Food Brain Predicts...

Trends 2022 & Beyond

SPOONSHOT®

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ABOUT SPOONSHOT

Spoonshot is a food and beverage intelligence company that is raising the bar for insight-led innovation. We believe that a holistic approach to data is the key to uncovering and shaping the future of food.

Spoonshot equips the food and beverage industry with unprecedented foresight by transforming long-tail, open data from diverse, authentic sources. Our AI, Food Brain, applies the domain knowledge of food science to connect disparate data sets and deliver personalized insights about emerging consumer and market needs, trends, innovation opportunities, and even generates concepts.

Today, Spoonshot is supporting challenger brands as well as the world's best-known companies in meeting the future needs of their customers.

For more information, please visit
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To request a demo of our AI-powered innovation research platform, email us on
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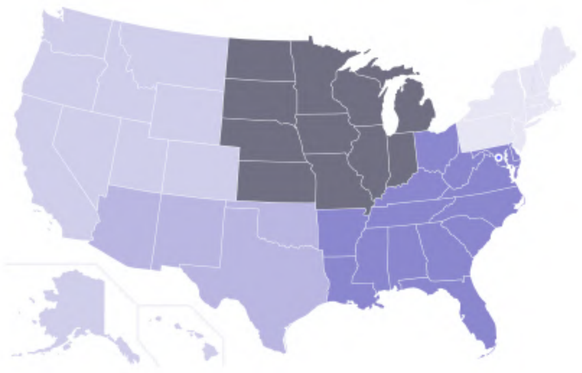
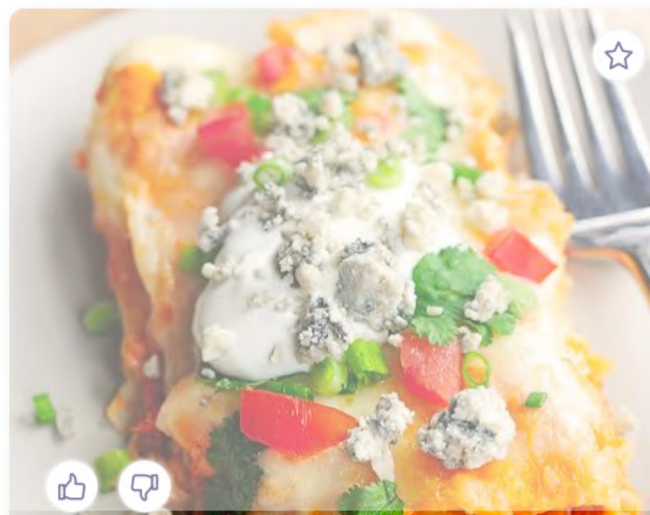
CHEF OLIVER

Quinoa Patties And Cauliflower With Tahini Mint Sauce

NOVELTY DISTRIBUTION

MENU DISH PENETRATION (REGION)





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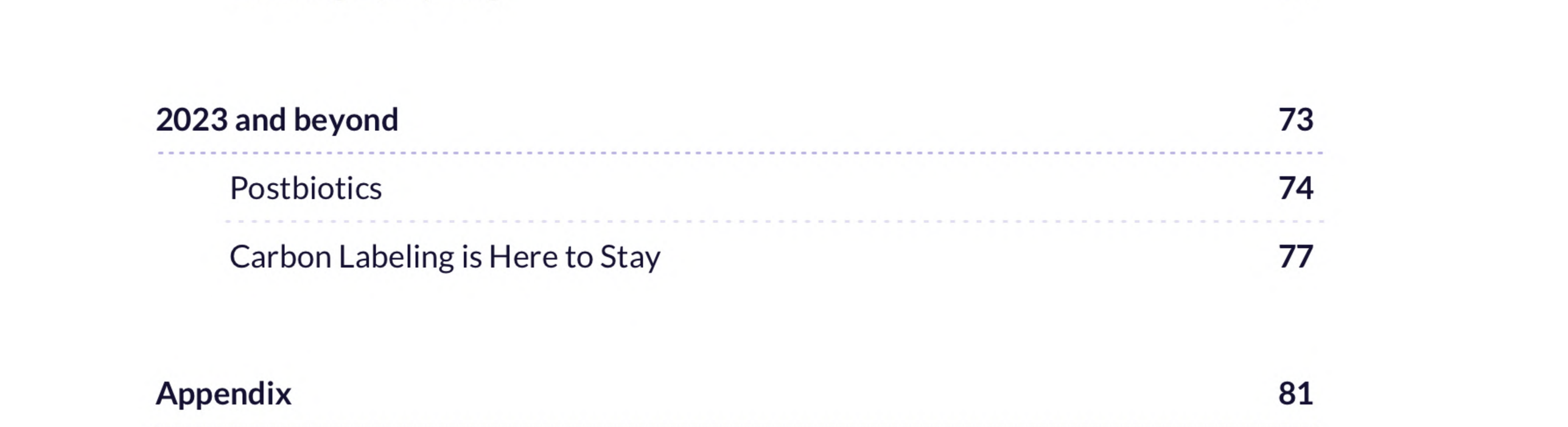


2022 TRENDS

We're getting a headstart on next year with our **9** predictions for **2022** and **beyond**. We expect to see sustainability and health taking center stage for food and drink companies in the coming year, as consumers show greater concern for these issues.

But both health and sustainability are pretty broad terms, so we've delved a little deeper into specific areas that are slated to grow. We'll also look into what to expect from food service.

HEALTH

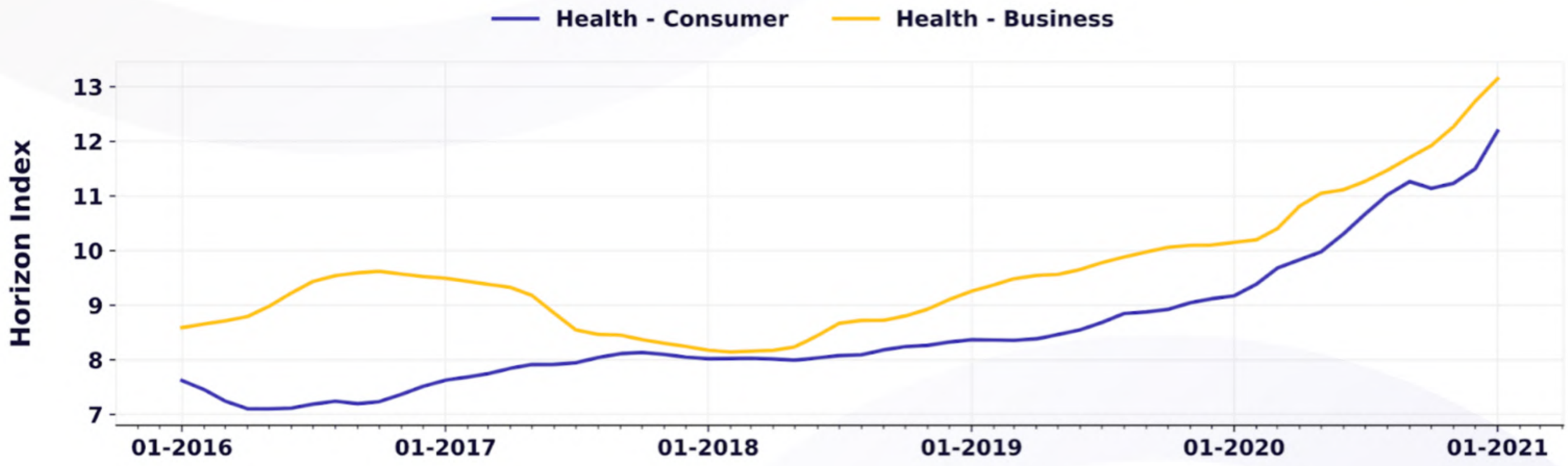
1
2good 2gether: Food Synergies

2
Breathe Easy: The Gut-Lung Axis

HEALTH

Over the last decade, consumers have been showing greater interest in taking better care of their health and companies have been increasingly offering them the means to do so through food and drink. Our data, based on an analysis of references to health, points to this as well. Spoonshot tracks interest in a topic based on articles and blogs published in the media. We also bifurcate this interest based on consumer media (consumer and influencer articles and blogs) versus business media (industry articles and blogs).

Interest in health grew by 30% in consumer media and by 29% in business media over the last year



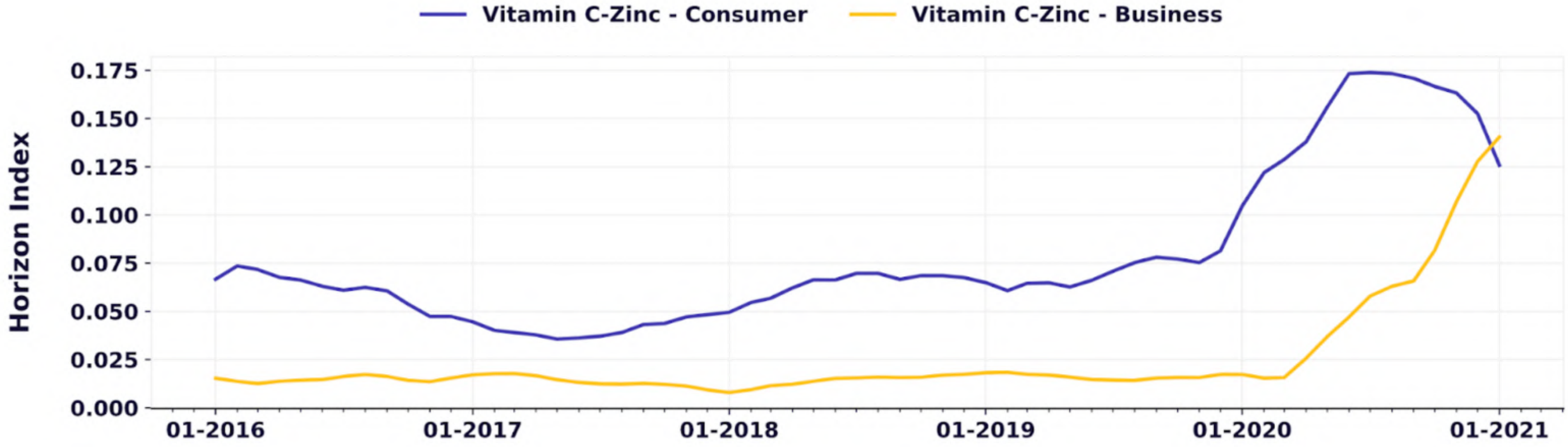
Source: Spoonshot

In the initial months of the pandemic, consumers sought out ways to boost their immunity and businesses were happy to comply - immunity became pretty much the claim of the year. But as more of us get vaccinated, this interest in generic immunity will fade away and will evolve into greater interest in specifics of nutrition and its impact on our bodies.

2GOOD 2GETHER: FOOD SYNERGIES

After initial studies of the COVID-19 strain found that people with greater immunity were less likely to suffer more severe effects of the virus, there was a flurry to stock up on everyone's go-to immunity booster, Vitamin C. Consumer interest spiked in the combination of Vit C and Zinc and its greater efficacy in immunity compared to just Vit C, which spurred on business interest in this combination. A significant number of food and drink launches featuring the immunity claim also promoted these two specific nutrients.

Business interest in the Vit C-Zinc combo went up 814% over the last year as consumer interest grew by 3%. However, it did grow by 66% in the first 6 months of 2020



Source: Spoonshot

Ocean Spray's B1U range of functional waters has a variant that carries an immunity claim, highlighting the presence of Vitamin C and zinc

Source: B1U

> *I love it! I chose the "I need immunity" because who doesn't want their immune system in top shape right now? ...There is a very slight after taste of zinc. Not like a cough drop but just enough to know it is there and will help boost your immune system… I will be trying this again and would recommend it.*
>
> **Walmart review**

Food synergy is the concept of how nutrients from different foods interact and improve (or even diminish) absorption and bioavailability of the nutrients in the body.

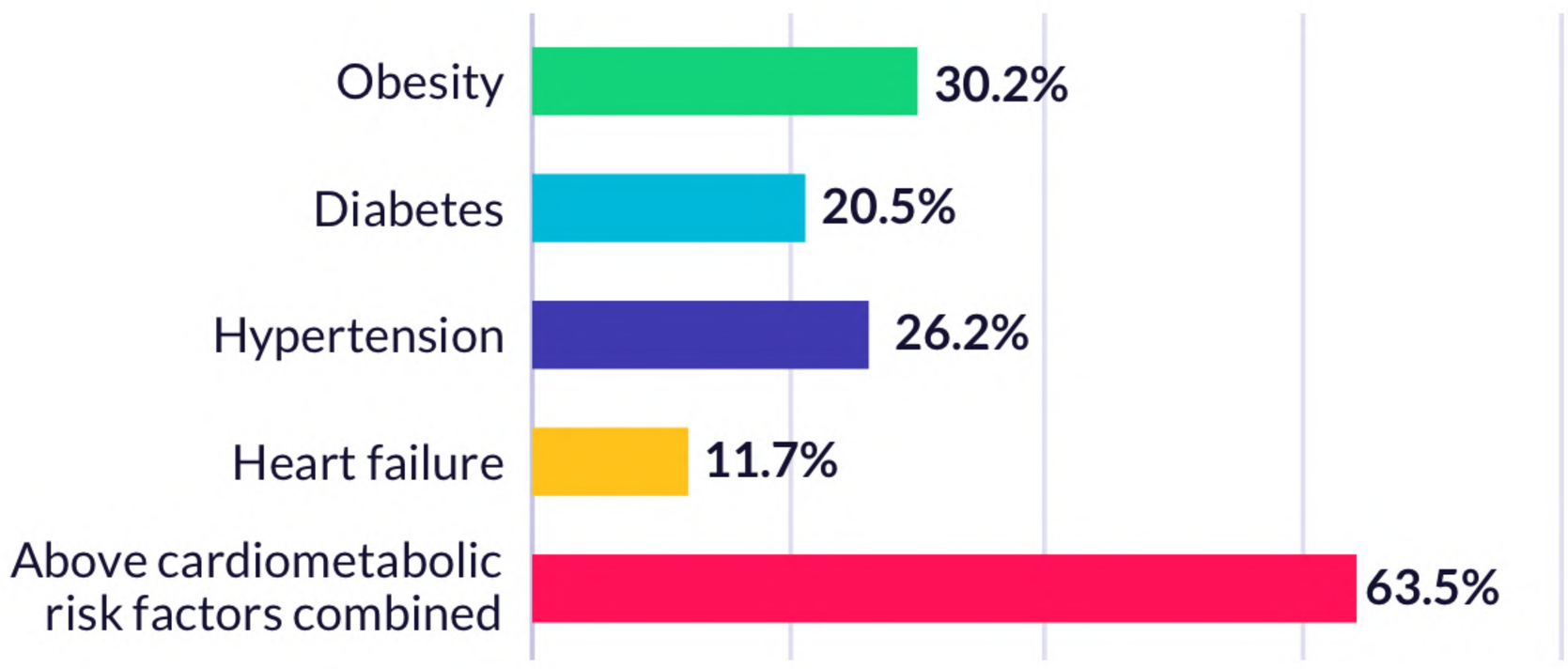
Bioavailability is the proportion of a nutrient in a food that is digested, absorbed, metabolized in our body. Not all micronutrients we consume are fully absorbed, which means that we do not receive the most out of our food.

Synergistic food blends can enhance potential health benefits significantly more than the individual ingredients. This is by no means a new concept within the scientific community, and sometimes, we're already using food synergies in our daily lives. We may just not recognize them as such (think Vit D fortified milk). Some established food pairings go well together not just because they taste great, but also because they do enhance nutritional bioavailability.

Research has also shown that synergistic blends can play an important role in preventing chronic disease. This has significance considering that a new modeling study, published in the Journal of the American Heart Association, has indicated that nearly **2 in 3** adults hospitalized due to COVID-19 in the US had at least one of the following four pre-existing conditions:

- **Obesity**
- **Hypertension**
- **Diabetes**
- **Heart failure**

Study suggests COVID-19 hospitalizations could have been prevented without four common pre-existing conditions.



Source: Gerald J. and Dorothy R. Friedman School of Nutrition Science and Policy at Tufts University

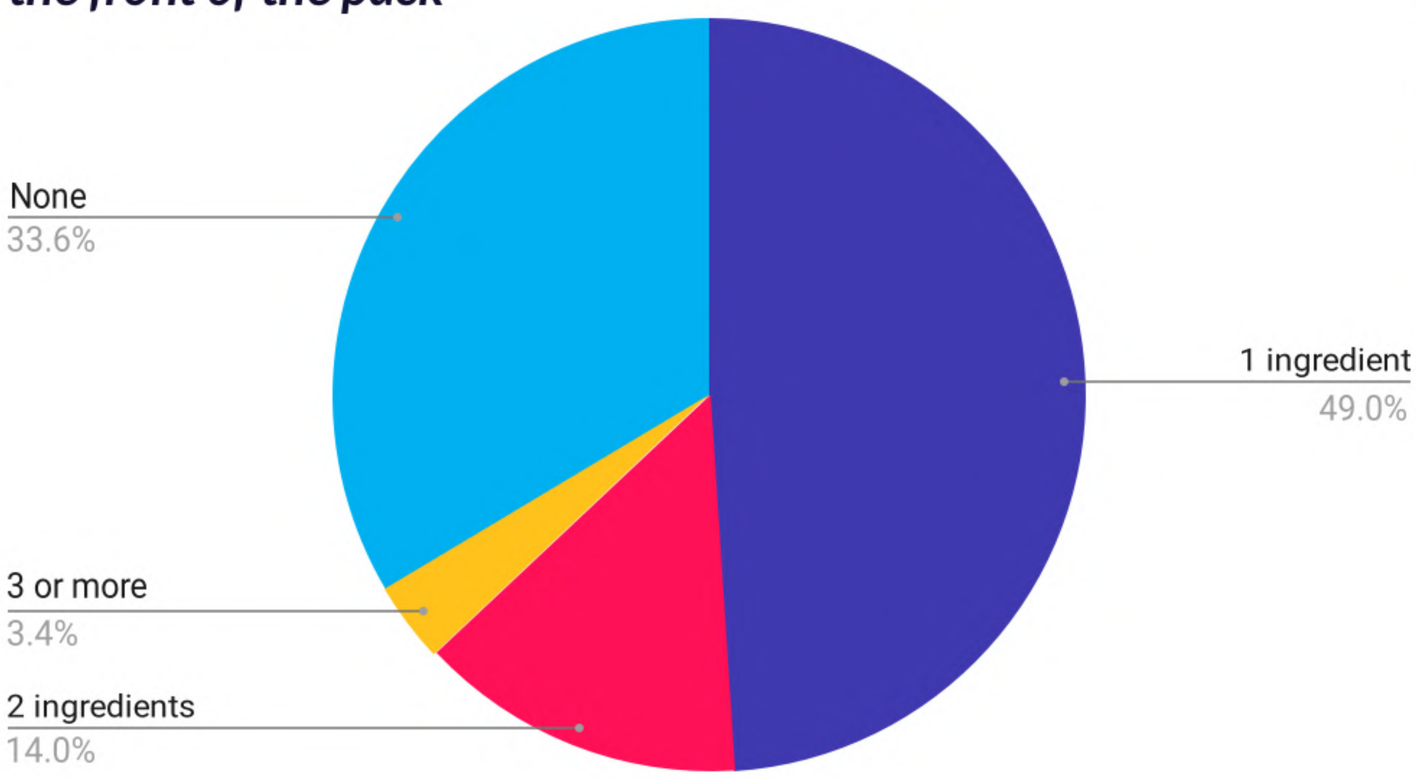
WHAT THIS MEANS

With food synergies aimed at combating such conditions, there is opportunity for food brands in retail and food service to promote health and wellness in a meaningful way.

There is scope for CPG companies to move to **promoting ingredient pairs** on pack for their increased benefits rather than focus on a single hero ingredient as has been the norm thus far. Research into food synergies could pave the way for some unique combinations that could further the area of functional foods rather than just focusing on finding novel ingredients.

Ingredient synergies may especially offer ways to improve the nutritional profile of meat-free protein alternatives as this space booms.

Share of products by number of advertised ingredients on the front of the pack



Using the food synergy concept to build restaurant menus could be used in the coming year as both a way to encourage people back into restaurants as well as to increase the functional benefits of food on the menu. We are likely to see restaurants partnering with nutritionists to use synergistic ingredient combinations to create dishes that enhance the bioavailability of nutrients, promoting benefits like immunity, gut health, eye health, and so on.

Some positive food synergy examples, backed by research, include:

Tomatoes and broccoli: Studies have found that the lycopene, Vit C, and Vit A in tomatoes, when combined with the phytochemicals beta-carotene, isothiocyanates, and indoles in broccoli, are more effective together at slowing the growth of prostate tumors.

Tomato + Broccoli

Very Low	High
Novelty	Flavor

2,815

Recipes *shared by home chefs that contain this ingredient combo*

2,356

Menu dishes *that contain this combo*

Raspberries and chocolate: Show improved synergistic effect in terms of antioxidant absorption

Raspberry + Cocoa bean

Very Low	High
Novelty	Flavor

Green tea and black pepper: Together this combination enhances the bioavailability of epigallocatechin gallate (EGCG) in green tea. EGCG is the most abundantly available catechin in green tea and is thought to reduce inflammation, promote weight loss, and help prevent heart disease

Black pepper + Green tea

Low	Medium
Novelty	Flavor

Apples and chocolate: Red apple skin is high in an anti-inflammatory compound called quercetin and chocolate contains the antioxidant catechin. This combination can reduce the risk of platelet clumping and improve cardiovascular health by providing an anticoagulant benefit.

Cocoa bean + Red apple

Very Low	High
Novelty	Flavor

Turmeric and pepper: Research has found that combining piperine from black pepper and curcumin from turmeric enhances curcumin absorption by up to 2000%. Curcumin on its own is poorly absorbed in the bloodstream.

Turmeric Powder + Black pepper

Very Low	High
Novelty	Flavor

15,280

Recipes shared by home chefs that contain this ingredient combo

7,528

Menu dishes that contain this combo

"This tea combines 2 of my favorite things! (1) tumeric with black pepper is one of my favorite spices to use when I am cooking recipes. They always turn out so flavorful. (2) I love to drink a hot cup of tea at the end of the day. So, when I found this organic turmeric pepper I was so excited. The taste of the tea is the purest I've ever had! After each sip is a pleasant hint of pepper. I love it!"

Social Media Post

But there are also negative synergistic effects.

Mixing milk and citrus can cause acidity

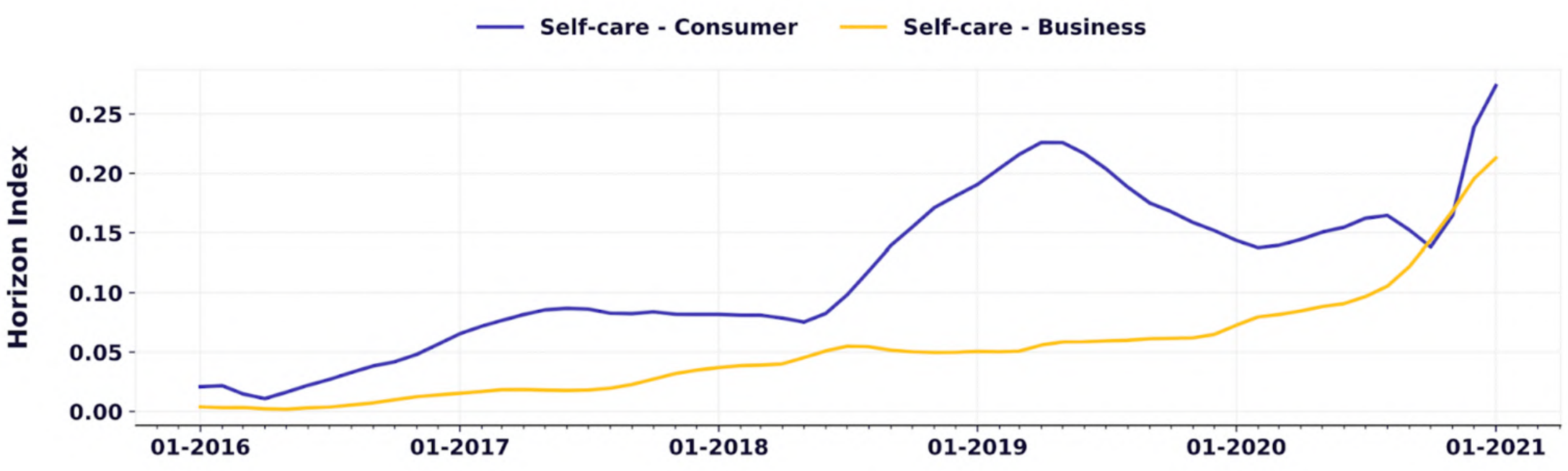
The acids in tomatoes can make it hard to digest the starch in rice, pasta, bread, potatoes, and other starchy foods

WHY NOW?

Synergistic food blends are going to become increasingly important as we see more people embrace specific food habits as part of their health journey. This includes diets like vegan, plant-based, gluten-free, keto, and others. Cutting out certain foods from our diet could increase the likelihood of shortfalls or deficiencies of related nutrients. Vegans, for example, are more prone to Vit B12 deficiencies since they do not eat animal products.

Driving these various health-related needs is the growing interest in self-care - caring for oneself and one's own health and wellbeing. Nearly 9 in 10 Americans now practice some form of self-care, with more than 1/3 of consumers increasing their self-care in the past year.

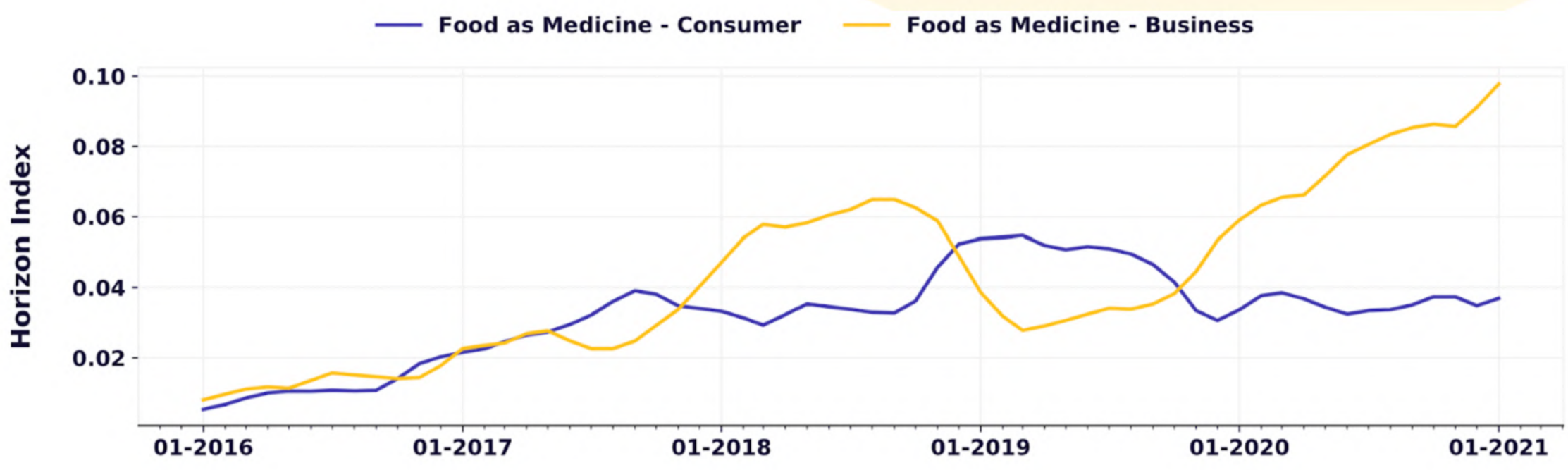
Over the last year, consumer interest in self-care doubled (99%), while business interest grew by 168%



Source: Spoonshot

While some of the nutrient deficiencies in diets can be made up for by dietary supplements, there is growing interest in the concept of food as medicine, consuming natural, minimally processed foods to get the most nutrition for better health outcomes. Growing healthcare costs, issues regarding access to healthcare, economic implications, and just growing awareness of the importance of staying healthy is only going to drive the concept of healthy aging. And ultimately, the growing interest in self-care and food as medicine will be the tributaries that flow into the ocean of healthy aging.

Business interest in food as medicine as a concept went up by 55% over the last year, while consumer interest saw a slight 2% decline



Source: Spoonshot

In the coming year, we expect to see greater consumer engagement with the concept of food synergy as they seek to take greater control of their health and rely on food as medicine rather than on pills.

Consumers will seek out a greater understanding of nutrition and means to improve nutrient availability based on their lifestyle needs.

Ingredient combinations that can enhance nutrient bioavailability will emerge alongside the single ingredient focus and pave the way for interesting innovation in the food and beverage space. As consumers become more interested in nutrition beyond just macronutrients, we expect to see a shift from the single "hero ingredient" callouts to "dynamic duos".

SPOONSHOT'S TAKE

Food as medicine

We'll see greater consumer engagement with the concept of food synergy as they seek to take greater control of their health and rely on food rather than on pills as medicine.

Dynamic duos

As consumers become more interested in nutrition beyond just macronutrients, we expect to see a shift from the single "hero ingredient" callouts to "dynamic duos".

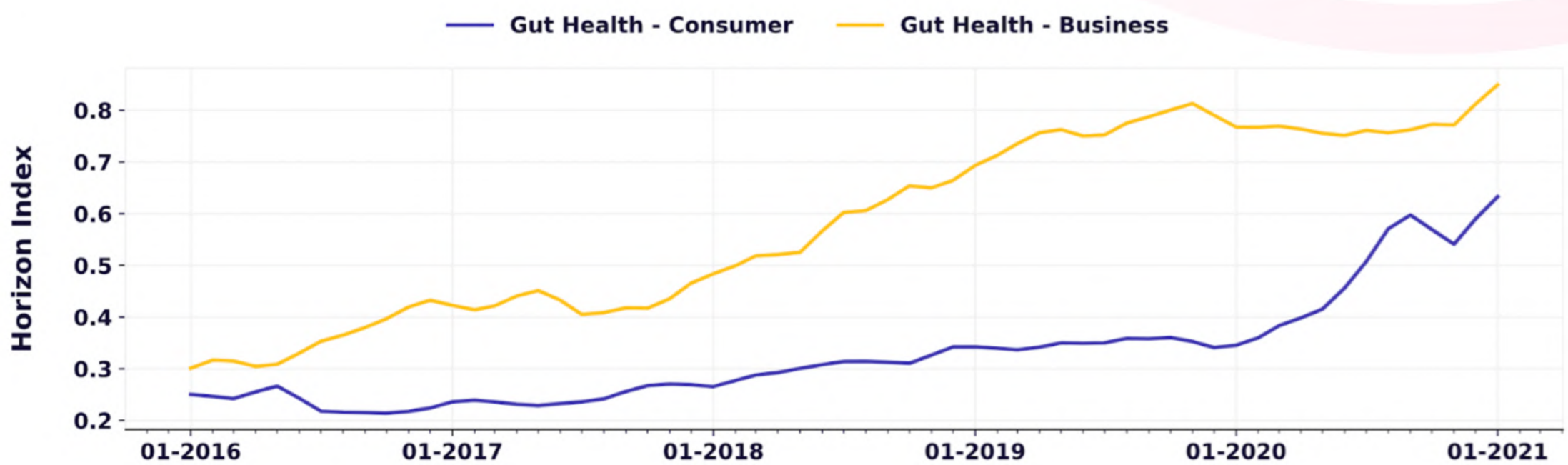
Food service synergy

Restaurants can use food synergies to create menus and dishes that enhance nutrient bioavailability, promote benefits like immunity, gut health, eye health, and so on. This can encourage people back into restaurants.

BREATHE EASY: THE GUT-LUNG AXIS

Over the last decade, we've seen how important maintaining a healthy gut microbiome has become in terms of the management of a number of health conditions. Interest in gut health continues to grow in both consumer and business media; social media conversations on health also put gut health as one of the leading health issues talked about.

Gut health continues to be important for consumers and businesses, with interest growing by 76% and 11%, respectively



Source: Spoonshot

Top health issues in online conversations on health

Weight loss
38.3%

Detox
10.6%

Antioxidant
8.5%

Muscle gain
6.7%

Gut health
6.4%

Source: Spoonshot

While researchers continue to investigate how the gut microbiome impacts gastrointestinal health, they are also finding indications that a healthy gut can have a positive impact on other functioning of other organs in the body.

One topic that many have become familiar with is the gut-brain axis, which has also been given a boost by growing interest in cognitive health. The gut-brain axis is a complex network that connects gastrointestinal function to cognitive and emotional centers of the brain. Gut microbes regulate our immune system, and changes in factors like diet or medication can result in inflammation not only in the gut but also in further off organs like the brain or the lungs.

The lungs, like many other parts of the body, have their own distinct microbiome but not as diverse or voluminous as the gut. In recent months, published research has pointed to a connection between the gut microbiome and the lungs, and is being called the “gut-lung axis”. Given the gut’s role in our body’s immune response, a healthy gut could be vital in fighting off any infection in the lungs as well.

When gut bacteria break down food, they produce metabolites. One type of metabolite includes short-chain fatty acids (SCFAs) that are produced in high quantities when dietary fiber is metabolized. SCFAs travel through the bloodstream to different parts of the body - including the lungs - to reduce inflammation and boost immunity. And because of this connection, gut-related disorders can affect the lungs and lung diseases can impact the gut.

For example, studies have shown that asthma, chronic obstructive pulmonary disorder, and some allergies are more common in people with gastrointestinal issues like irritable bowel syndrome or inflammatory bowel disease and vice versa. And consumers are starting to recognize this connection as well. Analysis of social media conversations shows that respiratory health is starting to emerge as an important issue for consumers. It's still quite a small share of overall health topics, but this will grow as these new connections become more evident.

Longtail health-related topics in social media conversations

Health Benefit	Share of Conversations
Respiratory Health	0.11%
Infant Health	0.07%
Enzyme Production	0.06%
Kidney Health	0.05%
Cell Protection	0.03%
Acid-Base Balance	0.02%
Supports Liver Function	0.02%

> *That makes so much sense. I have quite a few gut problems and during the night it triggers asthma*
>
> **Social media post**

In fact, a newly published study has pointed to a connection between gut health and lung health. In clinical trials, a combination of five probiotic strains was found to reduce symptoms of viral upper respiratory tract infections by over 27%. This probiotic combination has been found to have even greater efficacy among people over the age of 45 years, particularly those who are obese or overweight.

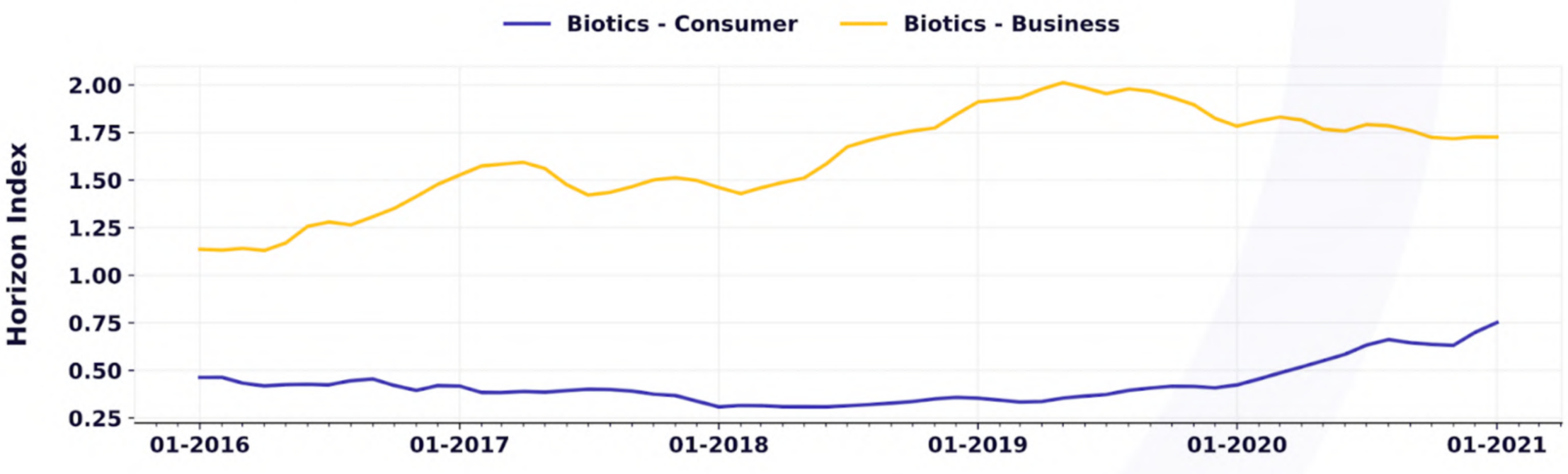
The five strains were:

1. *Lactobacillus acidophilus CUL60 (NCIMB 30157)*
2. *Lactobacillus acidophilus CUL21 (NCIMB 30156)*
3. *Lactobacillus plantarum CUL66 (NCIMB 30280)*
4. *Bifidobacterium bifidum CUL20 (NCIMB 30153)*
5. *Bifidobacterium animalis subsp. lactis CUL34 (NCIMB 30172)*

WHAT THIS MEANS

Interest in probiotics and prebiotics in consumer media grew by 65% over the last year as the health benefits of these ingredients become more widespread. Interest from business media (which is 3 times the size of consumer) tapered off a bit and declined by about 5% during this period.

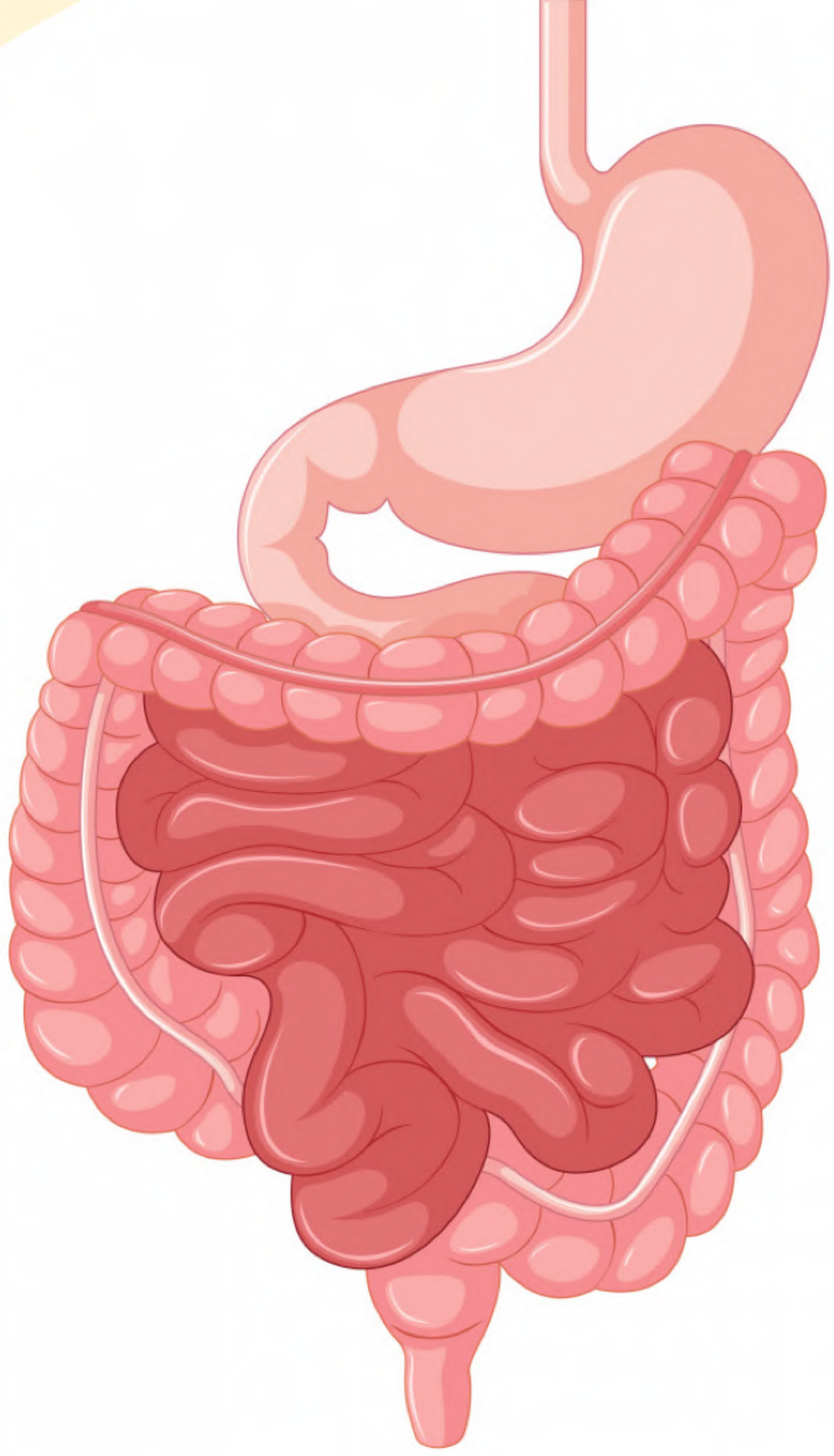
Interest in probiotics and prebiotics



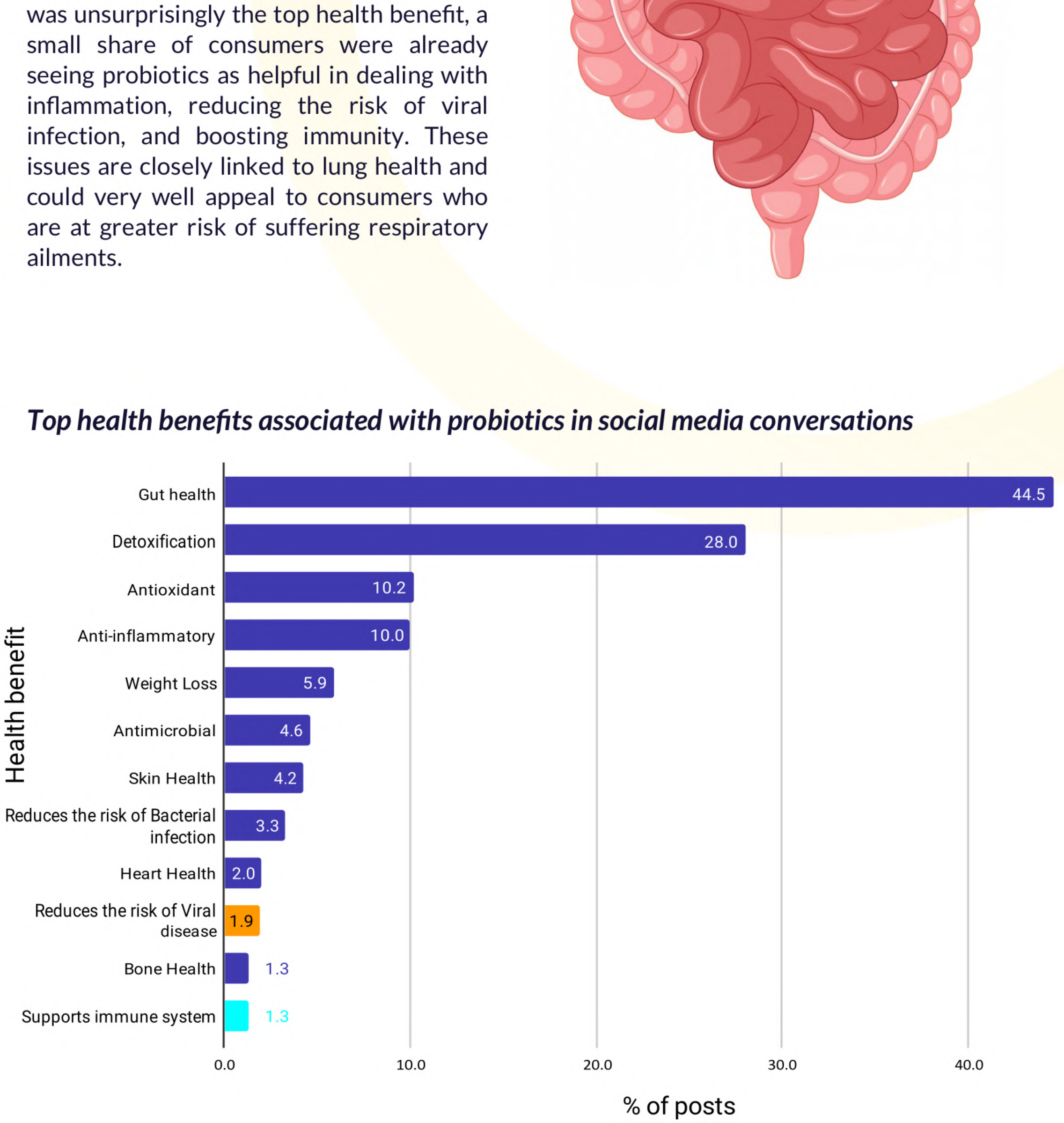
Source: Spoonshot

This is an opportunity for probiotics to offer expanded utility. Probiotics would not just improve gut health but also could reduce the severity of respiratory illnesses.

This research could very well reinvigorate demand for probiotics. An analysis of social media conversations found a fairly wide range of health benefits consumers associate with probiotics. While gut health was unsurprisingly the top health benefit, a small share of consumers were already seeing probiotics as helpful in dealing with inflammation, reducing the risk of viral infection, and boosting immunity. These issues are closely linked to lung health and could very well appeal to consumers who are at greater risk of suffering respiratory ailments.



Top health benefits associated with probiotics in social media conversations



Source: Spoonshot

WHY NOW?

Well, the short answer is COVID-19. This primarily respiratory illness continues to wreak havoc the world over, and boosting gut health to strengthen immunity and lung health as a therapy may have potential.

Even before the pandemic, respiratory illnesses were among the leading causes of death and disability the world over. According to a (pre-pandemic) report by the Forum of International Respiratory Societies

- Chronic obstructive pulmonary disease is the third leading cause of death worldwide
- 334 million people globally suffered from asthma, also the most common chronic childhood disease
- Pneumonia is a leading cause of death among children under the age of 5 years

These ingredients may also have potential to improve the lives of people who suffer from allergies and any other respiratory ailments in the long run. If a simple solution like consuming probiotics and prebiotics can alleviate the suffering and risk of so many, it should be encouraged and made easily accessible to all - in various formats and formulations. While more studies are needed to validate this, there are just generally a wide range of health benefits to consuming probiotics and prebiotics.

The gut-lung axis is just one of the many emerging benefits of maintaining a healthy gastrointestinal system. While it may be too early to use this as a scientifically-backed claim just yet, this is an evolution of the growing interest in gut health. It also just underscores the importance of the food-as-medicine credo that is increasingly gaining popularity among consumers.

SPOONSHOT'S TAKE

New opportunities

With new studies pointing to expanded health benefits of better gut health, the utility of probiotics and prebiotics will very likely open new opportunity areas, like lung health.

Long-term implications

Even post-pandemic, these ingredients have the potential to improve the lives of millions of people who suffer from minor allergies and any other respiratory ailments in the long run.

Easy access

If a simple solution like consuming probiotics and prebiotics can alleviate the suffering and risk of so many, it should be encouraged and made easily accessible to all - in various formats and formulations.

FOOD SERVICE

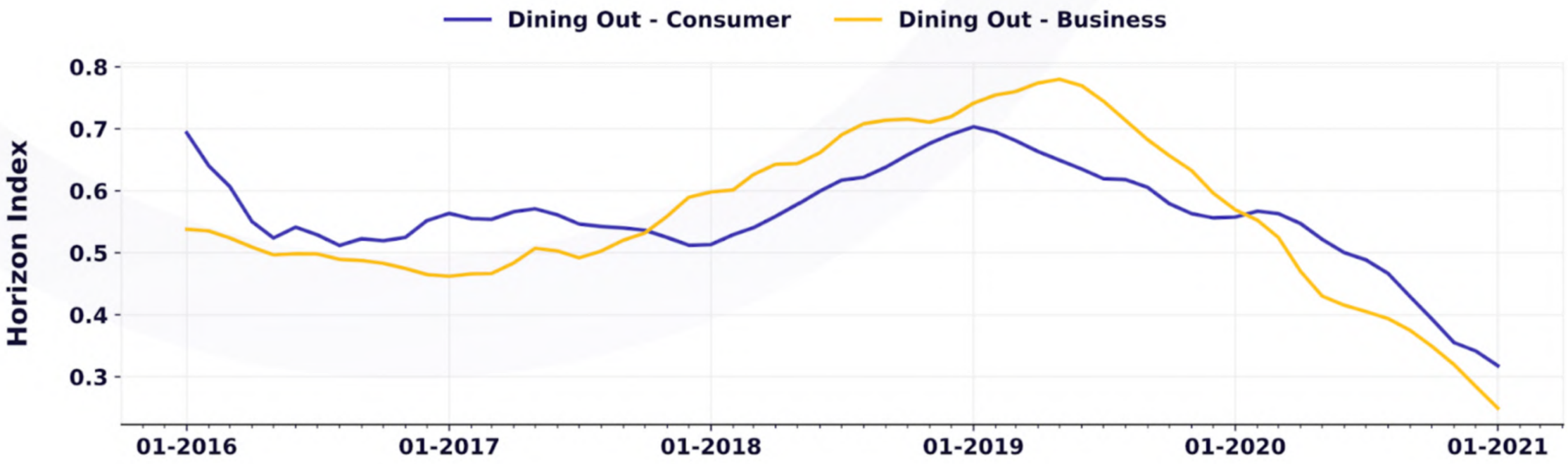
1
Scents and Sense-abilities

2
The Robots are Coming

FOOD SERVICE

One of the biggest victims of the pandemic has been the restaurant industry. Data from the National Restaurant Association in the US shows that total revenue for the industry in 2020 was US$240 billion below the pre-pandemic forecast. At the end of the year, over 110,000 dining-out outlets were closed for business, either temporarily or permanently. Millions of people were forced into unemployment.

Interest in dining out declined by 44% in consumer media and 21% in business media over the last 12 months



Source: Spoonshot

Getting back on its feet is going to be a tough journey for the industry and we will likely see a sea change in the way restaurants operate in the future to ensure safety for visitors and employees as well as profitability. We expect to see interesting hybrid models come up that will retain some of the trends that emerged during the last year dovetailing with new features to entice consumers back in.

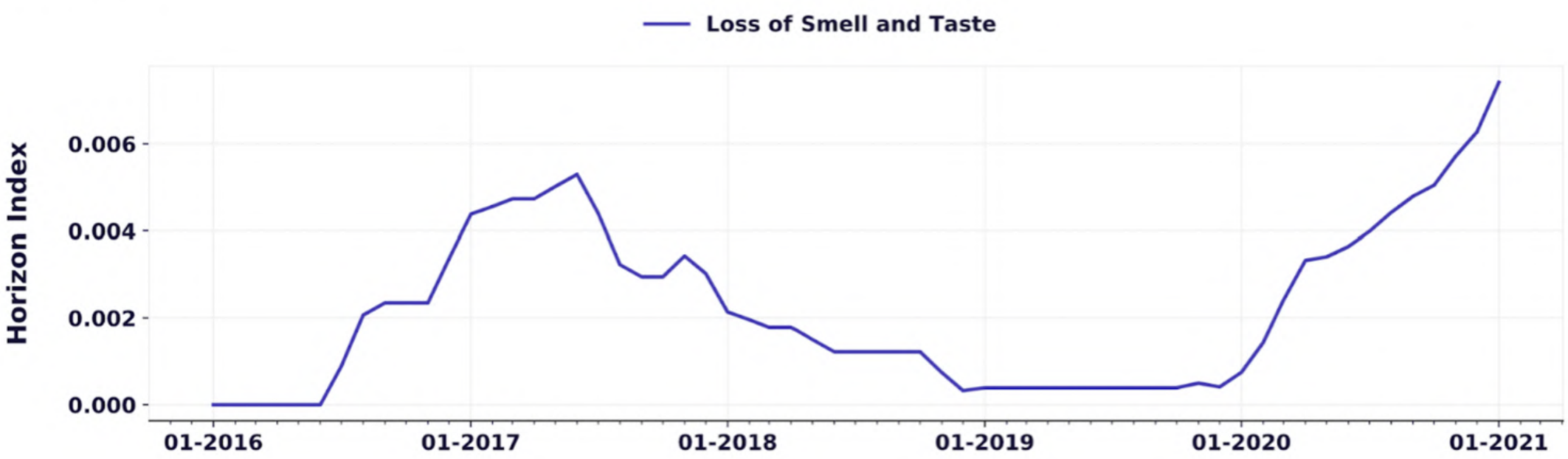
SCENTS AND SENSE-ABILITIES

Smell and taste dysfunction have been among the most common symptoms of COVID-19. According to studies, 30-80% of COVID-19 patients reported a loss or distortion of taste (called ageusia), loss of sense of smells (anosmia), or parosmia (distorted perception of smell).

Until recently, losing one's sense of smell was a disorder that wasn't well-known or recognized except by those affected and with few effective treatments available. Losing our sense of smell can have a profound impact on our daily lives - and how we perceive taste, since the two senses are closely linked and work in tandem to relay all kinds of information to the brain. Taste and smell work together so we can recognize and appreciate what we eat or even warn us about something that might have gone off. A study in 2014 found that people with anosmia were more than twice as likely to experience a hazardous event, such as eating spoilt food, compared to people without smell loss. It is believed that 75-95% of what we taste is actually due to the smell.

For many, getting back these senses after being infected has been a long and arduous process. Recovery has been different for everyone - for some, these senses returned in a few weeks, for some it was months, for others, it didn't happen at all. Current global data (as of early 2021) on this loss of smell indicates that around 50% of patients fully recovered their sense of smell within 40 days of onset of COVID-19, but an estimated 10% have not yet gotten back these senses.

Concerns over loss of smell and taste shot up by 418% in 2020 as they emerged as key symptoms of COVID-19



Source: Spoonshot

People recovering from COVID-19 have reported how common ingredients like onion, garlic, ginger, eggs, meat, lemons, coffee, and various fruits could smell and taste terrible. Some consumers have found the smell of meat so intolerable that they have turned vegetarian. So, menus that avoid these “trigger” ingredients and instead focus on other aspects to enhance appreciation of food would likely appeal to those recovering from the aftermath of the coronavirus.

> ***I had COVID-19 back in November and i had lost my sense of smell but it came back after a month. just recently i was making a smoothie and added celery but it had a weird smell like it was rotten so i threw it out and went to the market to buy another bundle but they all have the same disgusting smell. I can smell everything else except "CELERY"... I really hate this!!!***
>
> **Social media post**

> ***Had COVID in November, lost sense of smell. Came back after a few weeks and everything was normal. A few months back I started to smell a strange scent, only when my husband and I had a BM. You know how you can taste a smell? A few weeks after noticing these smelly poos I started to taste it in my food. Can’t eat meat, coffee has a weird aftertaste. Sweet things are okay, bread, cheese…***
>
> **Social media post**

Studies have shown that smell training - repeated short-term exposure to smells - can benefit people suffering from a loss of olfactory senses. Patients are encouraged to pick up familiar and pleasant scents and expose themselves to these regularly. There are now even training kits available to help with this.

The Smell Project's training kit includes essential oils and smell jars

My mom lost her sense of smell in July last year, and in November she's developed parosmia. The smell of onions, coffee, meat was the worst for her.She thought she would never regain her sense of smell.But then I read that essential oils can help.3 times a day for 20 seconds she smelled those oils,also she smelled fresh lavender and now she is much better, she no longer has an unpleasant smell, and 70% of her smell has returned. Don't lose hope and be persistent 😊

Social Media Post

After losing my smell, I did a lot of research about olfactory training before buying this kit and it's exactly what I was looking for. Very nice to use with pre-labeled bottles and jars. The 4 scents are chosen to represent a full spectrum of scents and are the same ones used in a lot of scientific studies.

Everything came exactly as described and the four essential oils are in glass amber bottles which I really appreciate since it reduces light damage for longer storage (Though I'm keeping in fridge as recommended). I also found out that their website includes the option to download additional logs, including digital logs which are a lot more convenient to use long term, that's what I've been using.

Amazon Review

WHAT THIS MEANS

For the **food service sector**, this is a potential area of focus as they reopen or as they revamp menus for delivery and takeaway. Incorporating dishes with ingredients and flavors that can be appreciated by people suffering from diminished or lost sense of smell or taste could prove extremely beneficial for restaurants and their customers.

> ***I had covid in October and loss my sense of taste and smell. It did come back but was a little off. A few months after that, I developed parosmia. It's affecting almost everything I eat. Meat, dairy, coffee, chocolate, garlic. Almost everything but fruit has this horrible taste, the same taste, some stronger than others. It's been almost 7 months since I've had covid and I've been dealing with this, most intensely, the past two months. Before that some things were a little off but it was NOTHING like it is now. Hoping it doesn't last forever 🥺 I miss food!***
>
> ***Social Media Post***

There is also scope to play up elements of texture and the various sensations offered by spices to make up for the loss of flavor. New tastes and textures, in particular, can help those suffering from anosmia or parosmia have a more fulfilling eating experience - and one that is nutritious too.

Flowery, fruity, spicy, and resinous aromas in foods can aid with smell training for patients suffering with anosmia or parosmia

Vitamin A drops is being considered as a treatment option, so foods rich in this vitamin can be introduced

Crunchy or crisp textures can help keep food in the mouth for longer, thereby extending taste

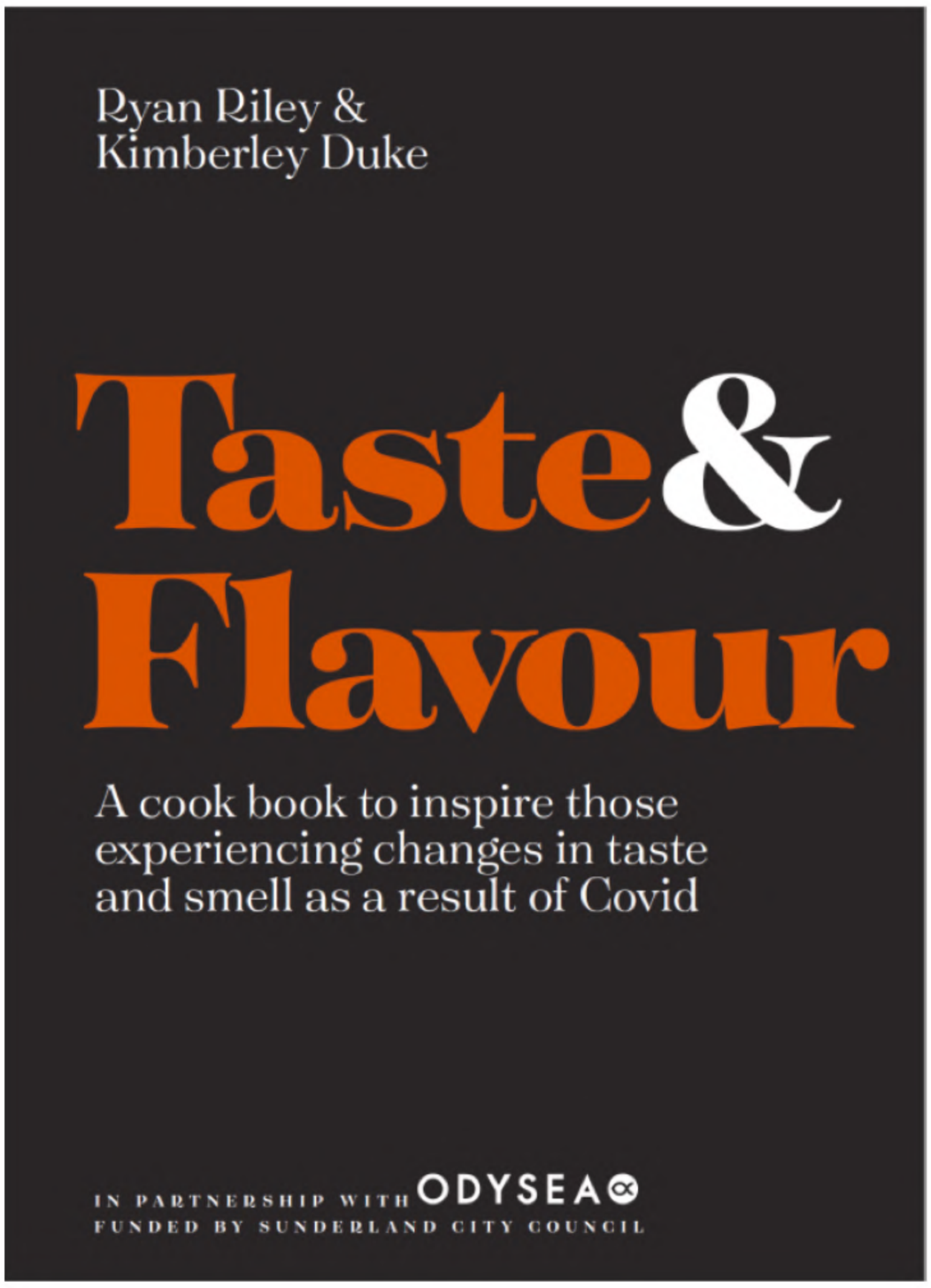
Contrasting textures - like crunchy and gooey - can offer a different experience and enjoyment of food

Foods that offer trigeminal sensations - which allows us to experience heat, tingling, or cooling effects of certain foods - can help people regain sensations

Umami flavors can increase saliva flow and increase taste of dishes

Building dishes and menus in restaurants for people who are struggling with loss of taste and smell can go a long way in helping them enjoy the dining out experience as well as rebuild their interest in different foods. Restaurants can also customize their dishes depending on the ingredients that serve as triggers for such patients.

Some non-profits like Life Kitchen and AbScent in the UK had been working with people who had lost their sense of taste and smell either due to cancer or other illnesses. Now they have extended their support to COVID patients as well. Life Kitchen, for example, has just launched a cookbook to help people enjoy their food again. The authors highlight that the recipes place strong emphasis on five elements – **"aroma, umami, texture, layering, and trigeminal food sensations (the tingling, burning and cooling we get from spices)".**



Source: Life Kitchen

WHY NOW?

While the share of those who have not recovered their sense of smell and taste may not seem like a lot, these conditions can be extremely traumatic, both physically and mentally. A functioning sense of smell and taste are vital for overall good health, since people who are put off by food may have trouble keeping up with their nutritional requirements. People reported excessive weight loss due to lack of interest in food or excessive weight gain as they try to capture a favored taste or flavor.

Concerns over mental health in consumer and business media have been on the rise, growing by 18% and 25%, respectively, in the last year

Source: Spoonshot

There is also some indication that these conditions can cause increased anxiety and depression. References to mental and emotional wellness in consumer and business media have been on the rise since 2016. According to chemosensory scientists, the loss of the ability to taste or smell could increase negative emotions due to lower serotonin flowing to the brain. Serotonin is a key hormone responsible for stabilizing our mood, feelings of well-being, and happiness. It also aids in sleeping, eating, and digestion. Mental health has become a very important concern for consumers and businesses alike, and solutions that can help better manage negative emotions are vital.

Even though this may seem like a very specific trend with a short shelf life, anosmia and its variants are a lot more common than many realise. A number of ailments can lead to issues with taste and smell, as can old age. As such, there is a longer term place for food and drink - in food service and in retail - that aid such consumers. It is also an opportunity for brands to experiment with new textures and flavor profiles.

SPOONSHOT'S TAKE

Help regaining senses

This is a potential area of focus for restaurants as they reopen or revamp menus for takeaway. Such recipes could prove extremely beneficial for customers during their recovery.

Health benefits

It also can help address issues related to mental health and nutritional requirements for those who are having trouble connecting with their food.

Wider appeal

These solutions are not just for people struggling post-COVID. Cancer patients, the elderly, and anyone with diminished senses will find appeal. Even CPG brands can incorporate some of these elements into products.

THE ROBOTS ARE COMING

We started to see the emergence of robot and drone delivery services for groceries and food in some cities during the pandemic to minimize points of contact. Now more restaurants are seeing the value of these robot delivery services by companies like Cyan Robotics' Coco for delivery within a specific radius to reduce human-to-human transmission and have a more cost-effective option to delivery apps. Over the next year, we will see these delivery robots expanding their radius of service.

Source: Cyan Robotics

Source: Miso Robotics

Robots are also being used to manage a number of kitchen and service tasks. Miso Robotics was one of the first to launch an AI-powered robotic kitchen assistant and end-to-end frying solution. Called Flippy, the robotic arm can be programmed to flip burgers, toss salads, and make bowls.

Source: Nala Robotics

In an interesting move, Nala Robotics has opened two restaurants that use automated kitchens to make foods from all around the world. A restaurant can expand its offering by just entering a recipe into the database. It also means that a recipe in one region can be replicated in another using the database. This opens up a multitude of opportunities for the expansion of restaurants and ghost kitchens into new areas and new cuisines that may not have been possible before without a trained chef.

With artificial intelligence and machine learning, Nala's systems are said to be able to create, alter, and master recipes across multiple cuisines. It can also be programmed to customize dishes to consumer's specifications.

Source: Keenon Robotics

Robotic wait staff is another area being explored by restaurants who are unable to hire full-time staff. Companies like Shanghai-based Keenon Robotics offer a range of commercial service robots for unmanned solutions across a number of industries, including food service, hospitality, and retail. Such products have even found applications in stadiums during sporting events.

One major concern about the use of robots has been replacing human labor, resulting in large-scale unemployment. However, Japanese robotics company Ory Laboratory Inc has launched a range of robots that can even help provide employment opportunities for differently-abled workers or workers who are unable to leave home for long periods of time - cohorts that are under-represented in service industries. The company has made “avatar” robots that come equipped with a camera, microphone, and speaker so that they can be operated remotely over the internet. The robots can be controlled just through eye-movement, making it possible for even completely immobilized people to take up jobs in the hospitality industry.

Source: Kerman Robotics

Source: Ory Laboratory Inc

WHY NOW?

As restaurants start to reopen for indoor or on-premise dining, the food service industry is struggling with - among other things - labor shortages. This covers not just front-of-house roles like server and cashier, but also back-of-house positions, like assisting in the kitchen.

One of the solutions that restaurants are starting to consider is automation to fill in the gaps, right from the making and serving of the food to home delivery. While automation or the concept of using robots in the food industry is not very new, it wasn't until the pandemic that the food service industry really started to consider these are viable options. Interest in robots in food service declined by nearly 20% during 2019, but it jumped back up during 2020 as restaurants remained shut. Now as restaurants reopen, many have been struggling to find experienced staff to fill positions for a wide variety of reasons.

Interest in the use of robots in food service grew by 34% during 2020

Source: Spoonshot

WHAT THIS MEANS

In the coming year, we will see a greater push for automation from the food sector, particularly in quick service outlets, where speed, quality, and consistency are important. There is scope for automation across the board to cut down tedious and repetitive tasks, like food prep, so that restaurants can focus on more value-added services, like creating new dishes. It can also help with changing menus more often.

Underscoring the importance of robots and automation for the food service industry is the fact that there is investment and consolidation happening in the area as well:

> In May 2021, San Francisco-based Chef Robotics announced that it had raised **US$7.7 million** in funding for pre-seed and seed rounds. The company is still in its early stages, but has said that its focus is on improving the production volume and consistency in quick service restaurants. The company's robot - Chef - uses AI to learn how to handle an increasing number of ingredients, which will allow restaurants to scale up quickly but also reduce food waste.

> In February 2021, food delivery partner DoorDash announced its acquisition of Chowbotics, which has made the salad-making robot, Sally. This can help remove too much human contact when making salads, keeping fresh food more hygienic and safe.

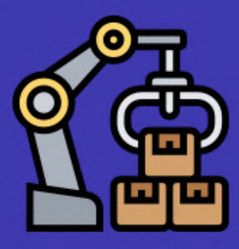
Source: chowbotics

In the coming year, we're definitely going to see a lot more automation and the use of robots in the food service industry, starting from growing or sourcing the food all, to preparing, all the way to serving and delivery. And it doesn't have to mean lack of employment opportunities for people.

SPOONSHOT'S TAKE

Robo-staff

The restaurant industry's current struggles with labor shortages will pave the way for greater acceptance and use of robots across front-of-house and back-of-house functions.



Automation all round

The entire supply chain, right from harvesting to delivery, is seeing the emergence of more automated options which can improve efficiencies all round.

New job opportunities

Traditionally, automation has resulted in job losses, but in some cases, it can help create new remote jobs for groups of people who had limited representation in the service industry.

SUSTAINABILITY

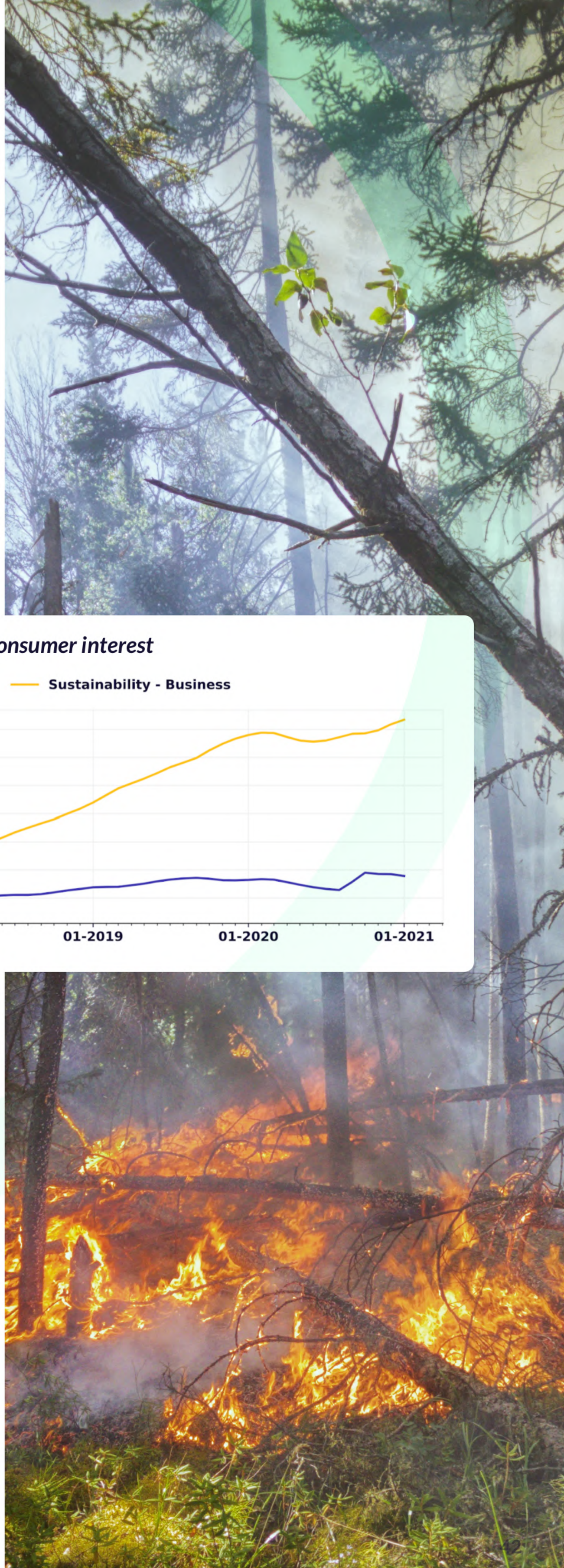
1
Lab to Fork

2
Plant-based Milk Goes Grain-ular

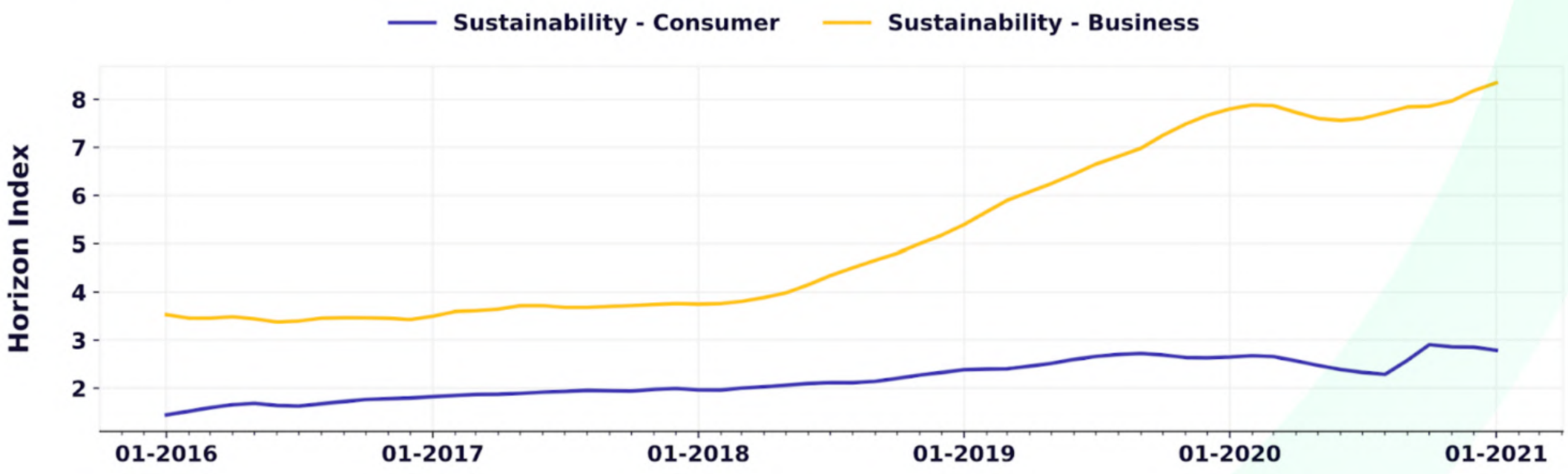
3
Growing Up-cycling

SUSTAINABILITY

The impacts of global warming and climate change can't really be ignored any longer and companies are recognizing that sustainability has moved on from a nice-to-have feature to a must-have. The pandemic did slow down the focus on sustainability a bit, but growth still continues. Interest in sustainability has grown by 17% since 2019 in consumer media and by 55% in business media. It will continue to pick up again when we get a better handle on the pandemic.



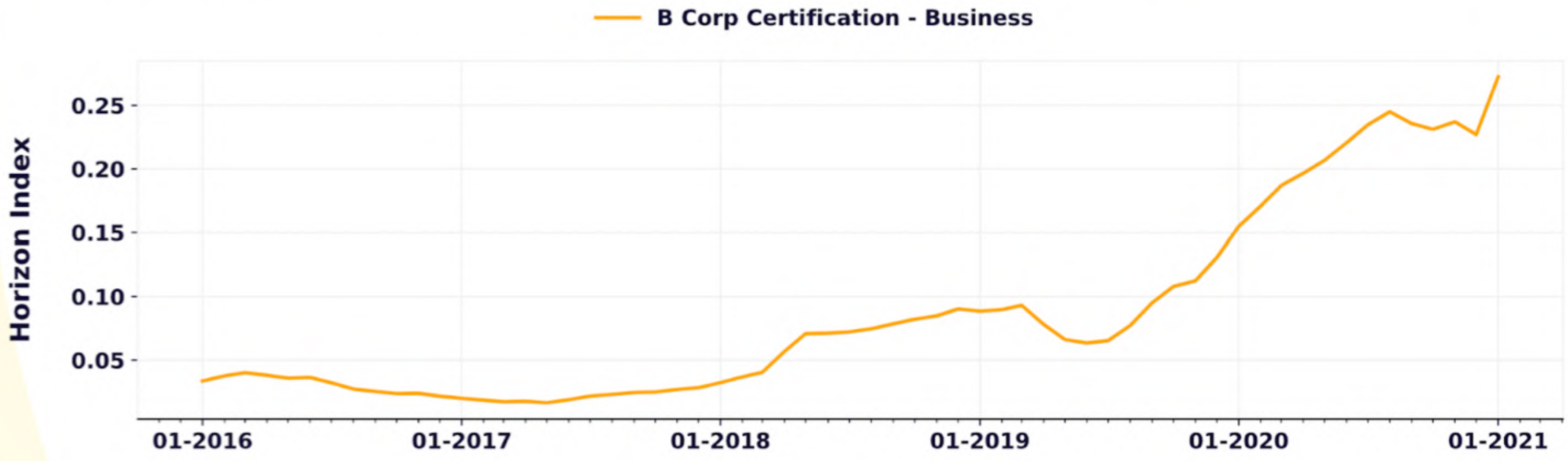
Business interest in sustainability is 3.4x that of consumer interest



Source: Spoonshot

Underscoring the commitment to sustainability among companies is that business interest in B Corp Certified companies within the food and drink space has tripled since 2019. To get this tag, companies have to go through a rigorous vetting process to show positive impact in the areas of governance, workers, customers, community, and the environment.

Business interest in B Corp certification has gone up by 209% since 2019



Source: Spoonshot

We'll be looking at some specific areas that are expected to hold the key to improving sustainability credentials. These may not be considered emerging trends, but they are expanding ones.

LAB TO FORK

In 2013, the first lab-grown hamburger was served to a small, select audience in London. It took three months to make, cost $280,000, and was hotly debated as unscalable. Now, less than a decade later, not only is it scalable, it's also becoming affordable, with production costs for equivalent products going as low as $10. In May 2021, Israeli start-up Future Meat said that its production cost for a 110 gram chicken breast is just under US$4.

Singapore became the first country to allow the sale of lab-grown or cultured meat to the public in late 2021 and US company Eat Just launched its lab-grown chicken at a local restaurant. This cultured chicken can be created in just 14 days, around 70% less time than it takes to grow a real chicken. Other companies and countries are setting up the infrastructure to do the same.

Singapore approves sale of cell-based chicken meat

Cultivated meat is made by extracting muscle stem cells from an animal, growing them in a medium, and structuring them using bioreactors into desired shapes (like cuts of meat). There are now more than 100 companies now working on cultured meat and auxiliary ingredients and technologies.

Lab-grown food may have started with meat, but it has most definitely not limited itself to that. We're now seeing the emergence of all kinds of lab-made food, all thanks to the wonders of microbial fermentation. They not only spell new ways of sourcing animal-based foods, but also foods that may be facing an existential threat.

Foods that are now being made in a lab include:

- *Dairy products*
- *Gelatin*
- *Collagen*
- *Animal fat*
- *Breast milk*
- *Honey*
- *Meat alternatives*
- *Coffee*

Scientists are breaking these foods down into their core cellular components and then growing them into desired shapes and sizes in massive vats. This process is becoming increasingly efficient and has the potential to create desired products in a matter of days. This means that as the process becomes more streamlined, many more foods will be examined for their potential for in vitro cultivation. Some of these products are either on their way to the market or are already there.

Companies like Perfect Day make dairy products by genetically modifying microflora to produce the proteins casein and whey. These dried proteins are combined with plant fats, water, vitamins, and minerals to make a lactose-free product that has the same taste, texture, and nutrition of milk. Perfect Day not only also makes the dairy-free dairy and its own products with this ingredient, it also makes the dairy-free dairy available to other companies.

Brave Robot's ice cream range is made made with Perfect Day's animal-free dairy

Source: Brave Robot

Source: Spoonshot

Coffee is one of the most consumed beverages across the world, and is also a victim of its own popularity. The surging demand is leading to significant deforestation, and the need for a sustainable solution has become urgent. Brazil, the world's largest coffee producer, is expected to have a bad year in 2021 for the crop over poor weather. The world is facing a massive shipping container shortage that has hit global trade quite hard and is expected to drive up prices of coffee (and various other goods).

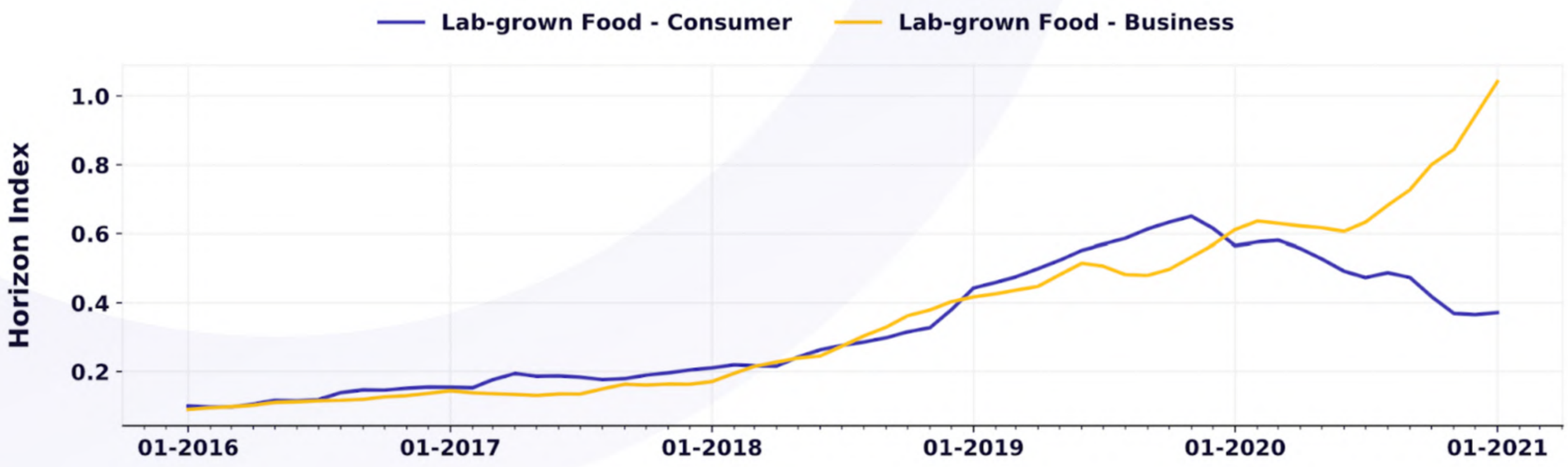
To combat shortages, Seattle-based Atomo Molecular Coffee has been working on creating a lab-grown beanless coffee and has even bagged an investment of USD2.6 million. The company has isolated the various molecular compounds from coffee and has replicated these in the lab to make a product that tastes and smells like real coffee.

Lab-grown coffee from Atomo

Source: Atomo Coffee

Investors clearly see the opportunity here. Big names like Bill Gates and Richard Branson and meat majors like Tyson have thrown their weight behind these products as interest in the space continues to grow. But for consumers, lab-grown food may be ahead of its time.

Business interest in lab-grown food grew by 64% over the last year, but consumer interest declined by 35%



Source: Spoonshot

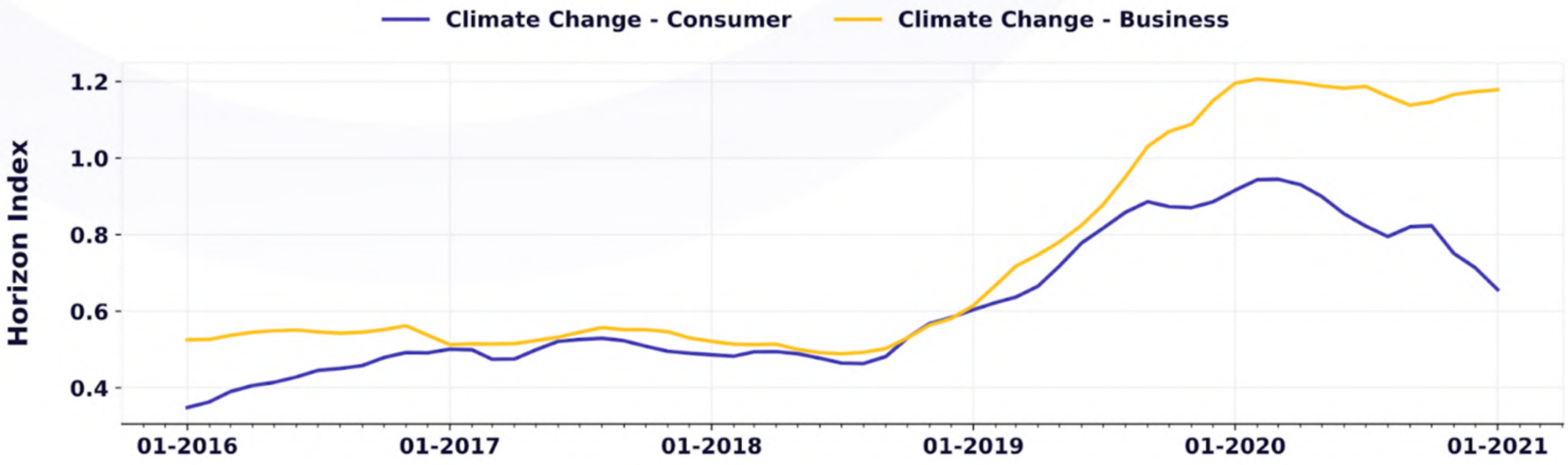
The science behind lab-grown food also will make it possible for companies to bring in a new era of customization, such as tailoring the amount of caffeine in coffee or the fat content of meat.

Lab-grown food will also provide solutions to "clean" protein alternatives, something that plant-based meat analogs will get called out for not having. This "clean" messaging may be the route to appeal to consumers. With these innovations, we can expect to see farm-to-fork evolve to lab-to-fork. Another feature that would appeal to consumers is the cruelty-free aspect of lab-grown products.

WHY NOW?

The initial driver for lab-grown meat was linked to animal welfare, and this has not changed. Now as concerns over manmade climate change have significantly intensified, environmental sustainability and food security are playing major roles in driving interest in cultured food. Consumer concerns over this topic declined in 2020 due to pandemic-related issues, while business interest remained more or less steady. Despite this, World Economic Forum surveys have found that extreme weather and climate action failure are increasingly being considered as global risks by people across the world.

Concerns over climate change have grown by 14% in consumer media and by 102% in business media since 2019



Source: Spoonshot

Despite this, World Economic Forum surveys have found that extreme weather and climate action failure are increasingly being considered as global risks by people across the world. In the 2021 report, four of the top five global risks as perceived by respondents were linked to environmental issues, while infectious disease was a new entrant in this year.

How top global risks by likelihood have evolved over the last decade

	1st	2nd	3rd	4th	5th	6th	7th
2021	Extreme weather	Climate action failure	Human environmental damage	Infectious diseases	Biodiversity loss	Digital power concentration	Digital inequality
2020	Extreme weather	Climate action failure	Natural disasters	Biodiversity loss	Human-made environmental disasters		
2019	Extreme weather	Climate action failure	Natural disasters	Data fraud or theft	Cyber attacks		
2018	Extreme weather	Natural disasters	Cyber attacks	Data fraud or theft	Climate action failure		
2015	Interstate conflict	Extreme weather	Failure of national governance	State collapse or crisis	Unemployment		
2012	Income disparity	Fiscal imbalances	Greenhouse gas emissions	Cyber attacks	Water crises		

Economic | Environmental | Geopolitical | Societal | Technological

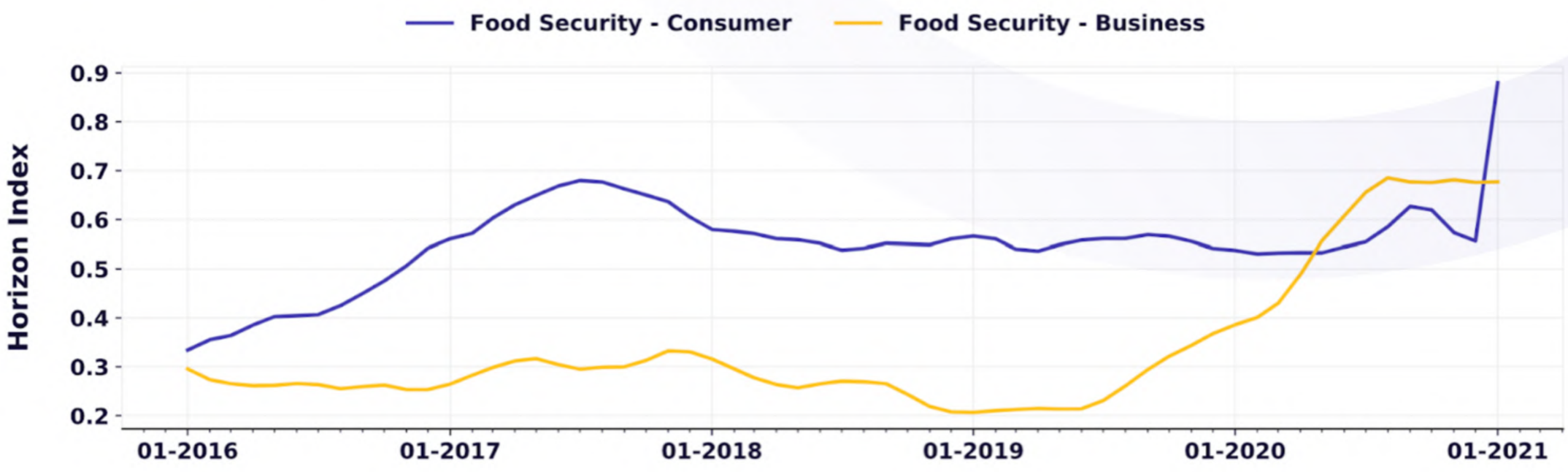
Source: World Economic Forum Global Risks Perception Surveys

WHAT THIS MEANS

Studies have indicated that meat, dairy, and egg consumption are responsible for over 80% of food-related greenhouse gas (GHG) emissions in the US. Switching to cultured beef could reduce GHG by 95%, land use by 98%, and energy use by up to 50%.

According to the World Economic Forum, the global population is expected to reach 9.8 billion by 2050, and the demand for food will be 60% higher than it is today. This is going to put the entire food ecosystem under tremendous pressure, as access to land will diminish. Lab-made food is an efficient way of producing food rapidly without putting more stress on water, land, and other resources.

Concerns over food security grew sharply by 67% in consumer media in just the first two months of 2021, while it grew by 68% in business media over the last year



Source: Spoonshot

Over the last year, we've witnessed first-hand the impacts of climate change and food insecurity around the world, and this has necessitated innovative, "in-the-test tube" solutions to food production. In the long run, lab-made food can help countries that depend heavily on imports for their food to work on an internal supply chain.

Over the next year or two, expect to see the animal products aisles expand to embrace cell-based foods as well, just as they have done for their plant-based peers. Other cultured foods will also start to appear on shelves or in products as ingredients slowly but surely.

SPOONSHOT'S TAKE

Clean solutions

Lab-grown food will provide solutions to cruelty-free and "clean" protein alternatives, something that plant-based meat analogs will get called out for not having. This messaging may be the route to appeal to consumers.

Customization

The science behind lab-grown food also will make it possible for companies to bring in a new era of customization, such as tailoring the amount of caffeine in coffee or the fat content of meat.

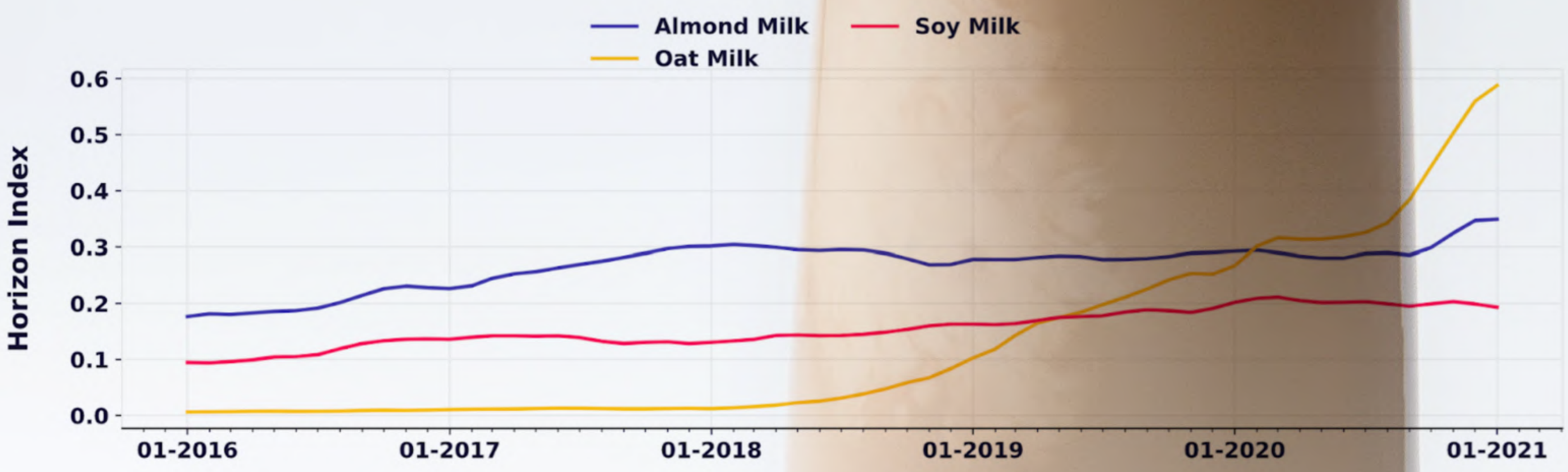
Long-term gains

There are growing concerns over climate change and food security. Lab-made food can help address these by removing pressure from resources and even internal supply chains for countries that are dependent on food imports.

PLANT-BASED MILK GOES GRAIN-ULAR

The next growth spurt for plant-based milks is going to come from grains. Oat milk has already set the stage for the acceptance of grain-based milks, with its taste and greater sustainability compared to almonds and other nuts. Interest in oat milk has overtaken the other top contenders in the space of alt milk. It nearly doubled - 95% growth - over the previous year, while interest in almond milk grew 19% and soy milk declined by 7% during the same period.

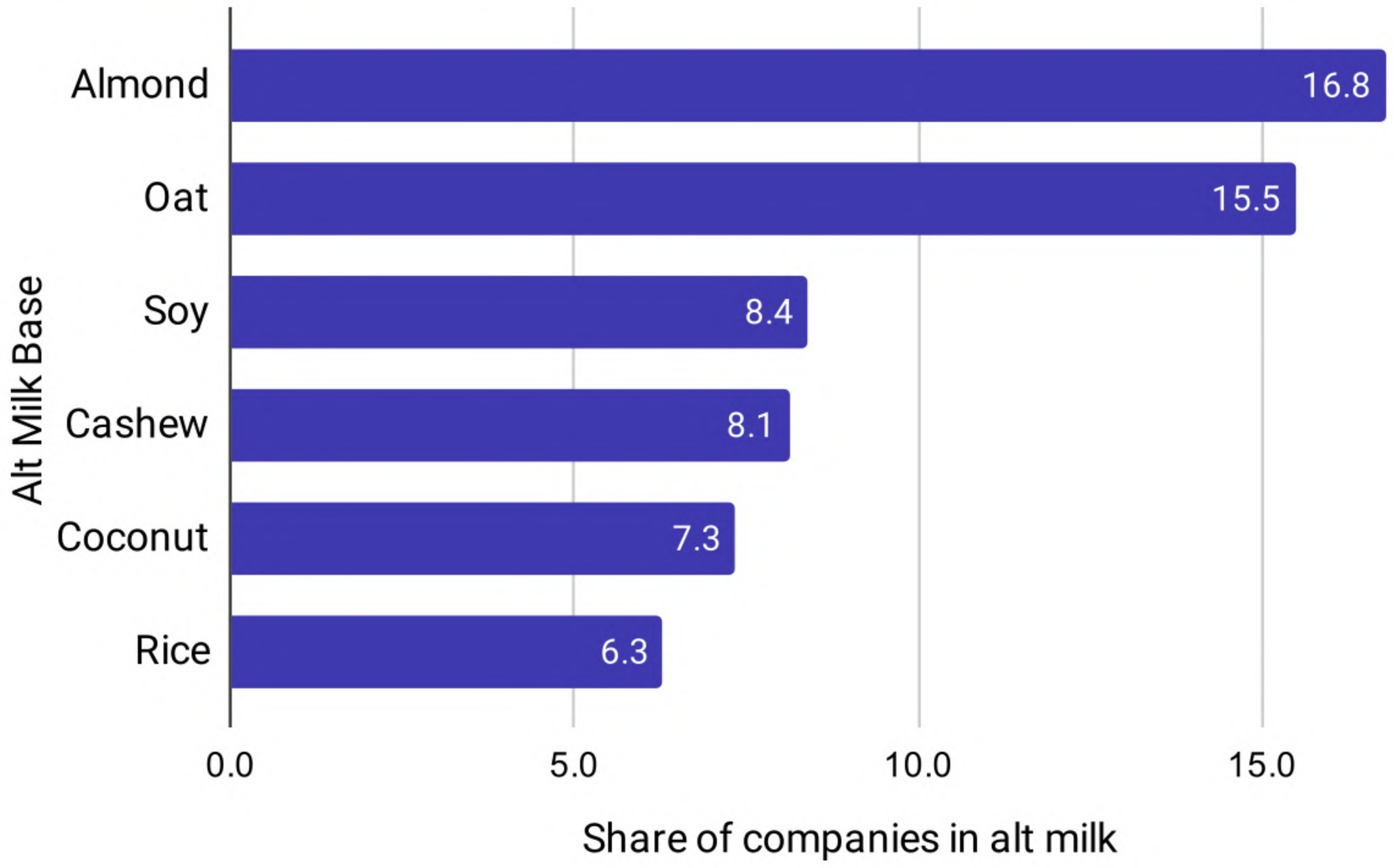
Interest (consumer and business combined) in different plant-based milks



Source: Spoonshot

There are now even more companies making oat milk than soy milk. In terms of sales as well, oat milk has become the second most popular plant-based milk, due to its taste, allergy-friendly, and sustainability credentials. For the 52 weeks to 6 September 2020, SPINS data estimated sales of oat milk at US$213.35 million versus almond milk at US$1.5 billion and soy milk at US$202.25 million.

Top alt milk base ingredients by number of companies



Source: Spoonshot

This makes the case to explore and expand other grains, barley in particular. Barley is a hardy grain and can be grown in extreme climates. It is the fourth most cultivated crop in the world and is quite nutritious, but not very widely used except in the alcohol industry to make beer. It is also soluble and this makes it easy to create a creamy liquid.

These are features that UK-based Bright Barley is focusing on as the first barley-based milk launched in the UK. Bright Barley is said to be low fat, a source of fiber, and has added calcium, vitamin D, and vitamin B12.

Source: Bright Barley

Alcohol majors Anheuser-Busch InBev and Molson Coors are also looking at dairy-free milks as part of their expansion into no-alcohol and better-for-you space. They are looking at utilizing the spent barley from their brewing process for these products. AB Inbev has invested in Take Two Foods and provides the latter with the ingredient used to make barley milk. Take Two also contains pea protein, chicory root, coconut, and sunflower oil. It also has a higher protein content compared to many oat milks.

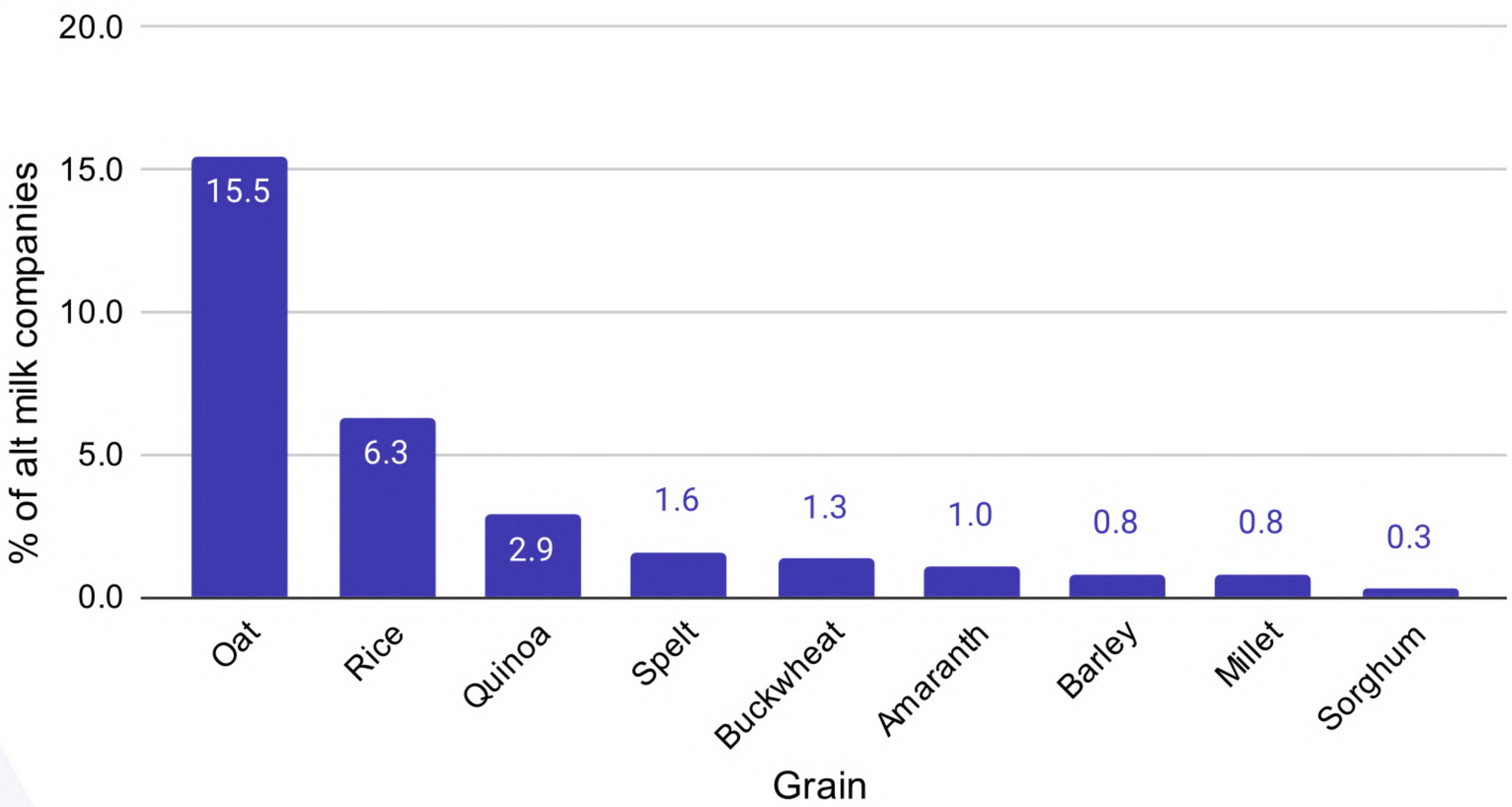
Source: Take Two Foods

The expansion of these brewing majors into the dairy-free milk space is an interesting move, but the advantages of waste-stream capitalizing are hard to ignore. In fact, alcohol companies could very well become a major source of raw materials for plant-based milks in the coming years. And this actually makes barley milk a lot more sustainable compared to the various other base ingredients being used.

WHAT THIS MEANS

In the coming years, there is going to be significant focus on other grains for plant-based milk innovation - ranging from established staples like **barley and quinoa** to relatively less familiar grains like **millets**, which also have a creaminess similar to oat milk. The wide range of options adds to consumer choice and use cases. Many consumers use different plant-based milks for different purposes.

Share of alt milk companies using grains as their base



Source: Spoonshot

LIke the alcohol companies, a number of dairy majors have also been expanding into this space. And like alcohol companies, looking for synergies within or adjacent to their own operations can offer routes to expand into this space as can investments in emerging start-ups in this space.

Meat companies have done the same - investing in plant-based alternatives as consumers look to reduce their meat consumption. This allows companies to soften the blow of changing consumer tastes.

Chobani has launched a range of oat milks

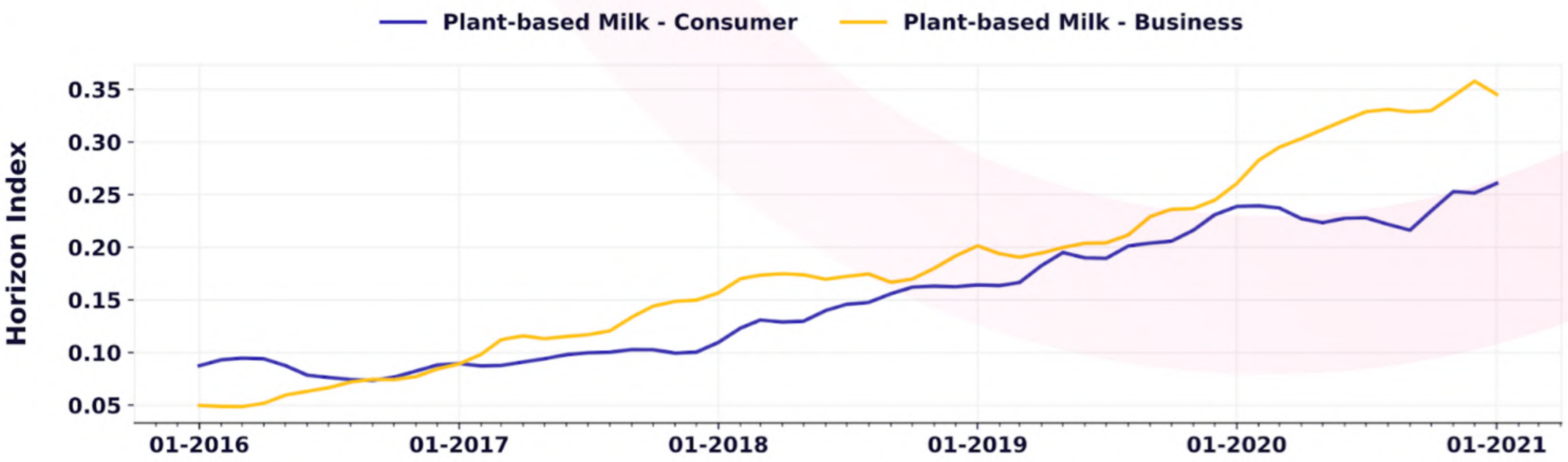
Source: Chobani

Another area of growth for plant-based milks as a whole is going to be a focus on functional benefits. These drinks will start to incorporate ingredients that are linked to expanding needs, such as energy, focus, relaxation, and stress reduction.

WHY NOW?

Non-dairy milk isn't just appealing to the lactose intolerant now, but also to a much wider consumer base. Interest in these milks has exploded so much that they have become a significant challenger to the dairy industry. The Plant Based Foods Association estimated that sales of plant-based alternatives accounted for 14% of the overall milk category in 2019.

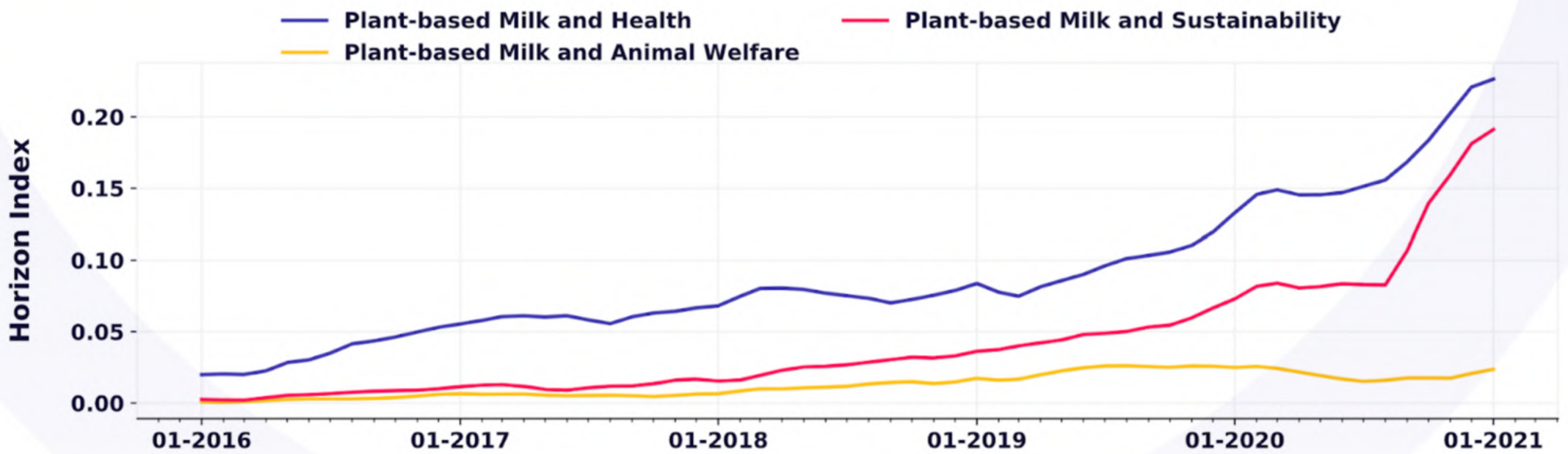
Consumer interest in plant-based milks grew by 9% over the last year, while business interest grew by 22%



Source: Spoonshot

The primary reason for the growth of non-dairy milk is linked to health, with interest growing by 61% over 2020. But environmental sustainability has seen quite a push in the last year, with interest growing by 185%, linked to growing concerns over climate change and the impact that agriculture has on it. Interest in animal welfare declined by 8%.

Drivers for plant-based milks



Source: Spoonshot

Our analysis of social media conversations showed that 63% of conversations on plant-based foods also talked about general health.

> *Switched to oatmilk after my gap year in the US 5 years ago. In this time plant based milk became more and more common and popular in stores in my home country. Never looked back. Helped me with weightloss and a better gut feeling. Also its fun to try new brands and milks. I still occasionally drink milk when hiking and vacationing in the alps though.*
>
> ***Social media comment***

Eco-friendly

For just a single liter, almond milk production uses more than 370 liters of water. The single largest producer of almonds in the world is California, which has been experiencing severe drought conditions. This makes almond milk a high unsustainable product in the long run. Rice milk production is also extremely water intensive requiring 270 liters, compared to just 28 liters for soy milk, 48 liters for oat milk. Grains like barley and other millets, are hardy drought-resistant crops that can be grown in different types of climate, making them an attractive alternative for grain-based milks.

Oat milk is fine, but I wouldn't call almond milk a "sustainable alternative" most of blue diamond comes from California where they drain the states already limited water supply. Each almond takes 1.1 gallons of water to grow.

Not to say I don't love and consume almonds but gotta be careful to just write off one thing for another. Also almonds are filled with oxalates

Social media comment

For anyone looking to purchase milk substitutes for their greener footprint, remember to go for oat, soy or rice milk over things such as almonds which are extremely water intensive to grow and require pollination by bees whilst simultaneously leading to mass collapses of hives

Social media comment

Price

Currently, oat milk is more expensive than almond milk, but that is largely linked to its novelty and the lower production yields currently. But that will likely change as production quantities increase.

Barley on the other hand is far more abundantly available, as the fourth most cultivated crop. Barley production is 7 times higher than oats production, which makes sourcing costs lower. Eventually, grain-based milks will emerge as more mid-market products to make it easier and more affordable for a wider audience to take up a plant-based lifestyle.

> *not sure about other countries but other than soy milk from asian grocery stores, the other milk alternatives are crazy expensive and I can't afford it.):*
>
> ***Social media comment***

> *I tried all the different alternative milks. I like rice milk but after I moved they don't keep it anymore. Then my local aldi started carrying oat milk and i loved that but it cost more. I'm back to soy milk now.*
>
> ***Social media comment***

> *I would love to buy more non-dairy milk, but when I'm on a skin tight budget that dirt cheap gallon of milk goes a lot further than higher prices half-gallon.*
>
> ***Social media comment***

Inclusivity

Depending on the grain, such milks can see growth as allergy-friendly alternatives to not just dairy, but also nuts and soy, making them potentially more inclusive.

> *plant based milks don't make my acne worse and dont have the weird aftertaste i often get from cow milk, plus with the benefit of being better for the environment*
>
> ***Social media comment***

THE CASE FOR BARLEY MILK

Barley	Pro's
4th most cultivated grain 7x more production than oats	Greater availability Potentially more affordable
Hardy Drought resistant Can be grown in extreme climates	Reliable supply
Spent grain can be used	Eco-friendly
Alternative for people allergic to nuts and soy	More inclusive (but not gluten-free)

Plant-based milks are here to stay and are gearing up to expand beyond soy and almonds. Grains are the next natural evolution, with the immense popularity of oat milk paving the way for other grains like barley that not only fulfil the health factor, but are better for the environment.

SPOONSHOT'S TAKE

The case for grains

The success of oat milk makes the case to explore the use of other grains to make alt milk. Grains like barley are more abundantly available compared to nuts, making sourcing easier and more sustainable.

Affordability

For the milk alternatives space to grow, affordability will be key. With greater choice of product, sourcing and production costs can be lowered. Long-term, grain milks will become mid-market products with a wider audience.

Access

Non-dairy milk is no longer just appealing to the lactose intolerant or those with allergies, but also to a much wider consumer base. It is only going to grow. A wider range of products increased access for consumers.

GROWING UP-CYCLING

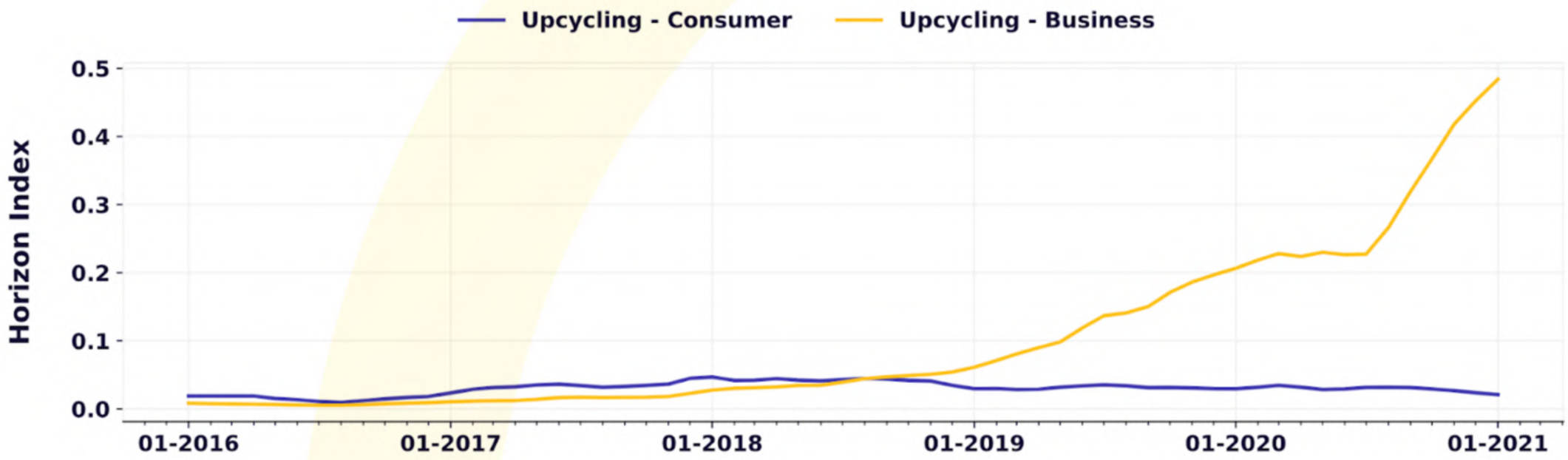
We had predicted in 2020 that this space is going to see significant action in the coming years. This is especially true now that upcycling has a formal definition and a certification program. The Upcycled Certification Program is currently the only third-party certification program for upcycled food ingredients and products globally.

UPCYCLED FOOD ASSOCIATION™ UPCYCLED CERTIFIED™

Source: Upcycled Food Association

This is a trend that has a lot more traction from businesses compared to consumers, since it has more to do with manufacturing and supply in large-scale quantities. Upcycling still remains a niche concept among consumers, but will become more popular as more products and companies highlight these credentials and efforts. In the coming year, companies are going to take a hard look at the byproducts of their manufacturing processes and figure out ways of making them consumable (and not just as food) and cutting down waste.

Interest in upcycling grew by 128% in business media compared to a decline of 32% in consumer media over the last year



Source: Spoonshot

Upcycling has evolved well beyond just making food and drink out of “ugly” produce. New research and processes are being developed that allow extraction of valuable ingredients and nutrients from byproducts for use in other products. A number of companies around the world are utilizing this information to set up waste processing sidestreams as both B-to-B and B-to-C players.

Next steps for upcycling

As upcycling becomes more accepted, the next focus is going to have to be to scale up the process and build a secure infrastructure. This means ensuring a regular supply of the raw materials (the byproducts of other manufacturing), sorting out the logistics of distribution, and expanding beyond regional or local markets. This is going to be key in terms of upcycling contributing meaningfully to reducing food waste and improving environmental sustainability.

We also expect to see greater synergies as large established players look to invest in this space to garner the advantages of potentially reducing the food waste and improving their sustainability creds with consumers. It also means that these companies don't necessarily have to start from scratch when it comes to working out the technical know-how of reviving what it often considered waste from their production process.

At present, the majority of companies offering upcycled food and drink is startups. Partnerships with larger players gives them the ability to scale up faster and reach a wider audience, thereby also educating consumers on the benefits of upcycling.

A 2021 study published in Food and Nutrition Sciences stated that only **10%** of consumers surveyed were familiar with upcycled foods, but once educated about them, **80%** said that they would seek out upcycled food products.

Renewal Mill helped start the Upcycled Food Association (UFA) because we knew that we needed a collective movement to help bring awareness of upcycled food to the average consumer. The largest achievement of the UFA to date is the creation and release of the first of its kind 'Certified Upcycled' seal. We want consumers to see the mark and immediately understand not only what upcycled food is, but more importantly, the impact upcycled food has from a climate perspective. Purchasing upcycled food puts the power back into the hands of consumers to make a tangible reduction in global food loss.

Caroline Cotto
President, Upcycled Food Association board
Co-founder and COO, Renewal Mill

In recent months, there has been a slew of multinational companies backing upcycling ventures. Over the next year, there will be many more. And this is a good sign for upcycling to further become mainstream. Not only do these large companies have the fiscal clout to push such products, they are also familiar names among consumers as well as potential goldmines for the raw materials.

Mondelēz International, through its innovation and venture hub SnackFutures, has supported the development of two brands that use upcycled ingredients.

CaPao is a snack brand that rescues and uses parts of the cacao fruit that would otherwise be considered a waste byproduct of cocoa production.

Source: CaPao

Dirt Kitchen Snacks makes vegetable snacks from produce that would otherwise be considered on-farm waste due to bruising or over-ripening.

Source: Dirt Kitchen Snacks

Retailer Kroger Co. and its Zero Hunger/Zero Waste Foundation have announced plans to invest a total of US$2.5 million in grants to start-ups that have new ways to manufacture, process, or distribute upcycled food and drink.

Barry Callebaut and Bloom Biorenewables have been working on extracting vanillin from hazelnut shells as an alternative to natural and synthetic vanilla extract (which are seeing shortages in light of exploding demand). Once this process is scaled, the chocolate major plans to use this as their flavoring agent as part of building a more sustainable supply chain.

Nestlé has been exploring the use of coffee fruit, cocoa pulp, and other byproducts of its own production processes to make new consumer products.

The company has launched its Incoa chocolate bar, which uses cocoa fruit pulp as a sugar alternative. This pulp is normally discarded, but this new upcycled use not only helps cut food waste but also can supplement the income of cocoa farmers.

Nestlé Australia has launched a range of upcycled caffeinated drinks called Nescafé Nativ Cascara. The lightly sparkling drinks are made from upcycled cascara or coffee berry husks, which usually get discarded during coffee harvesting.

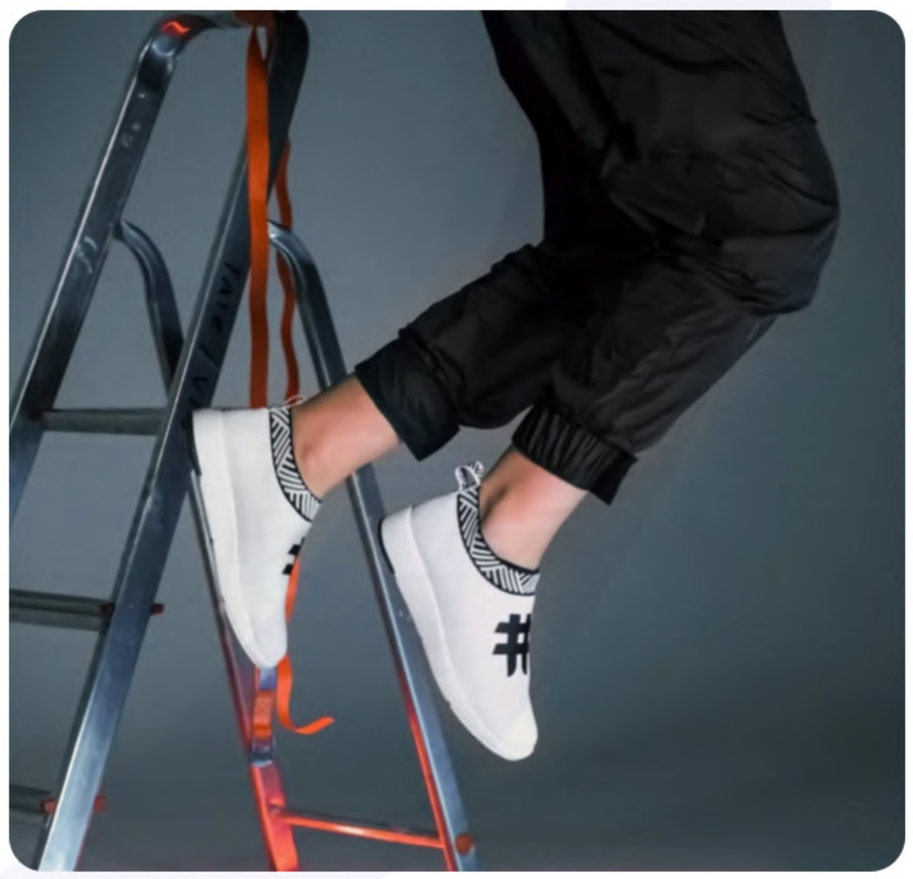
Source: Nestlé

These steps give us a glimpse into the future of upcycling, one where integration and investments will play a much bigger role.

In addition to producing ingredients for use within the food industry, the long-term potential for upcycling will also come in the form of raw materials for the non-food sector.

The fashion industry is also looking into ways of incorporating food waste into products like clothes and shoes to cut down on greenhouse gas emissions. Biotech company Mi Terro is making t-shirts from waste/spoilt milk by extracting certain protein molecules and spinning them into yarn. Rens Original introduced sneakers made from yarn derived from used coffee grounds and recycled polyester.

Source: Mi Terro



Source: Rens Original

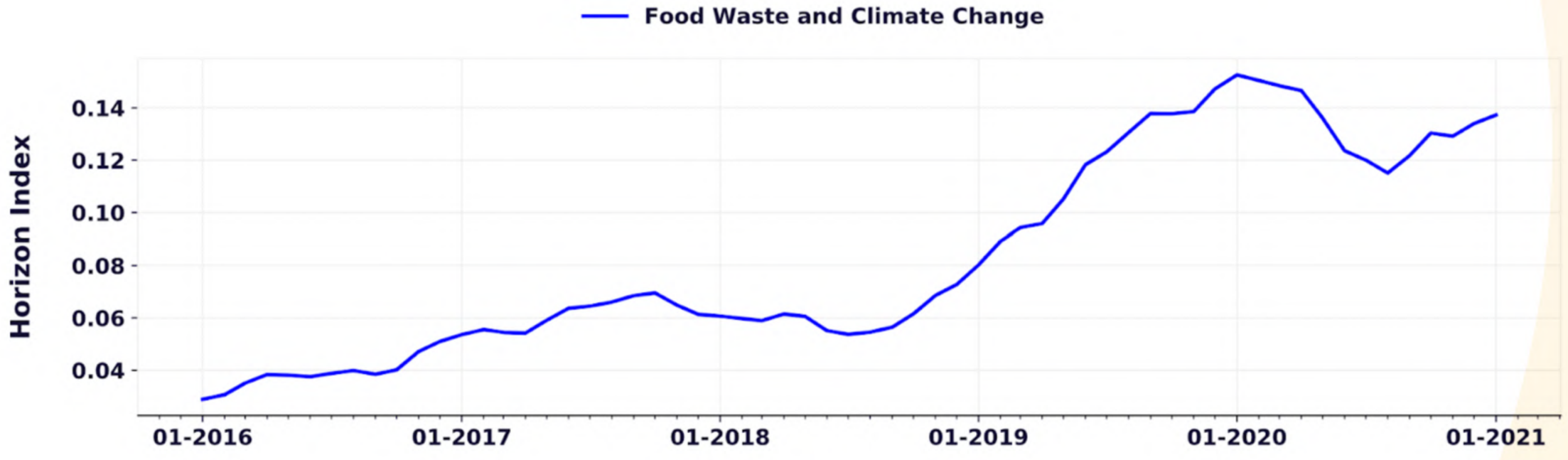
Recently published research has found that specialized bacteria can convert organic waste - like food waste - into high-value fuels and chemicals through a process called microbial chain elongation. This research is said to have significant potential for upcycling food waste and converting it into renewable energy.

WHY NOW?

Globally, 1.4 billion tons of food is wasted every year, with the US alone accounting for 40 million tons. Much of this food ends up in landfills, and is often the single largest component there.

The connection between food waste and climate change is becoming more evident. Climate scientists have called food waste one of the leading sustainability concerns worldwide, accounting for more greenhouse gas emissions than China and the US. Wasted food is said to account for 11% of the world's greenhouse gas emissions. It's even more worrying given increased food insecurity the world over in the wake of the pandemic. China has recently even announced laws to punish food waste and other countries may follow suit.

References to food waste and climate change together have gone up by 71% since 2019



Source: Spoonshot

Food waste and climate change are not issues that can be solved in isolation and instead require participation from consumer, food, and non-food stakeholders. Investing in new research and emerging technologies that aid food upcycling are going to explode in the coming years as they hold the potential to provide solutions for multiple industries to become more sustainable.

In the long-term, upcycling can only truly have a net positive impact on food waste and environmental (and business) sustainability when done at scale and across geographies - which is where the clout of multinational companies can truly play a role.

Over the next year, upcycling is going to move from niche food and drink launches and break out into the mainstream with greater specifics on the derived ingredients and their uses not just in food but also in non-food categories. We'll even likely start to see new claims on-pack aimed at promoting the use of upcycled ingredients and reducing food waste.

SPOONSHOT'S TAKE

Scaling up

Scaling up production is important for any new sector to grow and come into the mainstream. The focus of companies in this space will need to be on building a secure infrastructure and sustainable supply chain.

Synergies

We will see greater synergies or partnerships between large companies and the startups that currently dominate the upcycling space, especially in connection with scaling up.

Awareness

There will be greater efforts in spreading awareness of upcycling and its benefits amongst consumers, which can come from recognized brands promoting the same.

2023 AND BEYOND

1

Postbiotics

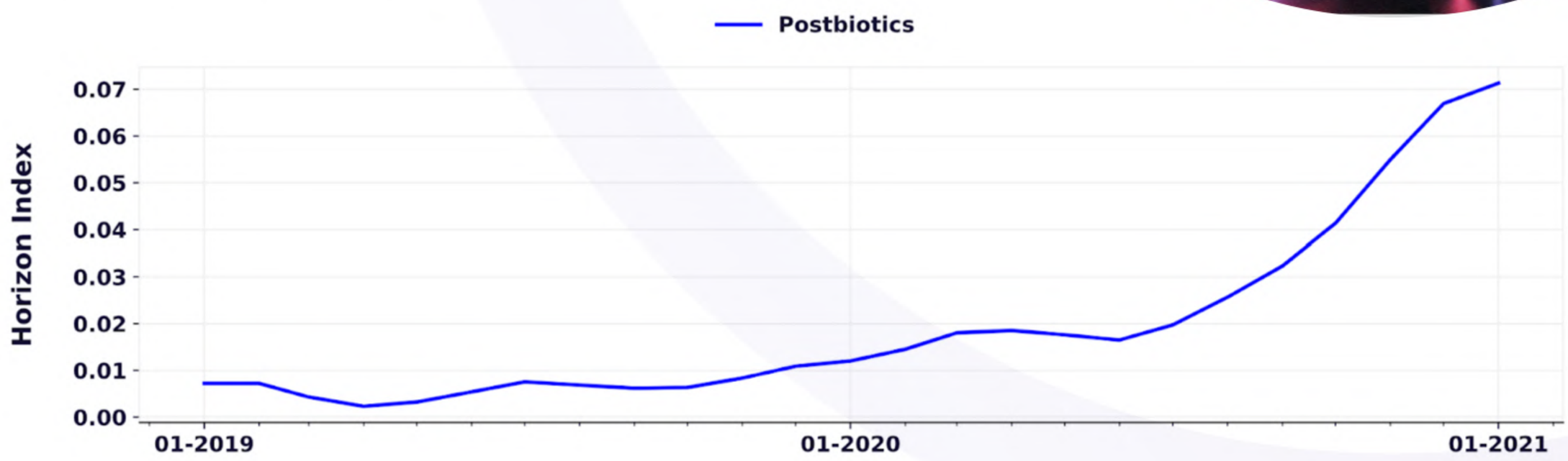
2

Carbon labeling is here to stay

POSTBIOTICS

As we've seen, gut health continues to take precedence, especially given emerging research that indicates how important it is for overall health. But these conversations will go beyond 'pro' and 'pre' into lesser-known biotics, such as postbiotics. This is a new category of functional ingredients into the biotics space but studies are indicating that they may have wide-ranging implications for health.

Interest in postbiotics went up by 391% over the last year



Source: Spoonshot

The term "postbiotics" has only recently been formally defined by a group of international experts and published in ***Nature Reviews Gastroenterology & Hepatology.***

Postbiotics are defined as "a preparation of inanimate microorganisms and/or their components that confers a health benefit on the host."

Postbiotics include either whole microbial cells or components of the cells, as long as they have somehow been deliberately inactivated. They are byproducts of fermentation in the intestine – when probiotics feed on prebiotics, postbiotics are produced including organic acids, bacteriocins, carbonic substances, and enzymes. Postbiotics can be found in some foods containing probiotics, such as kimchi, kefir, and sourdough bread.

APPLICATIONS

Postbiotics are likely to have many of the same benefits of prebiotics and probiotics, including lowering blood sugar and the risk of obesity, preventing leaky gut, as well as anti-microbial and anti-inflammatory benefits.

However, specific strains have also been shown to have expanded benefits:

> A proprietary postbiotic strain developed by House Wellness Foods in Japan has oral care benefits. Clinical trials showed that this strain was effective in increasing the depth of periodontal pockets greater than 4mm at baseline. The strain is said to be able to enhance immunity and eliminate microorganisms from these pockets, and relieve chronic periodontitis.

> Specialty ingredients manufacturer Sabinsa has a patented extraction process to extract a postbiotic from the cultured lactic acid forming bacteria B. coagulans. This postbiotic was found to have anti-inflammatory and anti-collagenase properties, which makes it a skin protection ingredient.

> Postbiotics are not live microbes and so may be suitable for use in a wide range of food and drink formulations by offering greater stability and shelf life. Unlike live probiotics, postbiotics can withstand heat and so can be incorporated into categories such as baked goods, snacks, and confectionery - potentially expanding the better-for-you features of these indulgence foods.

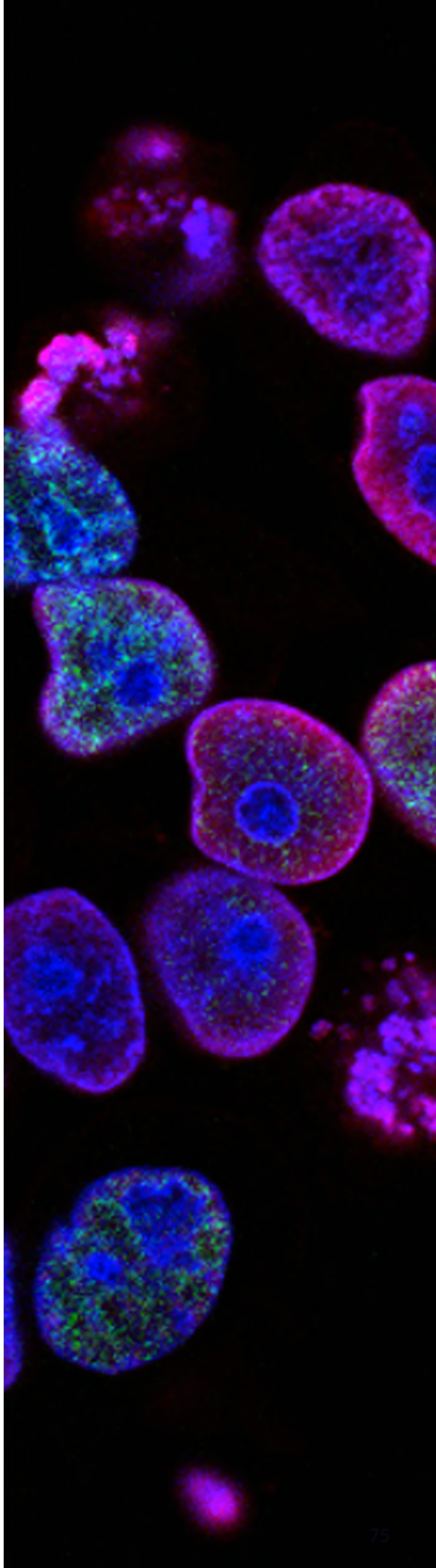


PHOTO CREDITS: DENNIS KUNKEL MICROSCOPY/SCIENCE SOURCE

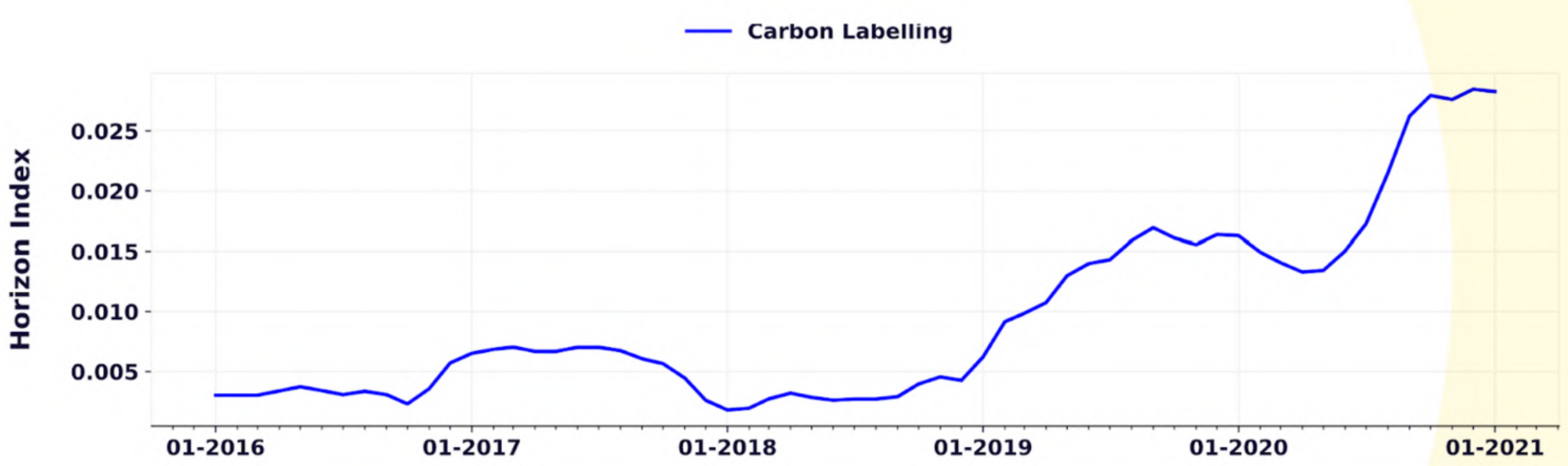
Postbiotics are starting to enter the dietary supplements space in certain markets, and is only a matter of time before they are incorporated into food and drink.

For example, South Korea-based Jung's Laboratory of Immunology's Vita Postbiotics range features probiotics, prebiotics, and postbiotics that offers specific benefits for different consumer groups.

CARBON LABELING IS HERE TO STAY

More food and drink products are starting to highlight their sustainability credentials by being upfront about their carbon footprint. Carbon labels are showing up on products in different formats and it looks like they are here to stay.

Interest in carbon labeling grew by 90% over the last year

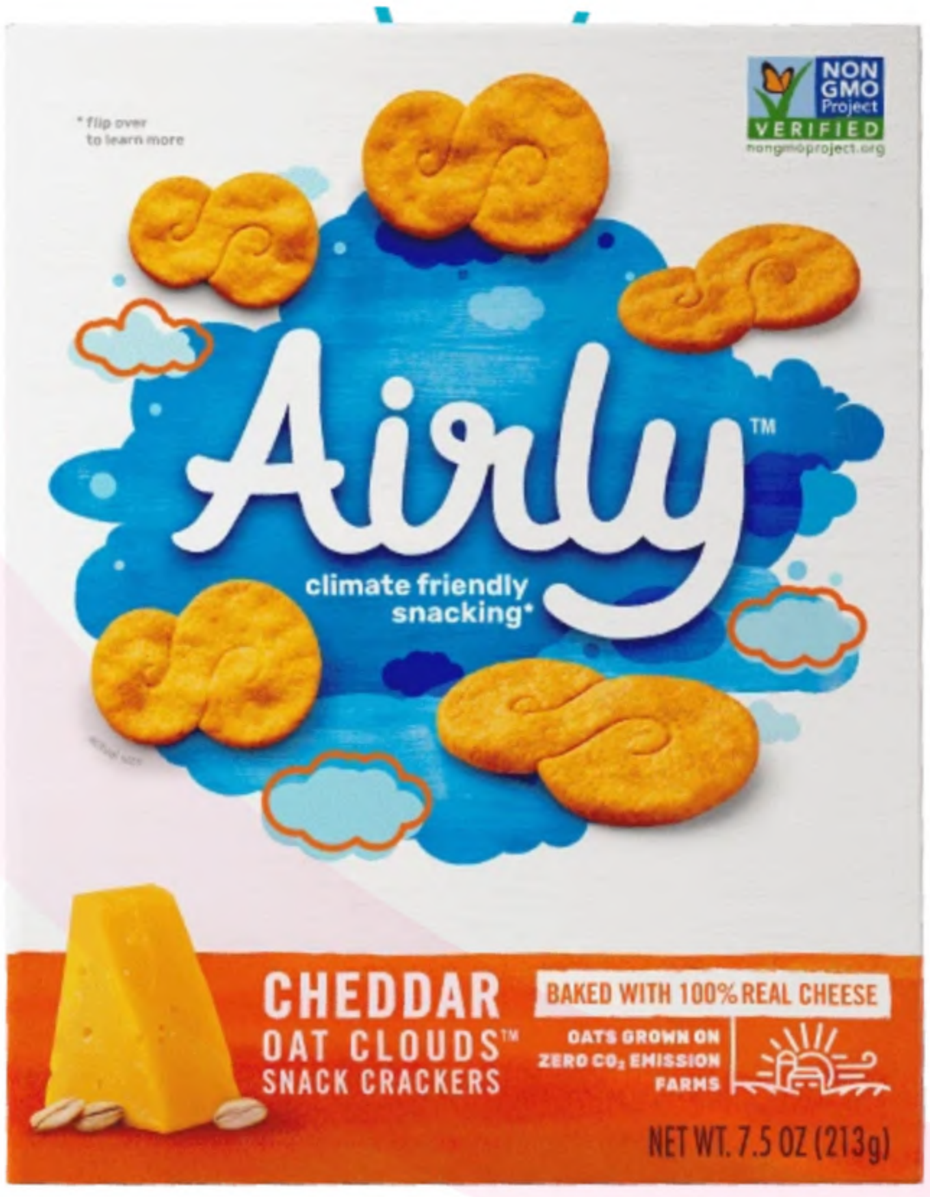


Source: Spoonshot

We're seeing brands, retailers, and restaurants starting to focus on on-pack carbon labeling as a way to promote transparency and spread awareness of our impact on the planet and appeal to environment-conscious consumers. Different ways of showcasing this environmental impact have emerged, but with references to emissions data or production processes.

According to the General Mills-owned Epic brand of protein bars, 80% of the greenhouse gas emissions from raising the beef to make the bars are offset by regenerative farming practices. And as proof of this, Epic's Beef Barbacoa-Inspired Bar is said to be the first bar to carry the Ecological Outcome Verification (EOV) Seal from the Savory Institute.

Source: Epic



Source: Airly Foods

Airly's climate-friendly credentials say that the oats used to make their crackers are grown on farms that have zero carbon emissions. In addition, the production of each box of snacks is said to remove 18-21g of CO2 from the atmosphere.

Source: Wunda

Nestlé's new plant-based milk range, Wunda, calls out that it is carbon neutral on the front of the pack and is certified by the Carbon Trust. The milk is made from peas, which are said to be one of the most eco-friendly sources of plant-based protein. According to Nestlé, the carbon neutral claim has been achieved through various measures, including using renewable energy for production, reducing emissions during distribution, and investments in offsetting projects.

These different methods of calling out the eco-friendly nature of the products can be inconsistent and hard to understand for consumers. This is why an independent scoring system - called Eco-Score - has been launched in parts of Europe to help consumers easily measure the environmental impact of foods. It classifies food products from A (low) to E (high) according to their impact on the environment.

Source: Open Food Facts

This score considers factors like the life cycle of the product, production, transport, packaging, origin of ingredients, and so on, and then gives a single, easy-to-understand symbol for carbon impact. This is similar to the Nutri-Score used to show how healthful a food is.

The idea behind the Eco-Score is to encourage consumers to choose foods that have a lower impact on the environment and climate, promoting more conscious purchasing when it comes to food and drink.

SPOONSHOT'S 2022 TRENDS SUMMARY

2good 2gether: Food Synergies	Health		2022
Breathe Easy: The Gut-Lung Axis	Health		2022
Scents and Sense-abilities	Health	Food Service	2022
The Robots are Coming	Food Service		2022
Lab to Fork	Sustainability		2022
Plant-based Milk Goes Grain-ular	Sustainability		2022
Growing Up-cycling	Sustainability		2022
Postbiotics	Health		2023 & Beyond
Carbon Labelling	Sustainability		2023 & Beyond

APPENDIX

HORIZON INDEX

To be able to compare different trends across one scale, we have developed the Horizon Index. We combine relevant data for each Hot Topic from different data types to calculate a value. The scale is normalized ranging from 0 - 100. So a score of 100 would hypothetically mean that all the data in the world of food & beverage is referring to a specific topic. Therefore, a higher Horizon Index is directly proportional to greater coverage of a particular topic across our data sources.

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