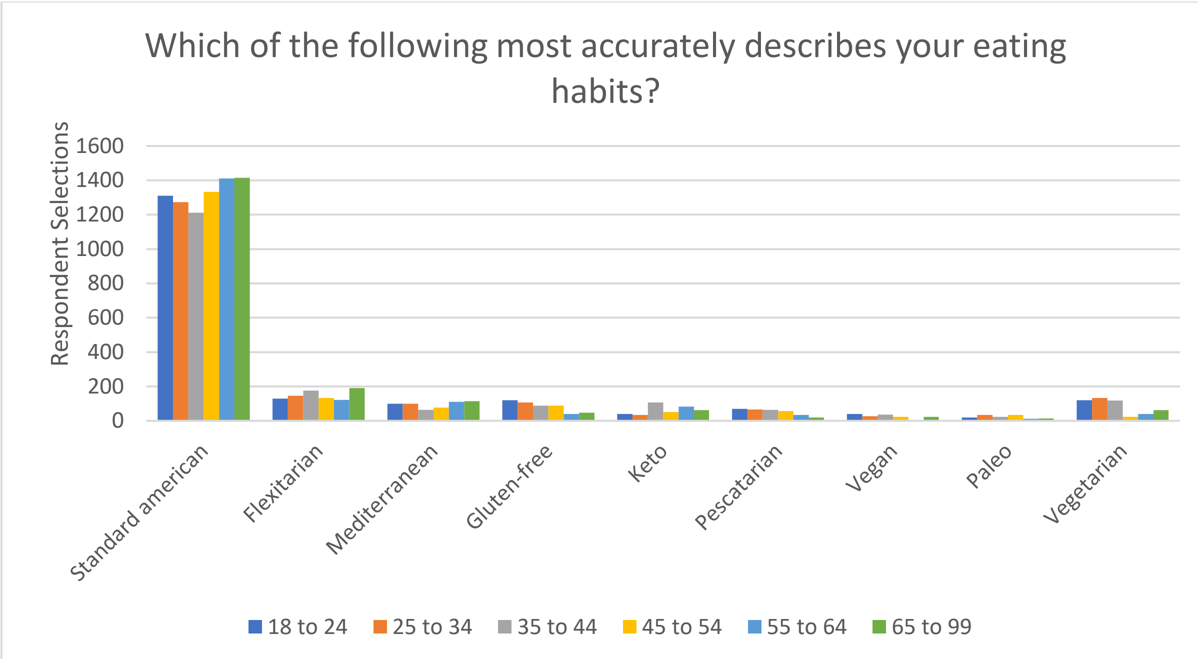

Figure 31.a. Eating habits based on age

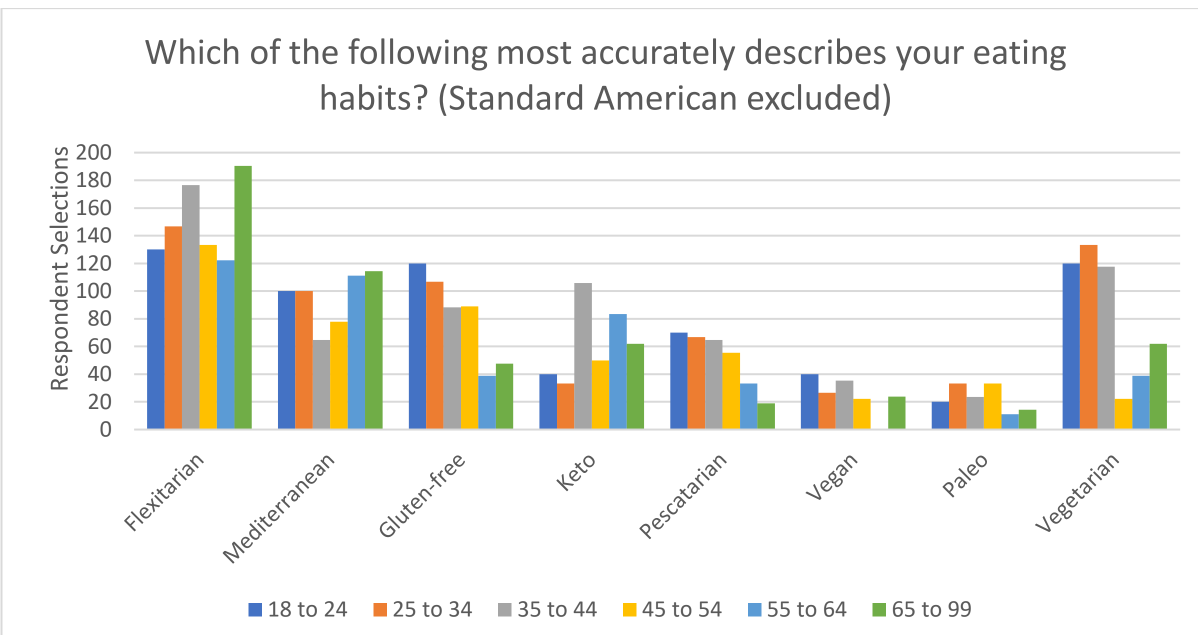

Figure 31.b. Eating habits based on age, excluding Standard American

Gender

When broken down by gender, it became notable that more respondents who identified as male had previously consumed seaweed, and appeared more eager to do so again (Figure 32). The greatest barrier to purchasing seaweed products for those who identified as female was cited as taste, followed by lack of familiarity (Figure 33). For men, the greatest barrier to purchasing seaweed products was lack of familiarity, followed by taste, and unsure how to prepare. One-third of total respondents who selected “lack of familiarity” also selected “taste” as a barrier, which could indicate that their lack of familiarity leads to them thinking that they do not or will not like seaweed products. Those who identified as non-binary/third gender/prefer not to say only made up ~1% of survey responses (n=21), which makes it very challenging to extrapolate information between the populations due to low sample size.

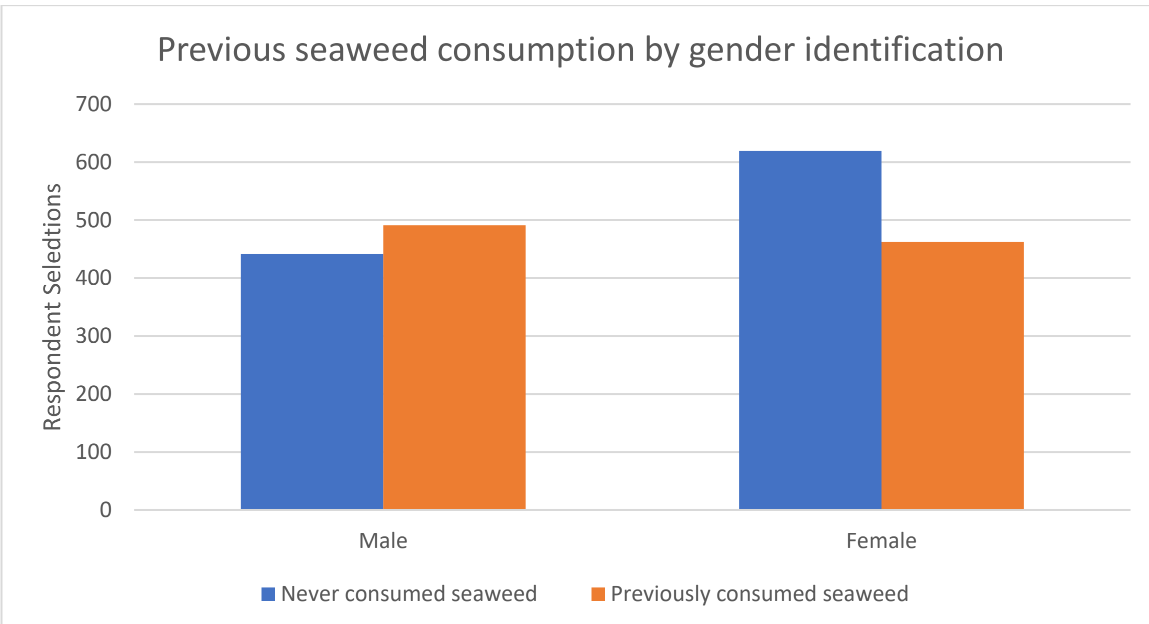

Figure 32. Seaweed consumption based on gender

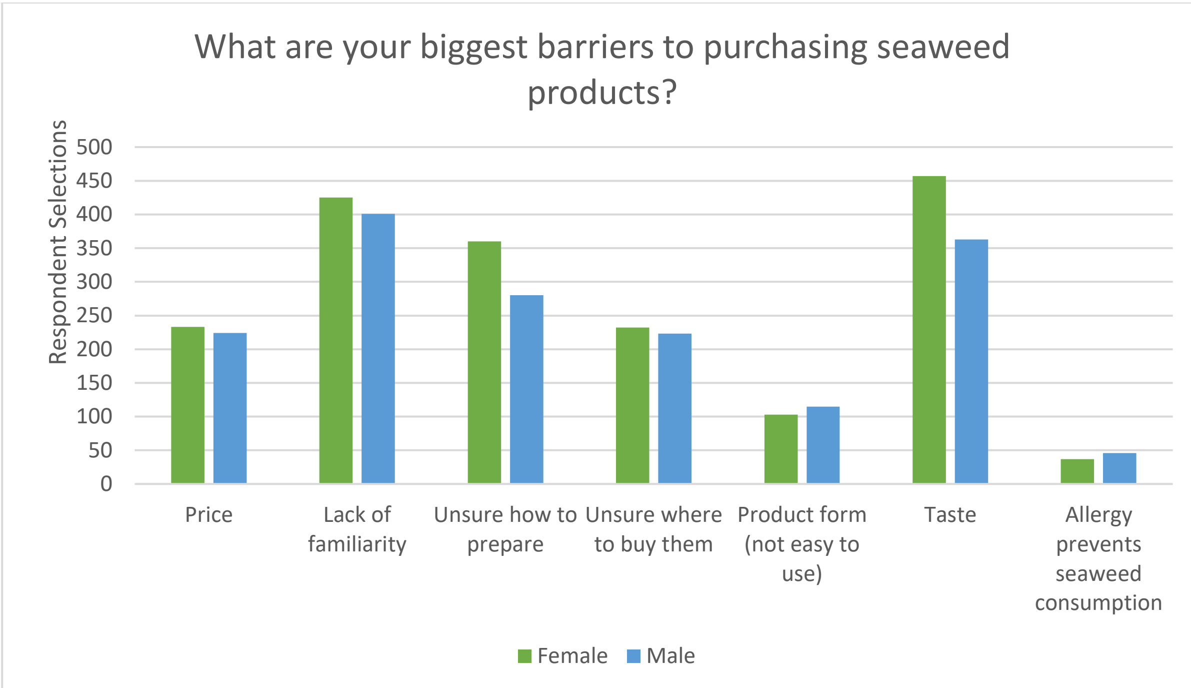

Figure 33. Seaweed purchasing barriers based on gender

Figures 34 and 35 illustrate that both men and women tended to favor categories that required little to no preparation, including snack and ready-to-eat foods. This is bolstered by the fact that there was no statistically significant difference in the preferences between men and women regarding ready to eat and snack foods. The only statistically significant findings from Figure 34 is that men would like to see seaweed frozen, at a deli, or in a fast casual restaurant ($p<0.05$) more so than women. For Figure 35, men were more likely to purchase a product if it was labelled with Grown in Maine, Grown in Alaska, Domestic, or Regenerative ($p<0.05$, except Maine $p<0.1$). Beyond these mostly place-based attributes, nothing held statistical significance.

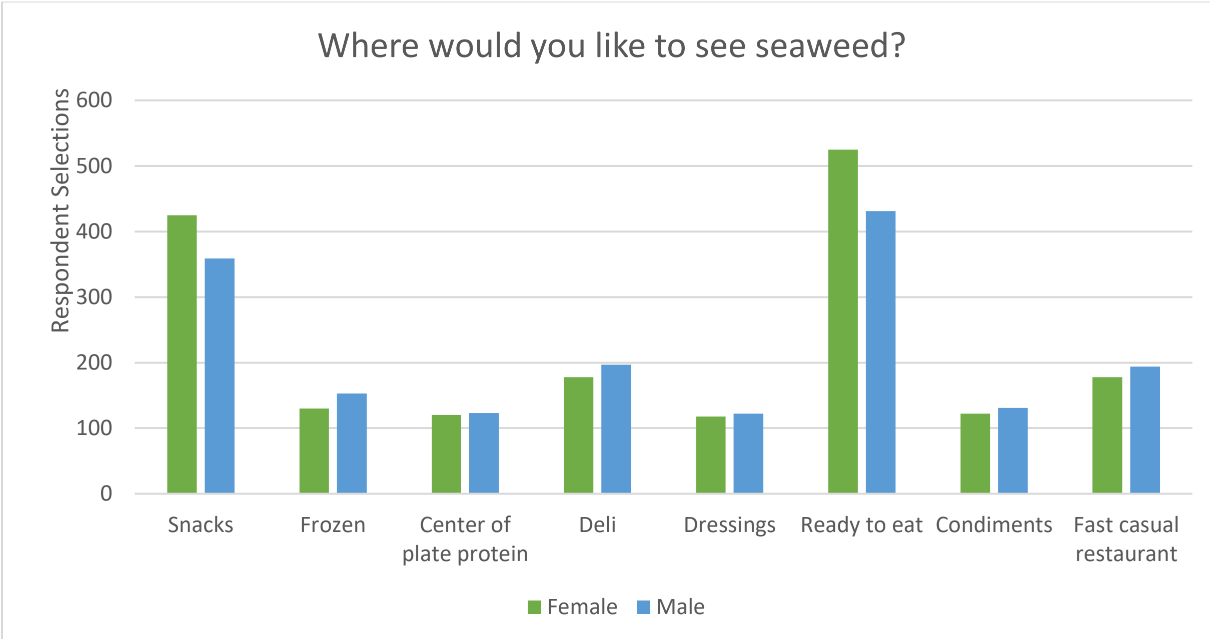

Figure 34. Seaweed product form preference based on gender

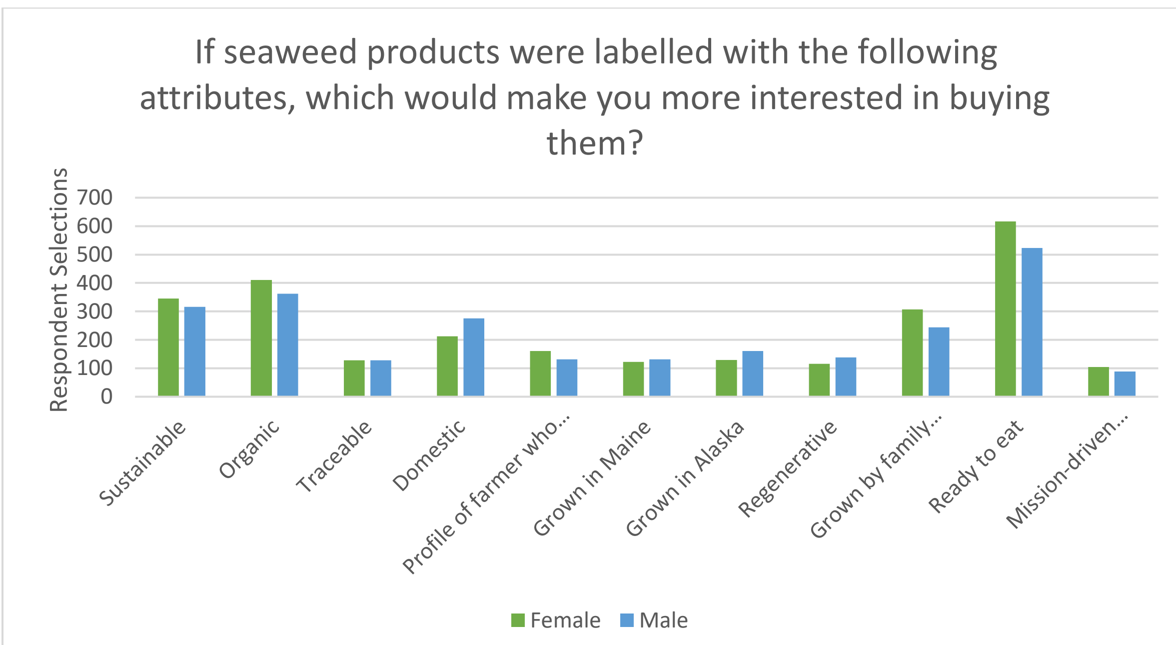

Figure 35. Seaweed product attribute preferences based on gender

The recurring theme of preferences for taste and familiarity remained true across gender as well, as the only category that women chose higher than men was that they like the base product. This means that in the survey women selected a product that they already know that they like, are familiar with, and know how to prepare. With ~70-80% of women serving as the primary grocery shopper and primary food preparer in their household (Schaeffer, 2019), this presents a potential market growth opportunity for seaweed. As shown below, both genders much more frequently chose supermarket as their primary shopping for food location. It does also note that slightly more women shop for food online, while the other categories remain nearly identical (Figure 36).

Figure 36.a. Primary grocery shopping location based on gender

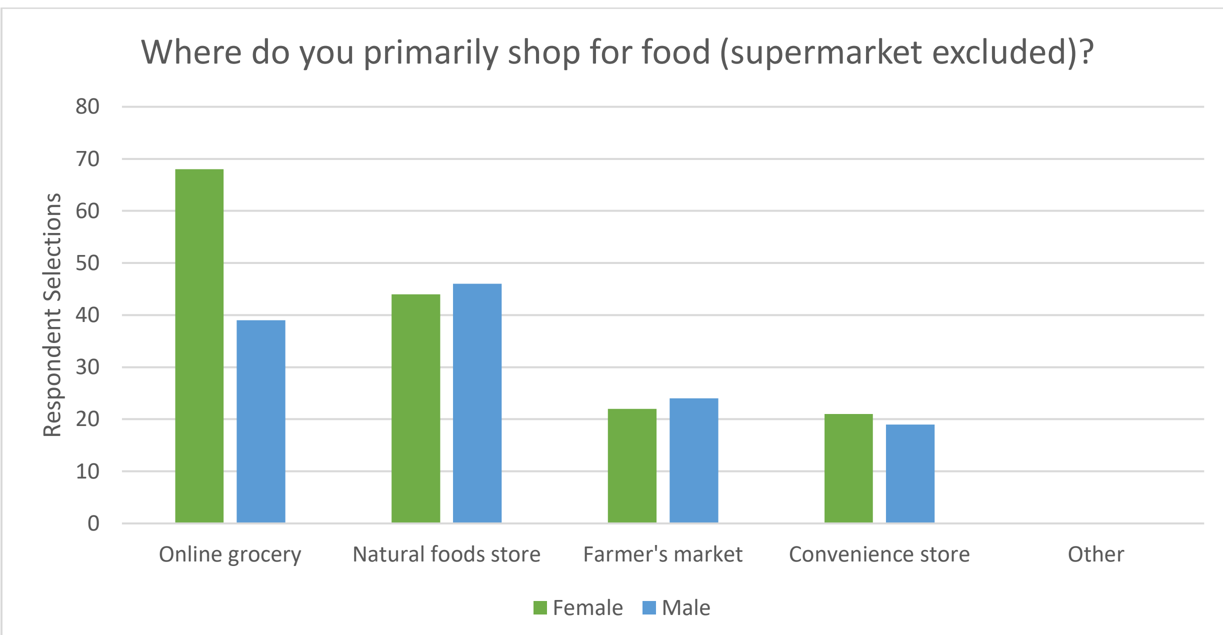

Figure 36.b. Primary grocery shopping location based on gender (supermarket excluded)

Consistent with previous findings across the whole survey, liking the base product and health benefits remained the top two categories across both groups (Figure 37). Women tended to choose a product more frequently than men if they liked the base product, while men chose products just slightly more than women for its health benefits. The latter came as a surprise, as other studies have found that women tend to hold greater beliefs in the importance of a healthy diet compared to men (Wardle et al., 2004).

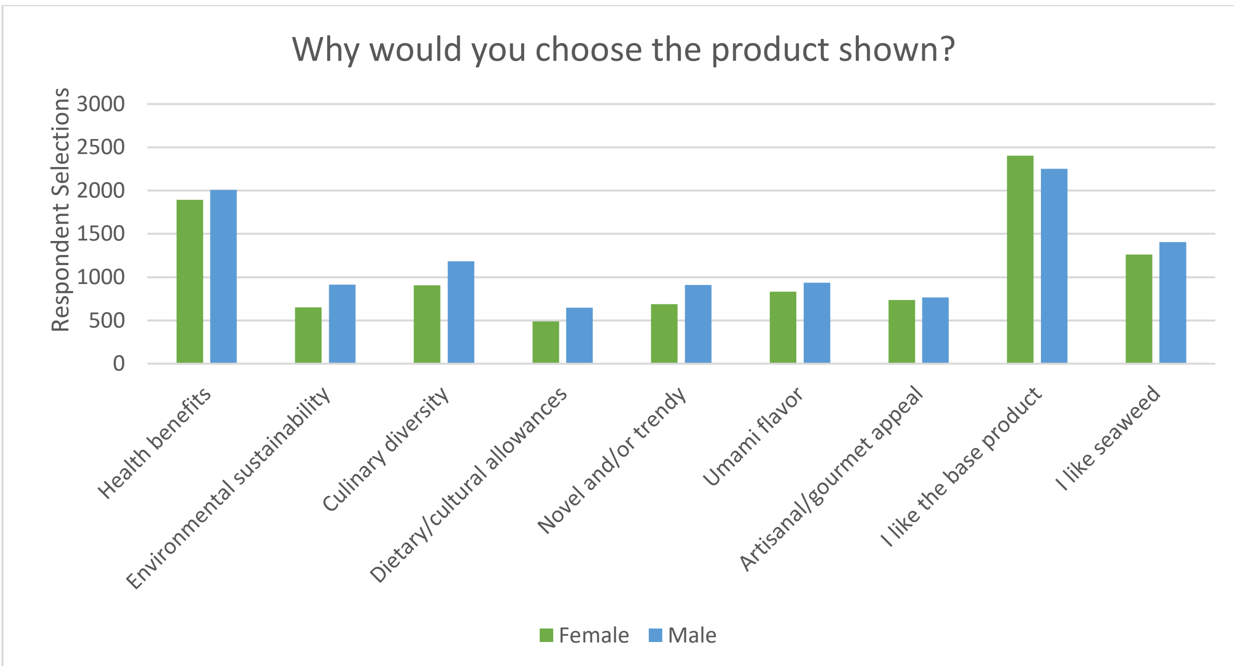

Figure 37. Rationale for choosing products based on gender

Male respondents, who consumed more seaweed and more often claimed to like seaweed, rated every product higher than women, highlighting their increased willingness to consume seaweed (Figure 38).

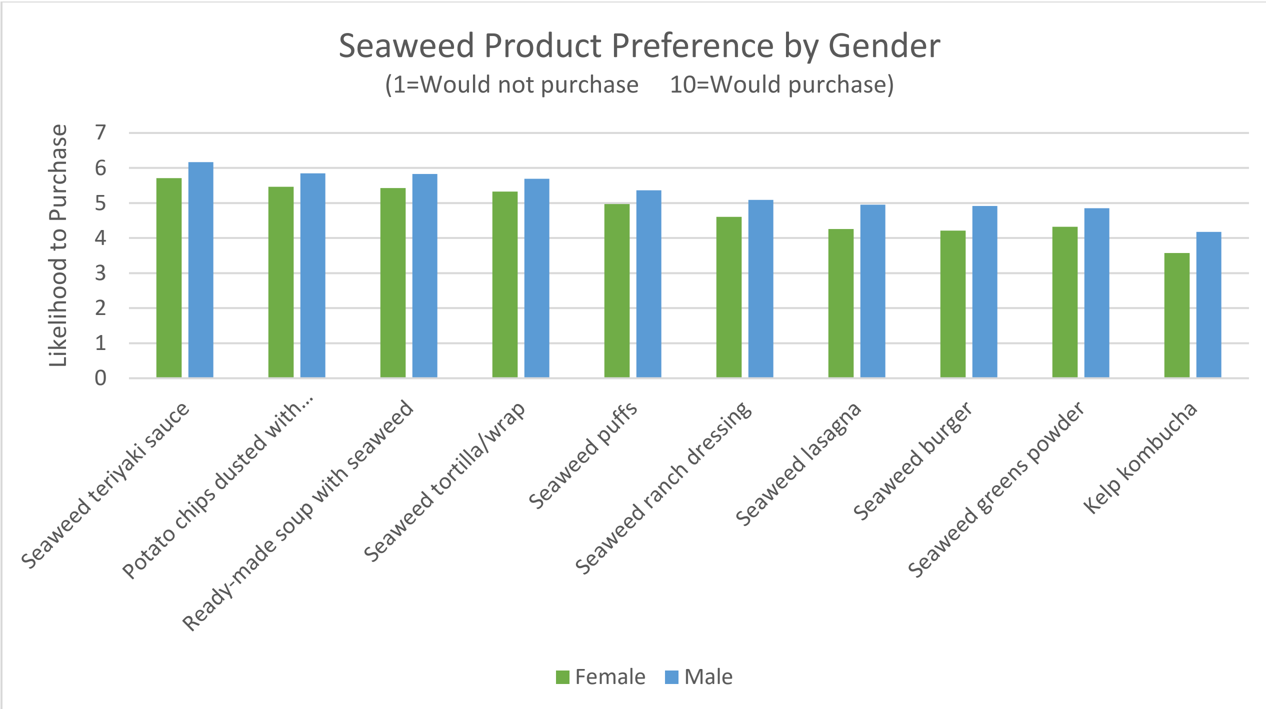

Figure 38. Seaweed product preference based on gender

Open-Ended Responses

Following each of the ten individual seaweed items, respondents were asked, in an open-ended format, "What drove your decisions to purchase/not to purchase the products above?" Five main categories emerged. Respondents were driven to purchase seaweed because:

A. It was included in items that they already liked e.g. "I don't know if I like the taste of seaweed or kelp. When you combine it with a food I already like I might try it."
   - Similarly, some stated that they would prefer to have seaweed where its use is subtle, or where it is not the main ingredient.

B. They were intrigued by the health benefits, especially when paired with foods they enjoy e.g. "I've heard that seaweed is good for you, so I'd mostly be interested in trying it as an ingredient in products I already like."

There were also comments from those who already enjoy seaweed, or seek culinary diversity, but those were far fewer than any categories mentioned here. Many were driven to not purchase seaweed products because:

C. "They don't sound good"

D. They have never had seaweed or do not like seaweed e.g. "Seaweed is for fish and turtles and things like that" and "I'm not a plant eater."

An additional category also emerged in which :

E. Respondents had not previously consumed seaweed, but were open-minded, and wanted to try it before committing. Many of these respondents also cited the need for samples to help them make their decision, e.g. “I would try a sample but not pay for it,” “If I had a sample, I might change my mind,” and “I would never buy anything 'new' unless first given free samples to see what it tastes like.”

Demographics

Centiment, a research platform, was contracted to provide a nationally representative panel of the U.S. with a sample size of 2,000. The following figures provide the demographics for all respondents.

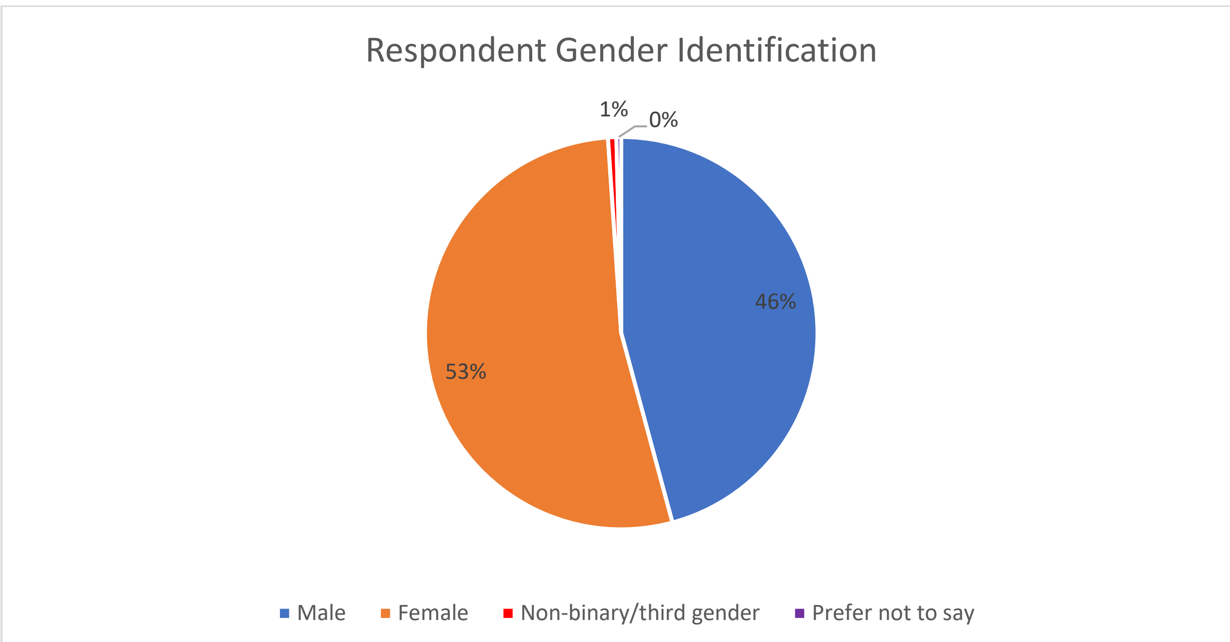

Figure 39. Respondent gender identification

This provides a representative sample, as the U.S. Census Bureau reports the current U.S. population as 50.4% Female.

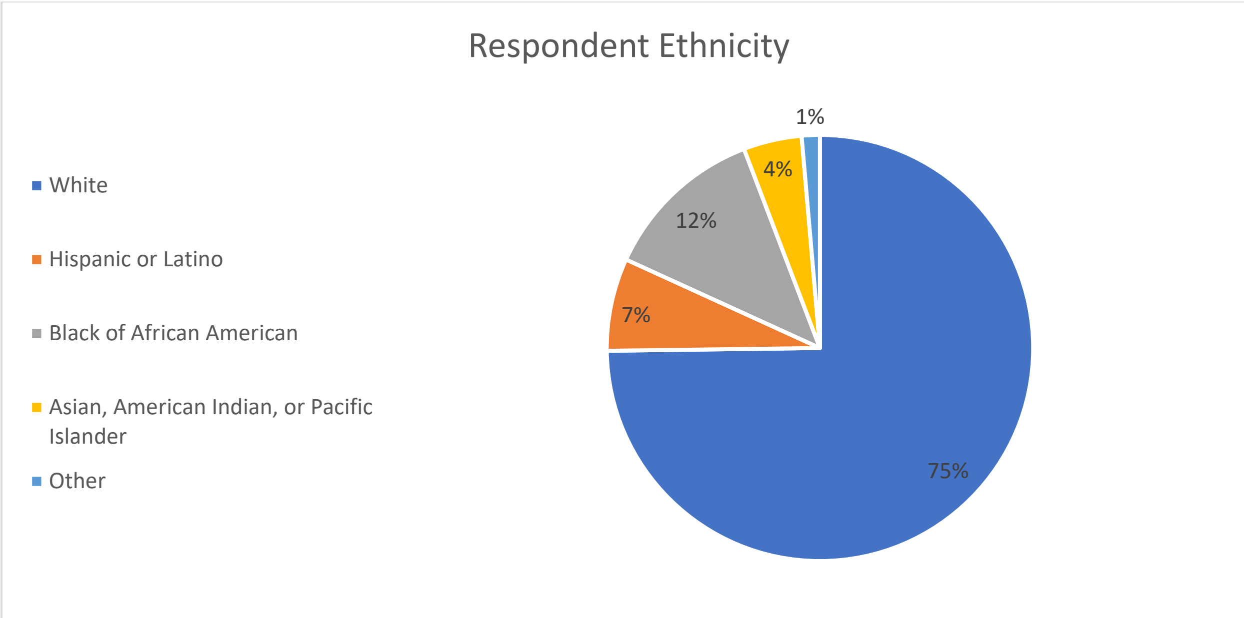

Figure 40. Respondent ethnic identification

The responses follow a similar pattern to national statistics. However, the sample of this survey does potentially contain a larger amount of White (75% in the survey sample vs. 59% at the national level), and lower amount of Hispanic or Latino (7% vs. 19%), respondents. Given variation in how ethnicity questions are asked in surveys, census, etc., this can be an especially tricky number to pinpoint. Some surveys include Hispanic or Latino within the White category, others include it on its own, and others are included in a 2 or more race category. This survey included Hispanic or Latino as its own category. It is difficult to say if the number of White and Hispanic or Latino respondents is balanced with U.S. residents, but the remainder of the ethnic groups selected remains close to national averages with Black (12% vs 13%) and Asian, American Indian, or Pacific Islander categories (4% vs. 6%).

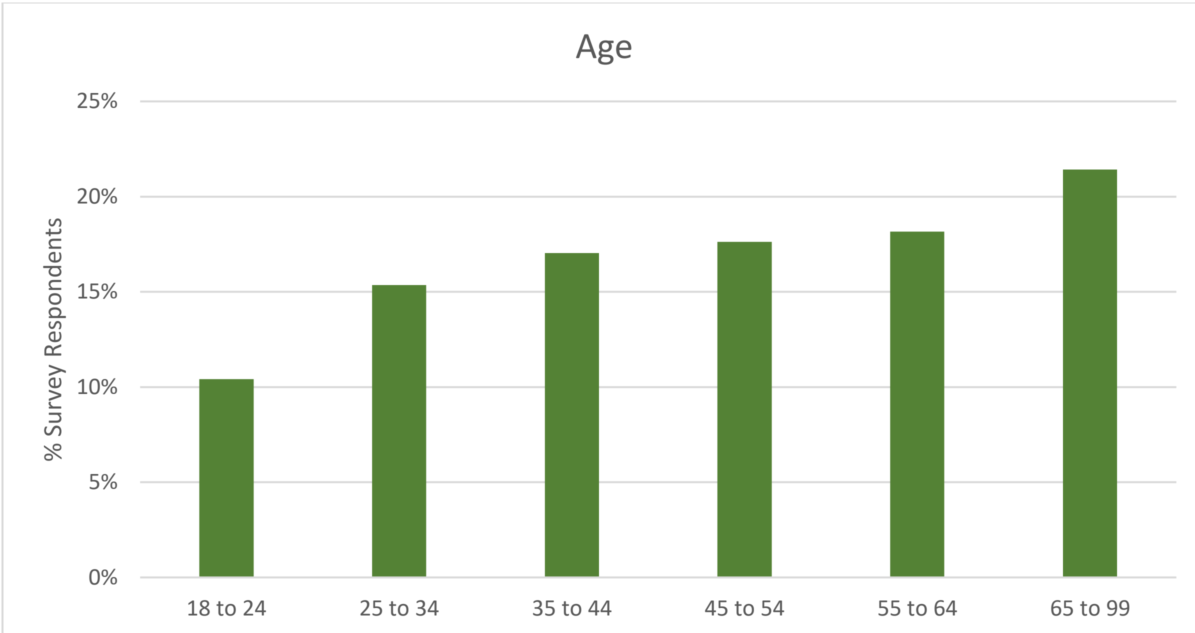

Figure 41. Respondent age

The age makeup or survey respondents closely follows that of the U.S. as well. According to U.S. census data, the age groups above are represented at the following levels, respectively: 13%, 17%, 16%, 15%, 16%, and 21%.

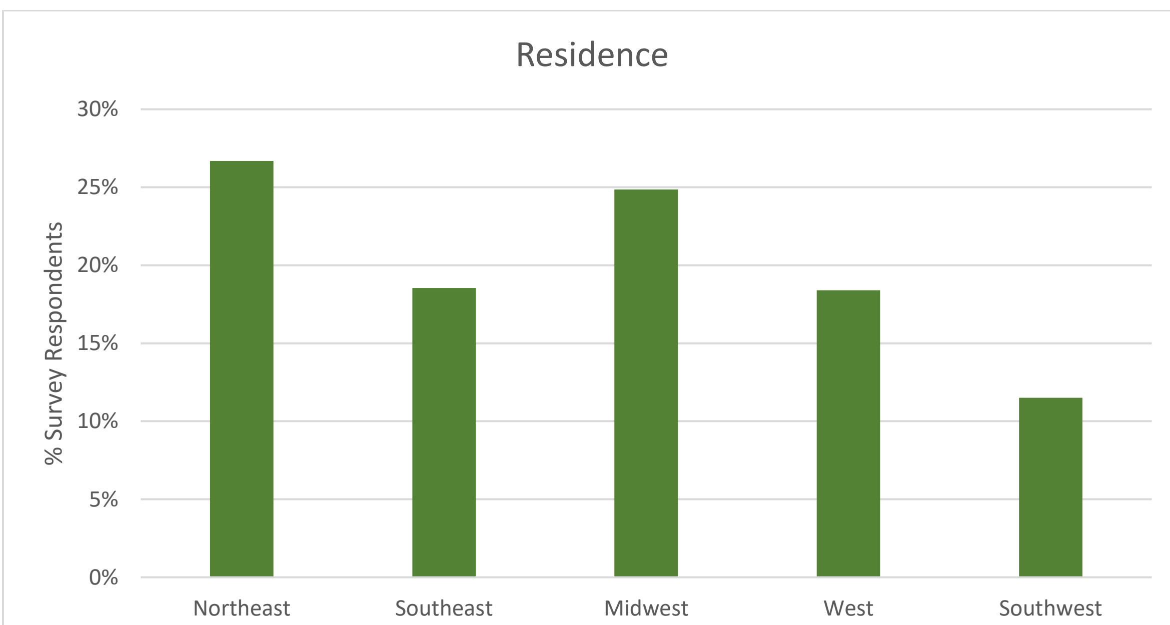

Figure 42. Respondent region of residence

Due to unclear definitions of the regions above, an accurate number of residents in each region is difficult to establish on a national level. The closest comparison places the Northeast with 17% of the population, the Midwest with 20%, the West with 24%, and the South with 39%. This indicates that our sample has a higher level of responses from the Northeast and Midwest. Due to differences in distinctions of Southeast, Southwest, and West compared to the data mentioned above, it is difficult to draw a conclusive comparison beyond the fact that the numbers remain similar to national-level data.

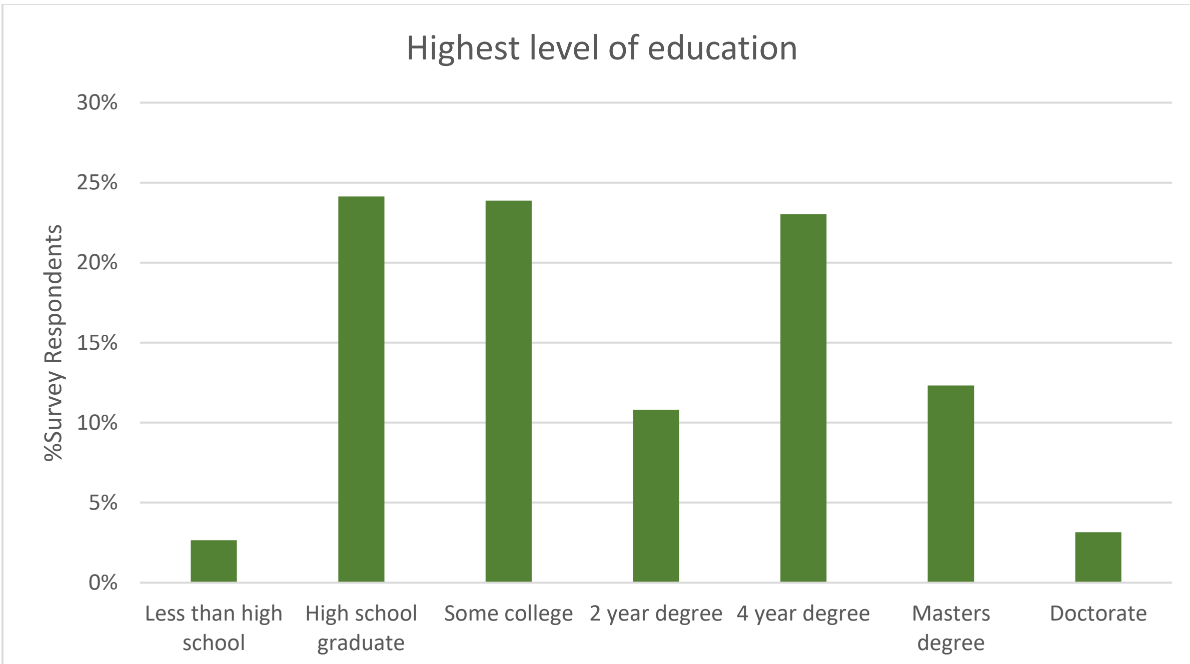

Figure 43. Respondent educational attainment

Survey respondents closely followed the highest level of education attained compared with national samples, respectively 9%, 28%, 15%, 10%, 23%, and 14% (including all advanced degrees). The most notable deviation is that this sample contained fewer people with less than a high school degree, and more who graduated high school or had some college experience.

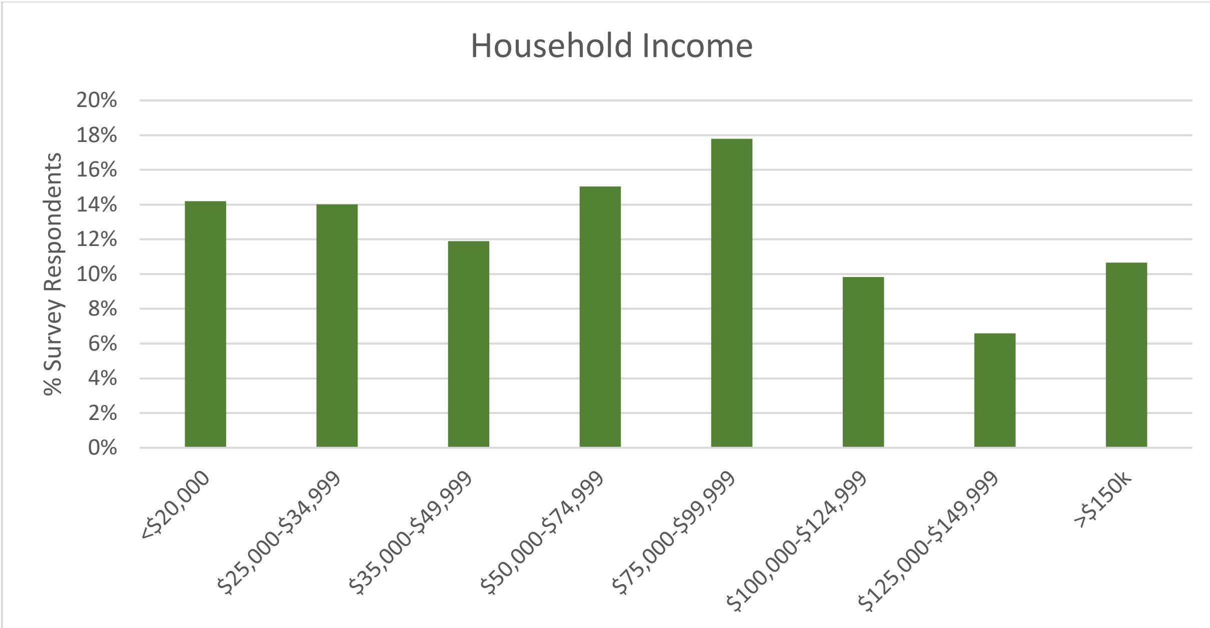

Figure 44. Respondent household income

The household income of respondents is similar to that of national trends, however it skews slightly lower with the inclusion of more responses in categories comprising <$75,000.

Conclusions

When it comes to trying new products with seaweed in them, consumers in this survey indicated that they would prefer more familiar products. Respondents indicated that they are drawn to products where they already know that they like the base product, and then seaweed is included as an addition. Examples include seaweed teriyaki sauce and potato chips dusted with seaweed. The findings show that the second-most important factor to respondents is that they want food that is ready-to-eat, including snacks that contain seaweed. This was indicated by almost half of the survey respondents. The draw of health benefits follows that of liking the base product and the ready-to-eat or snack forms, and is higher amongst those who have previously consumed seaweed. Age is also highlighted as a driver for future seafood consumption, as those under 45 indicated a higher likelihood to purchase seaweed products. Although roughly half of the respondents have not previously consumed seaweed, many of them still indicated an interest in consuming seaweed. These respondents would need to try seaweed, likely for free, before they could commit to purchasing a new product on their limited budget. Despite barriers and limited previous consumption from respondents, the data collected from this survey show that those interested in creating new products with seaweed should keep top of mind the familiarity and draw of the base product, followed by the form of the product, and then its health benefits.

For any questions, please contact the author, Christian Brayden, at christian@maineaqua.org.

Appendix

Individual seaweed product preferences

For each individual product, motivations varied as to why a respondent would/would not purchase the product. For the most part, liking the base product (e.g. teriyaki sauce) remained the primary motivation for purchasing the product. However, two items varied from the trend – seaweed greens powder and kelp kombucha. For these products, which overall ranked as the least likely to be purchased, health benefits were ranked as the number one reason. It is expected that the ranking is due to respondent association between greens powder, kombucha, and "health," as opposed to items such as potato chips or seaweed puffs – which have not traditionally been considered "health"-focused foods.

Seaweed teriyaki sauce

Figure A.1. Rationale for purchasing seaweed teriyaki sauce

Figure A.2. Rationale for not purchasing seaweed teriyaki sauce

Respondents were driven to purchase seaweed teriyaki sauce, as with other products, based on liking the base product (teriyaki sauce), with health benefits as a distant second factor. Primary drivers to not purchase the product were “It doesn’t sound good” and “I don’t like seaweed.”

Ready-made soup with seaweed

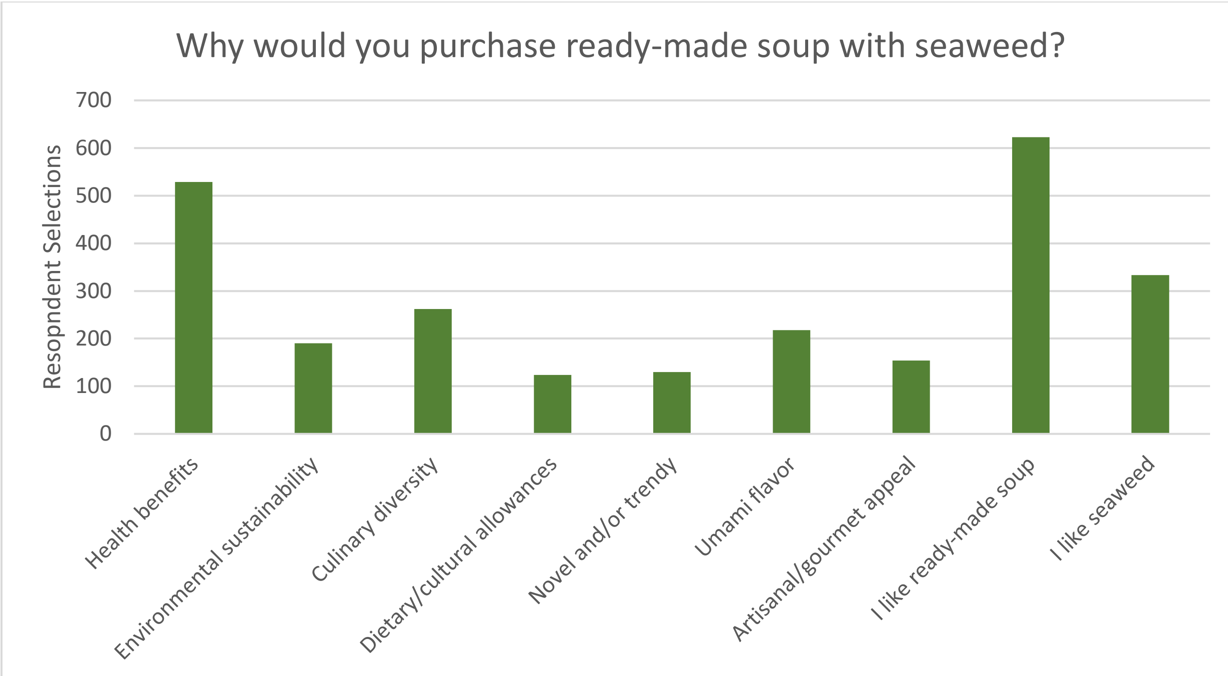

Figure A.3. Rationale for purchasing ready-made soup with seaweed

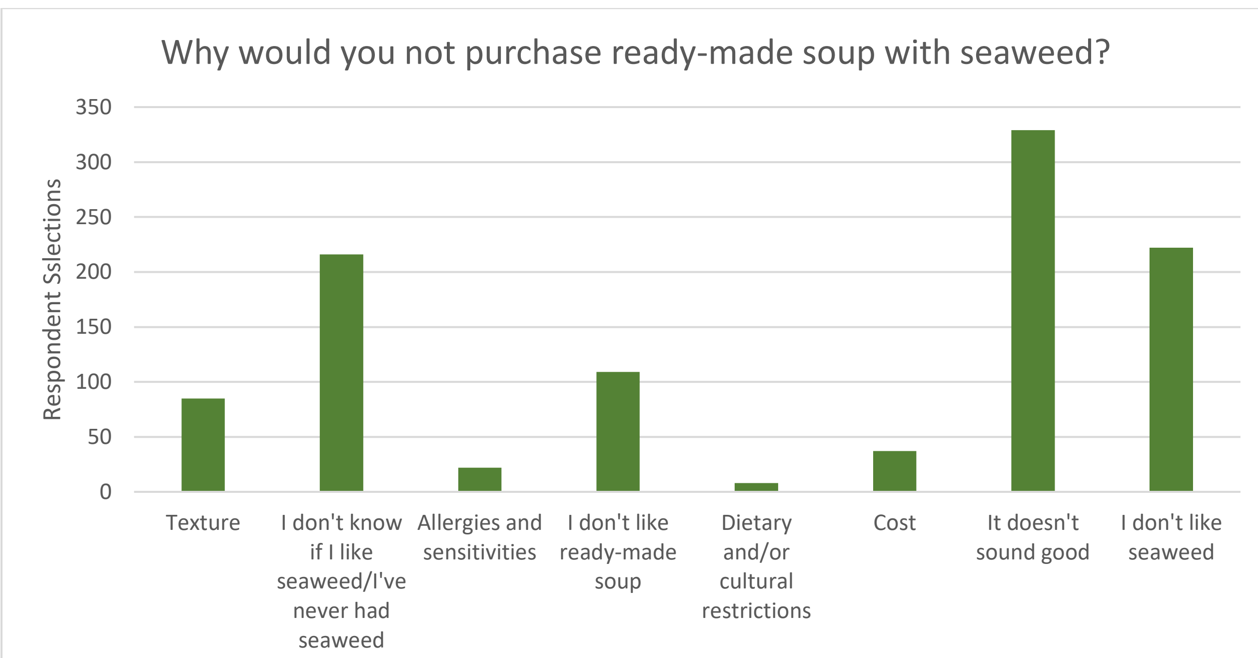

Figure A.4. Rationale for not purchasing ready-made soup with seaweed

Respondents were driven to purchase ready-made soup with seaweed, as with other products, based on liking the base product (ready-made soup), with health benefits coming in as a close second factor. Primary drivers to not purchase the product were "It doesn't sound good" followed by "I don't like seaweed" and "I don't know if I like/I have never had seaweed."

Seaweed tortilla/wrap

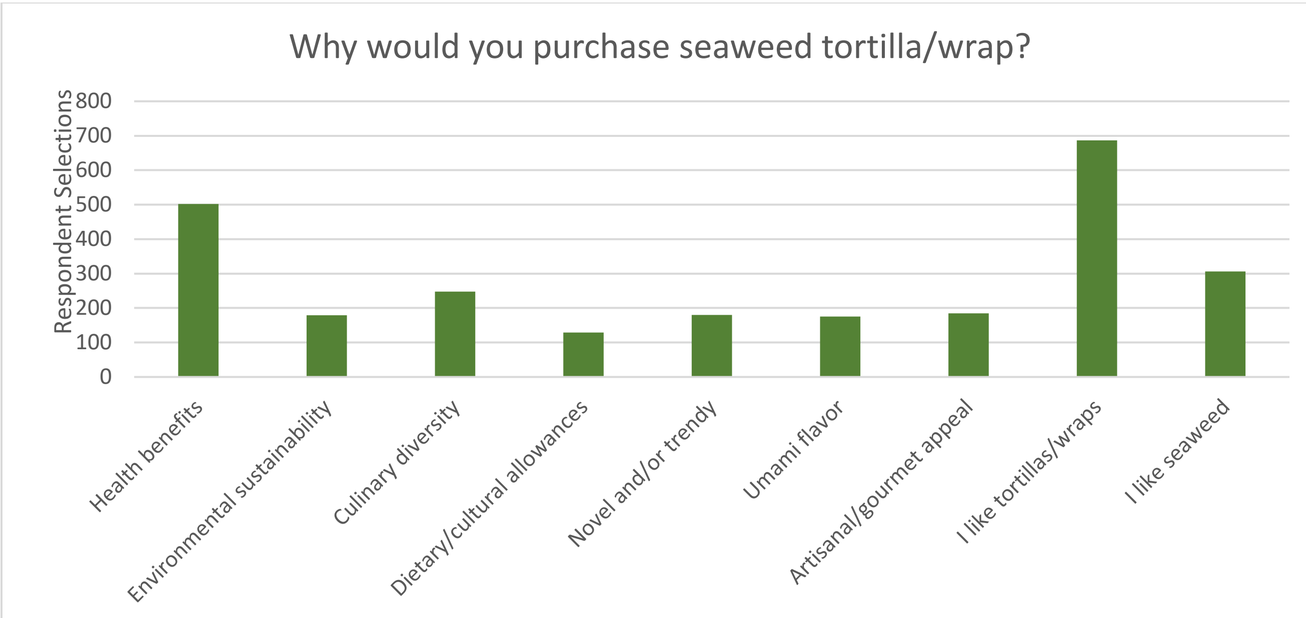

Figure A.5. Rationale for purchasing seaweed tortilla/wrap

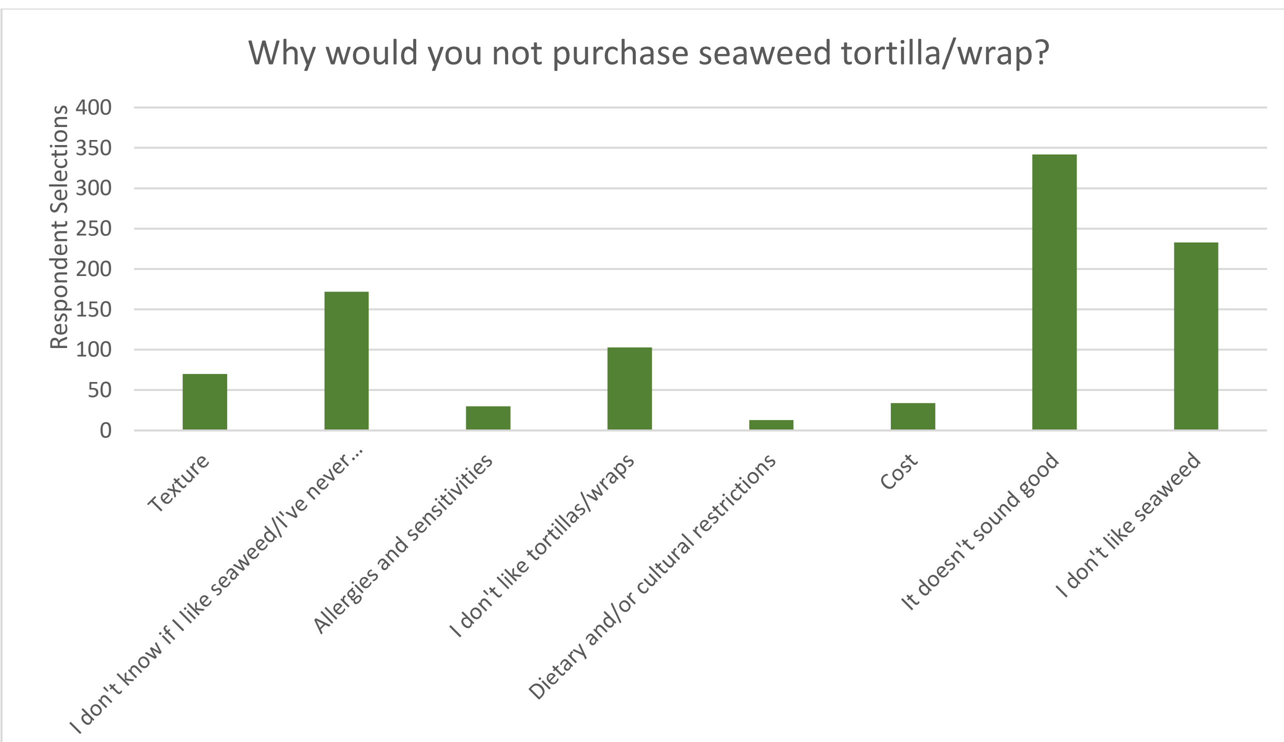

Figure A.6. Rationale for not purchasing seaweed tortilla/wrap

Respondents were driven to purchase seaweed tortilla/wraps, as with other products, based on liking the base product (tortilla/wrap), with health benefits as a second factor, and all others notably lower. Primary drivers to not purchase the product were “It doesn’t sound good” and “I don’t like seaweed.”

Potato chips dusted with seaweed

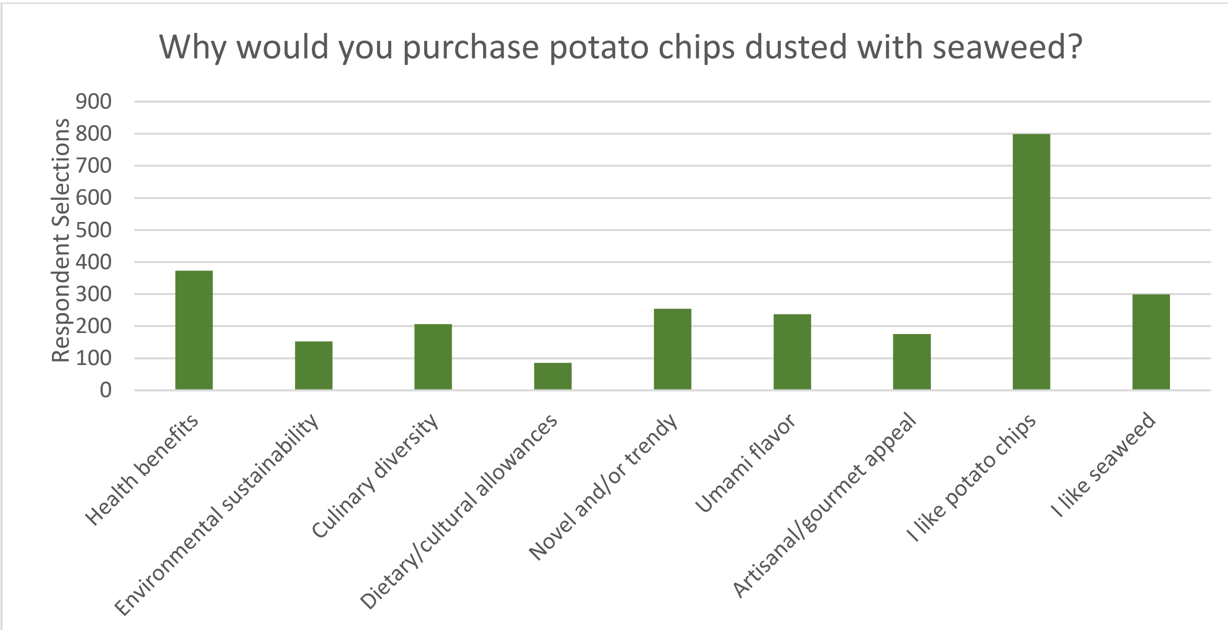

Figure A.7. Rationale for purchasing potato chips dusted with seaweed

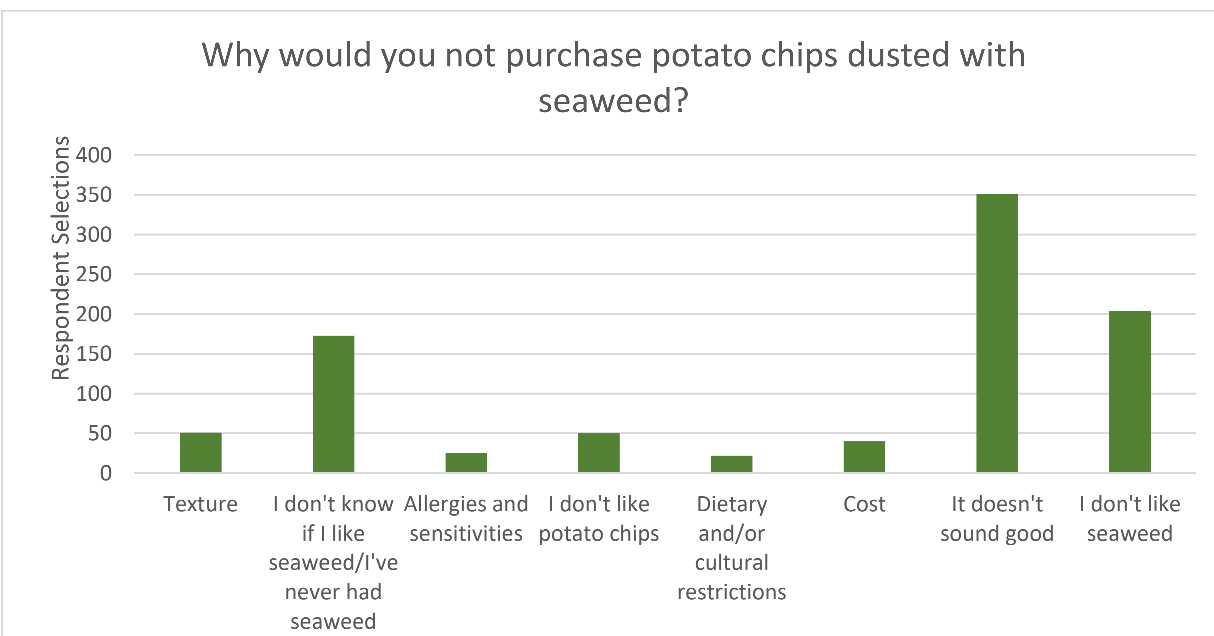

Figure A.8. Rationale for not purchasing potato chips dusted with seaweed

Respondents were driven to purchase potato chips dusted with seaweed, as with other products, based on liking the base product (potato chips), with health benefits as a distant second factor. Primary drivers to not purchase the product were “It doesn’t sound good” and “I don’t like seaweed.”

Seaweed lasagna

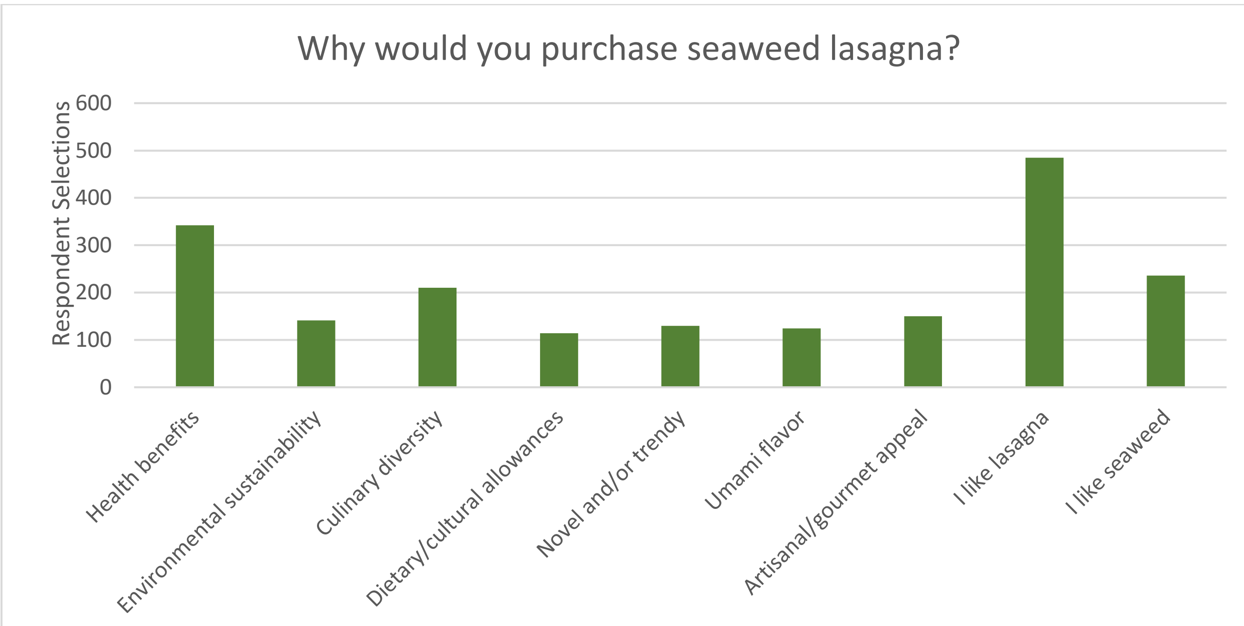

Figure A.9. Rationale for purchasing seaweed lasagna

Figure A.10. Rationale for not purchasing seaweed lasagna

Respondents were driven to purchase seaweed teriyaki sauce, as with other products, based on liking the base product, with health benefits as a secondary factor. The primary driver to not purchase the product was "It doesn't sound good," distantly followed by "I don't like seaweed" and "I don't know if I like/I've never had seaweed."

Seaweed puffs

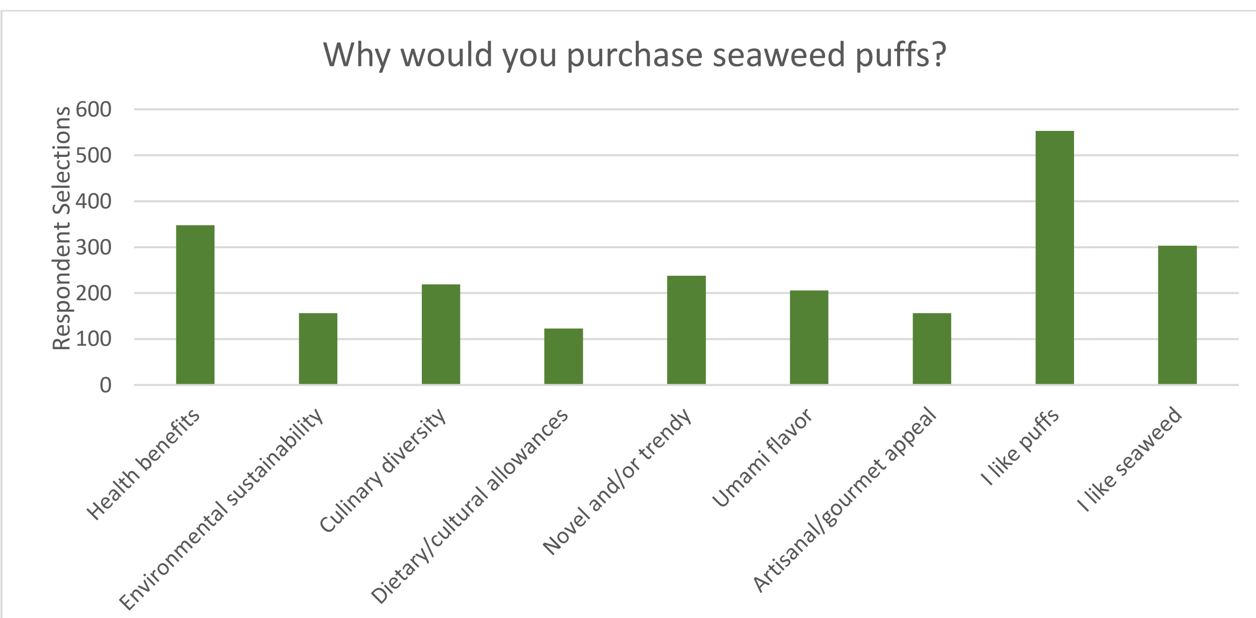

Figure A.11. Rationale for purchasing seaweed puffs

Figure A.12. Rationale for not purchasing seaweed puffs

Respondents were driven to purchase seaweed puffs, as with other products, based on liking the base product (puffs), with health benefits as a second factor and “I like seaweed” as a near third. This could perhaps be a seaweed-forward snack for those who enjoy leaning into the seaweed portion of the product. Primary drivers to not purchase the product were “It doesn’t sound good” and “I don’t like seaweed,” although more responded to these two questions with “I like seaweed” for a reason to purchase the product.

Seaweed burger

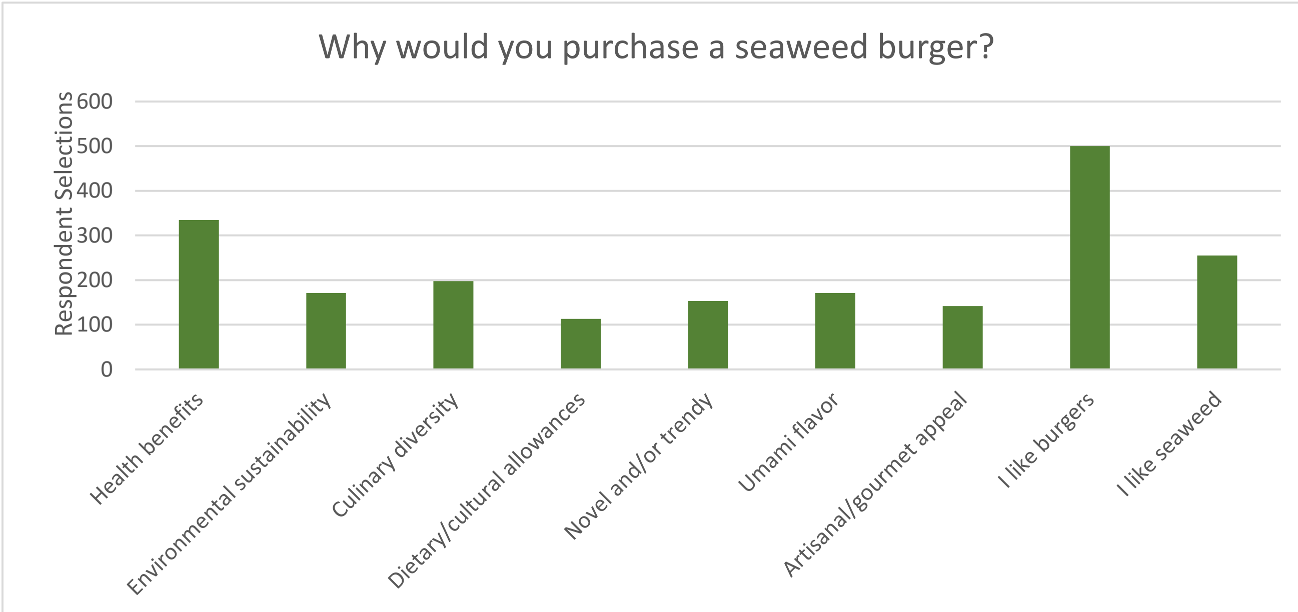

Figure A.13. Rationale for purchasing a seaweed burger

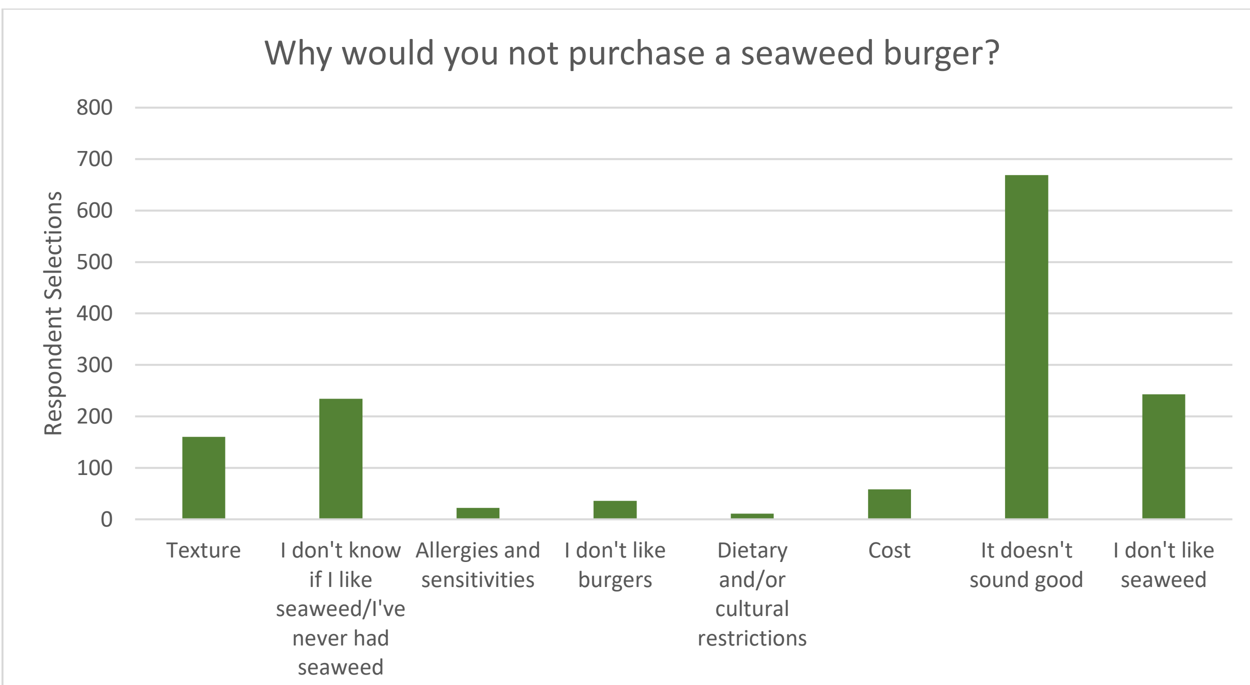

Figure A.14. Rationale for not purchasing a seaweed burger

Respondents were driven to purchase a seaweed burger, as with other products, based on liking the base product (a burger), with health benefits as a distant second factor. Primary drivers to not purchase the product were led by “It doesn’t sound good” and “I don’t like seaweed” and “I don’t know if I like seaweed/I have never had seaweed.”

Seaweed ranch dressing

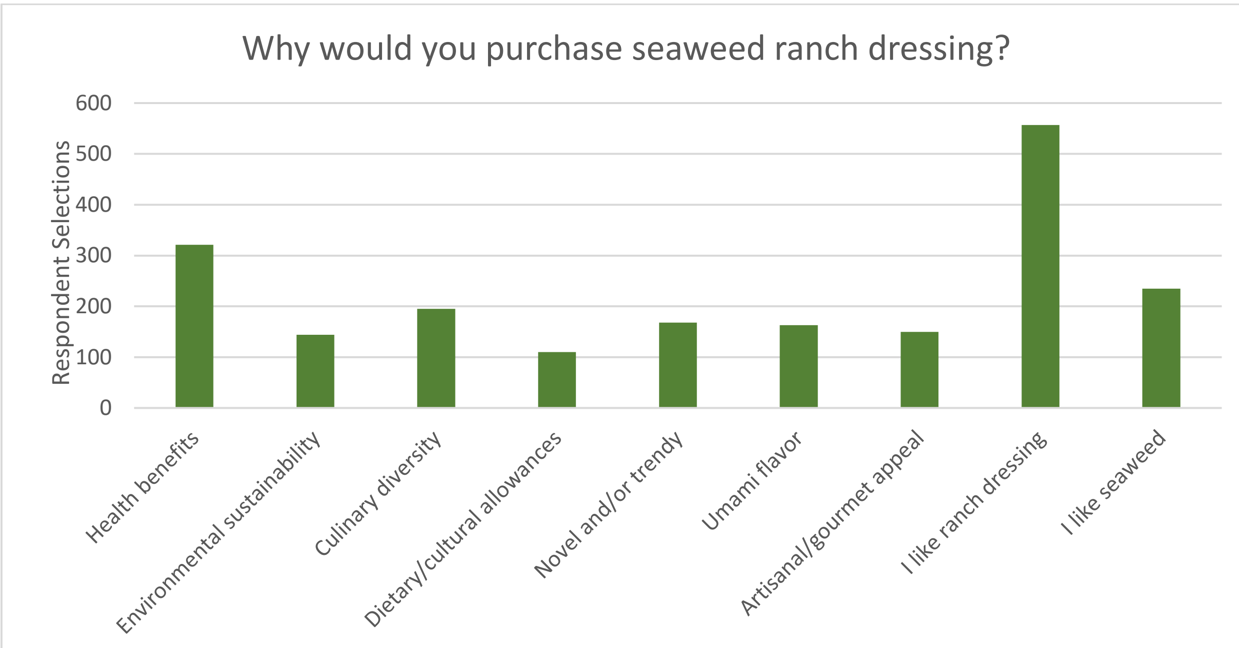

Figure A.15. Rationale for purchasing seaweed ranch dressing

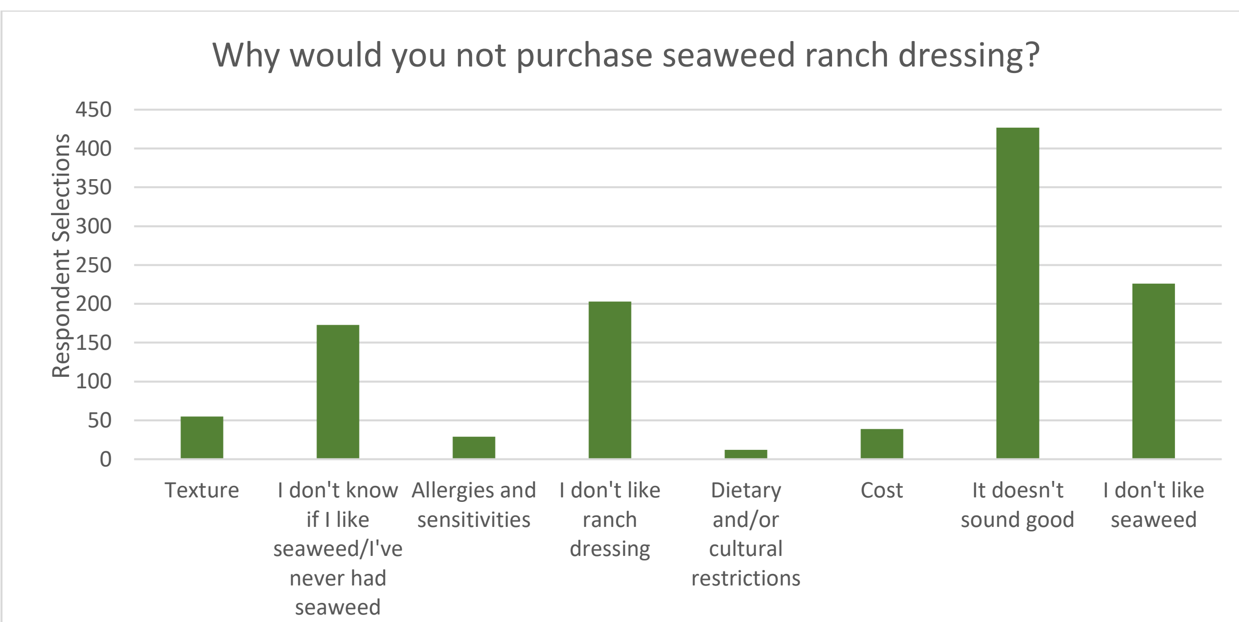

Figure A.16. Rationale for not purchasing seaweed ranch dressing

Respondents were driven to purchase seaweed ranch dressing, as with other products, based on liking the base product (ranch dressing), with health benefits as a second factor. Primary drivers to not purchase the product were “It doesn’t sound good,” “I don’t like ranch dressing,” and “I don’t like seaweed.”

Seaweed greens powder

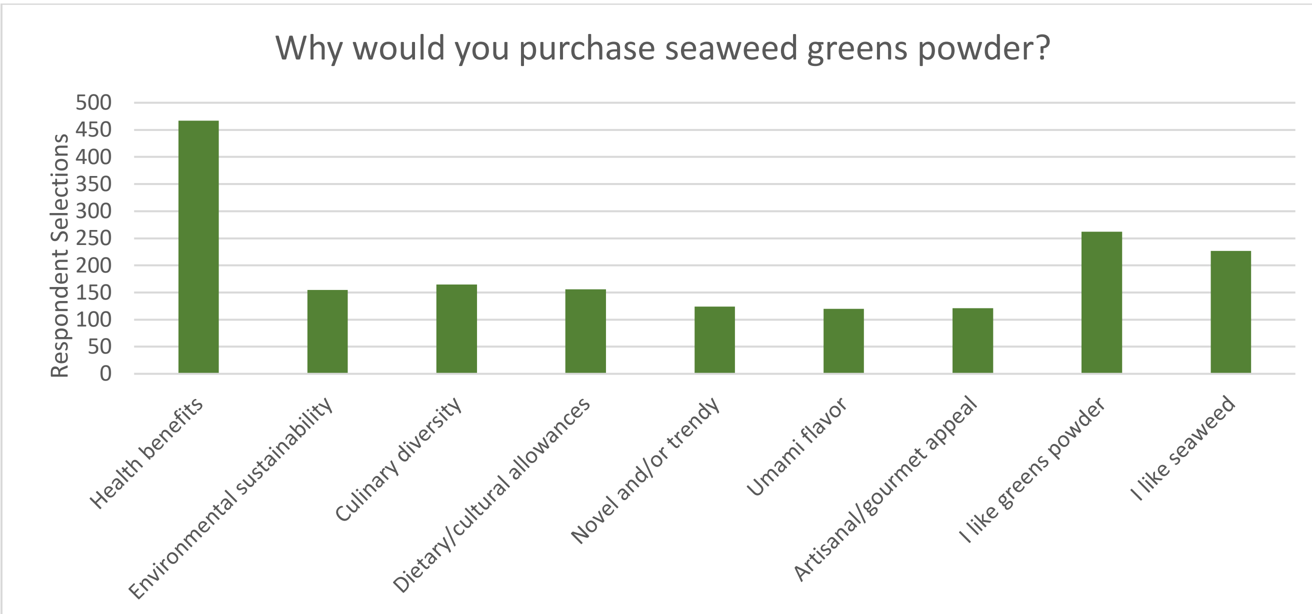

Figure A.17. Rationale for purchasing seaweed greens powder

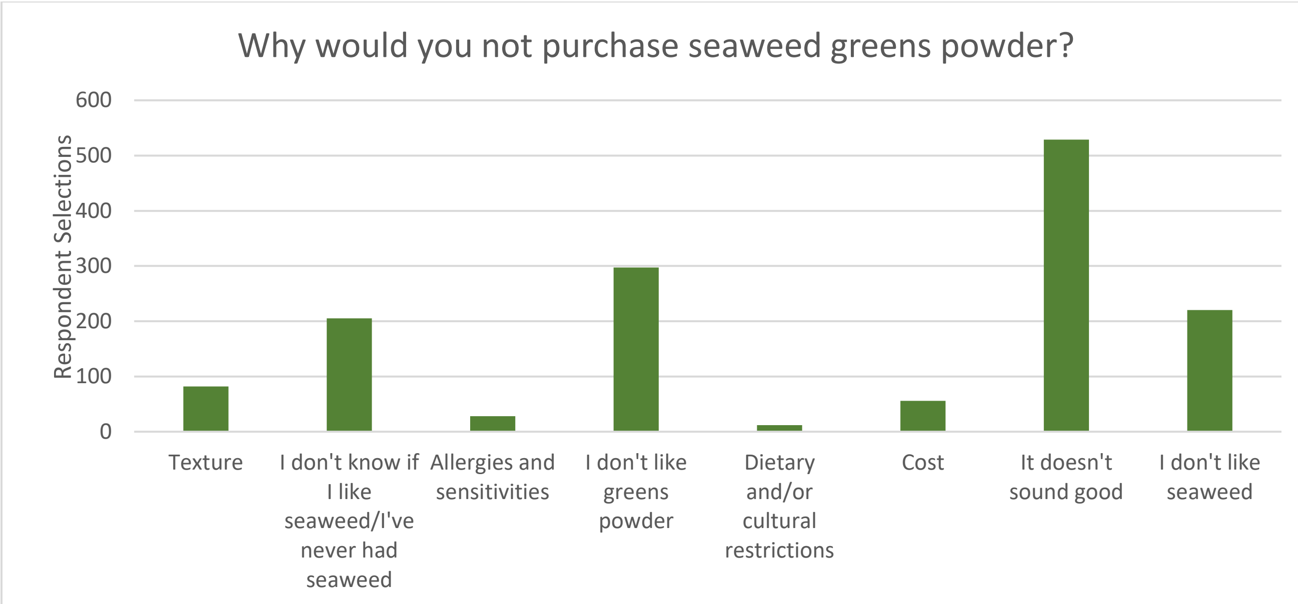

Figure A.18. Rationale for not purchasing seaweed greens powder

Respondents answered differently to seaweed greens power, with the primary driver of purchase being health benefits, followed by liking the base product (greens powder) and "I like seaweed." Primary drivers to not purchase the product were "It doesn't sound good" and "I don't like greens powder." In this circumstance, more stated that they did not like they base product than those who like the base product – likely a factor in its overall low rating.

Kelp kombucha

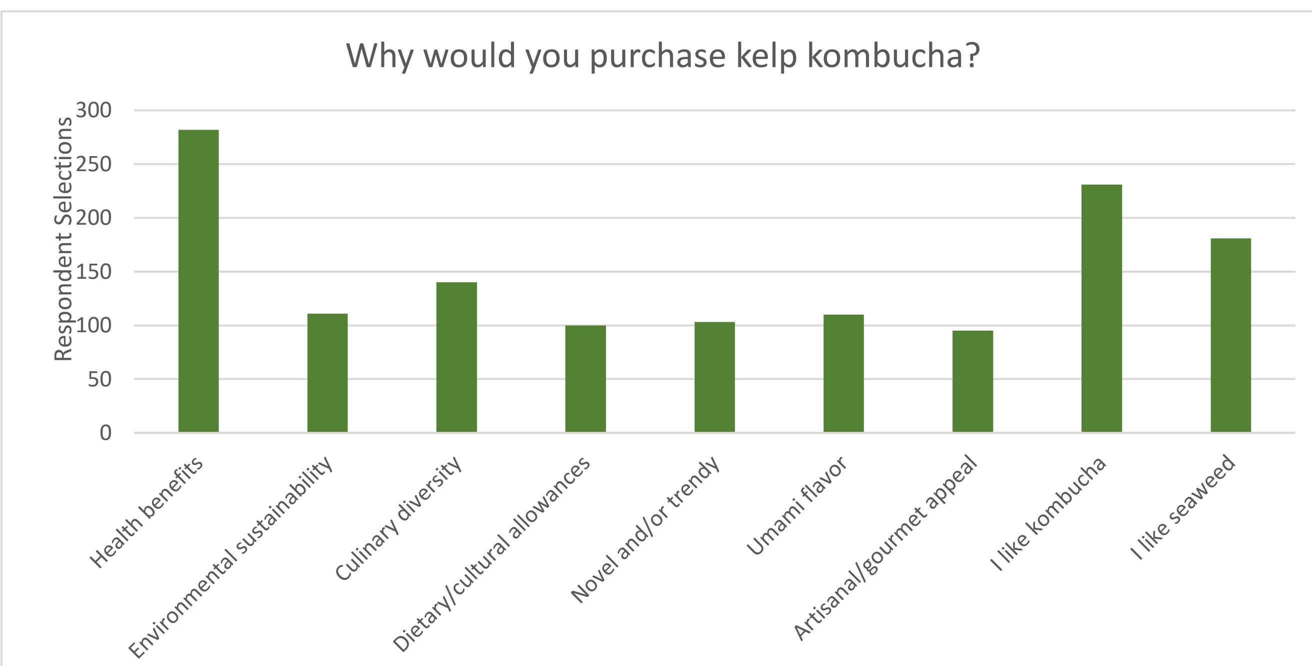

Figure A.19. Rationale for purchasing kelp kombucha

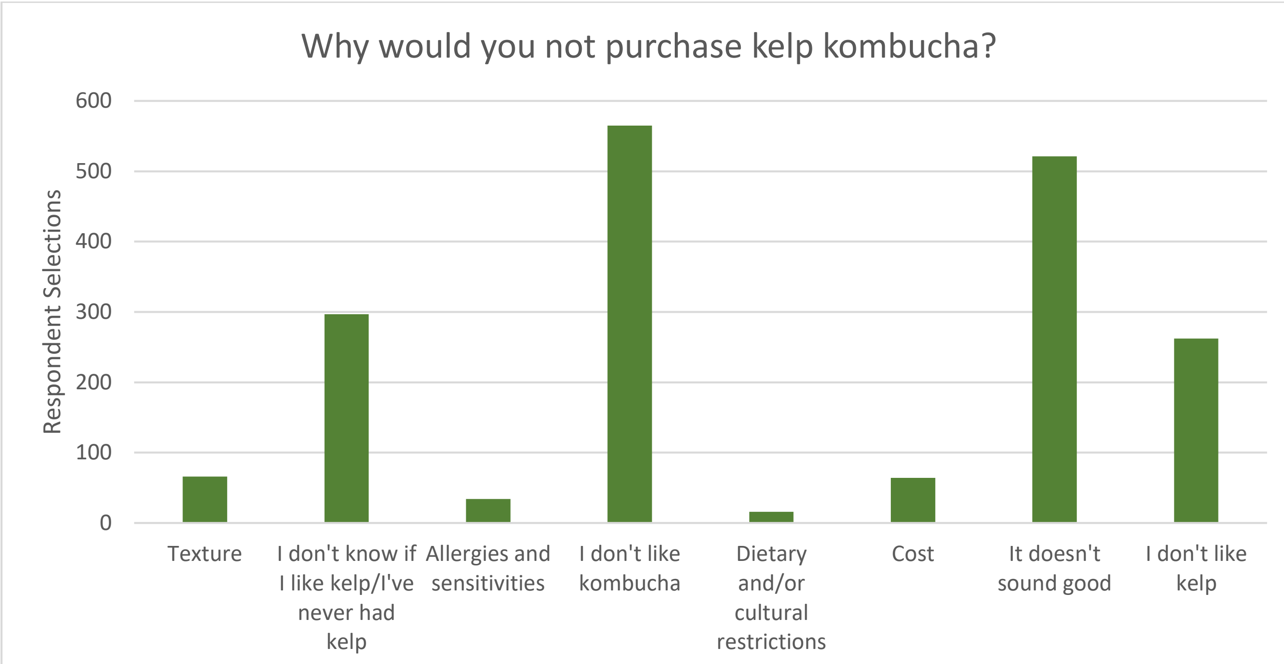

Figure A.20. Rationale for not purchasing kelp kombucha

Kelp kombucha also held health benefits as the highest reason to purchase it, followed by liking the base product (kombucha) and I like seaweed. Those who would not purchase kelp kombucha named not liking kombucha and “it doesn’t sound good” as their top factors. More than two times as many respondents noted not liking kombucha compared to liking kombucha, likely leading to the overall low product rating.

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