

FReSH insight report

SUSTAINABLE AND HEALTHY DIETS:

Reviewing existing dietary guidelines
and identifying gaps for future action



Food Reform for Sustainability and Health (FReSH) thanks the following companies for their contributions:

FReSH Healthy and Sustainable Diets group leaders:



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1. The FReSH context

FReSH (Food Reform for Sustainability and Health) is a key WBCSD (World Business Council for Sustainable Development) project which emerged from our partnership with EAT in response to the accelerating global problem our planet and people are facing: one-third of the food produced is lost or wasted and 40% of agricultural soil is degraded, yet 800 million people are undernourished and food insecurity is generating civil unrest. In addition, 2 billion adults are overweight, leading to increased numbers of noncommunicable diseases and associated healthcare costs in both the developing and the developed world. Fixing this broken system can't be done through a piecemeal process. It requires a full-scale transformation.

FReSH aims to develop business solutions that create healthy, enjoyable diets for all, produced responsibly, within planetary boundaries by 2030. Acknowledging that business has played a key role in the food system both on the positive and the negative side, FReSH members are joining forces to develop solutions providing healthy, enjoyable diets for all whilst contributing to socioeconomic development and minimizing (and eventually eliminating) environmental impacts and waste.

In addition to the need to address societal and environmental urgency, improving food systems also provides a significant global business opportunity. While it is acknowledged that every business has to promote its own products in order to make profits, there are many examples of how making profits and “doing good” can be combined. The potential value for a worldwide food and agriculture system in line with the Sustainable Development Goals (SDGs) is estimated at USD \$ 2.3 trillion at current prices. For instance, reducing food waste in the value chain is estimated to be worth up to USD \$ 405 billion a year by 2030, while low-income food markets could see up to USD \$ 265 billion in revenue growth.¹

Where traditionally the focus of efforts to address food system sustainability issues was on farm to fork, **it is now time to look at these from fork to farm**: putting consumer needs and desires at the heart of solutions to enable longer term consumption shifts while taking a complete value chain approach that links food consumption to production, distribution and agriculture.

To that aim, FReSH members worked together in 2017 and early 2018 to analyze state of the art production systems in the world food system – covering the full value chain from consumption to production – and potential intervention areas.

This report summarizes the findings of the Healthy and Sustainable Diets group, which investigated healthy and sustainable diet types based on broad scientific agreement. The report is assisting FReSH members as a first science-based guide for possible intervention areas for dietary shifts and business solutions to close dietary gaps to benefit people's health within planetary boundaries.

For this report, 12 geographically diverse countries were selected, prioritizing those with significant populations and cultural diversity, from USA to Nigeria. The existing dietary guidelines and actual consumption data were compared spanning a range of regions and levels of development and, in some cases, considering different age segments of the population.

We added three countries later on, based on matching priority countries from other related projects. We collected actual consumption data for these countries using national survey data and public databases where available. The gaps between national dietary recommendations and actual consumption per country and age segment were based on available national environmental and nutrition guidelines. In some cases, we used proxy data where actual consumption data not been published. From these, we have started to identify discrepancies between the guidelines and the consumption data. Where a local recommendation does not exist, the consumption data can be compared to a globalized recommendation taken from reasonable averages among the various guidelines.

This work has informed our recommendations for intervention areas for each country and on a global level. We acknowledge that in the coming years much more information and research will become available that will provide more detailed data on dietary guidance and gaps to close.

This report only highlights the situation as it stands in 2017/2018.

¹ Business and Sustainable Development Commission. (2017). *Better Business Better World*. Retrieved from: <https://sustainabledevelopment.un.org/content/documents/2399BetterBusinessBetterWorld.pdf>

2. Understanding existing dietary guidelines

Country-level dietary guidelines observations

We selected 12 globally diverse countries covering each of the key global regions, representing a significant population size, with both urban and rural communities and with various dominant age groups to have a good spread of food systems and nutrition habits globally. We inventoried existing dietary guidelines related to the 12 identified countries and others, with special interest in those already incorporating sustainability-inspired recommendations.

Country-level dietary guideline observations

- Where available, the sustainable food-based dietary guidelines all point in the same direction.
- Energy consumption to match requirements through food choices, which provide all essential nutrients, is a key point in all guidelines.
- Some countries are more specific with respect to recommended amounts to be consumed (e.g. meat and dairy) than others.
- In guidelines where there is no focus on sustainability, there is more focus on consumption of lean meat (and not so much on limiting intake of (red/processed) meat).
- For the other food groups there does not seem to be much difference between guidelines that take the environment into account and the ones that do not (yet). This confirms the results of several modelling/scenario studies in different countries, suggesting that eating according to national dietary guidelines would already reduce environmental impact.

Table 1. Inventory of selected current existing dietary guidelines by country and region

Region	Country (*selected 12)	Type of guideline in place (year of release)
North America	USA*	Nutrition only, sustainability inclusion rejected (2015)
Latin America	Argentina Brazil* Colombia Costa Rica* Mexico*	Nutrition only (2016) Nutrition and sustainability (2014) Nutrition only (2014) Nutrition only (2011) Nutrition only (2013)
Europe	France* Germany Italy* Netherlands Norway Spain* Sweden UK*	Nutrition and sustainability (2017) Nutrition and sustainability (2013) Nutrition only (2003) Nutrition and sustainability (2015) Nutrition and sustainability (2015) Nutrition with some sustainability aspects (2016) Nutrition and sustainability (2015) Nutrition with some sustainability aspects (2016)
Middle East	Qatar Saudi Arabia*	Nutrition and sustainability (2015) Nutrition only (2012)
Asia	China* India* Indonesia Thailand	Nutrition and sustainability (2016) Nutrition only (2011) Nutrition only (2014) Nutrition only (2001)
Africa	Nigeria*	Nutrition only (2006)

Food group-specific observations

Meat

- A recurring common guideline (for both sustainability and conventional guidelines) is to eat a diversity of protein-rich foods, including those from plant sources.
- There is overall guidance to eat less fresh and processed meat, with preference for non-ruminant/white meat and lean red meat when consumed.
- The five countries with the clearest sustainability guidelines (China, Germany, Netherlands, Sweden and United Kingdom) give guidance on type and amounts to be consumed and are very much aligned, with guidance amounts of no more than 500/600 g cooked meat per week (45–70 g per day). These amounts are not usually split into meat types (red, poultry, etc.).
- The Netherlands indicates maximum red meat consumption of 300 g per week.
- Even in countries where meat is an important nutrient source (such as Nigeria), there is guidance to consume “moderate” amounts of meat.

Fish

- Countries with sustainability guidelines mostly recommend consuming fish one or two times per week. Countries with a strong fish culture recommend slightly higher consumption (e.g. Spain and Sweden) with two to three times per week.
- Variation in the consumption of low-fat and oily fish is recommended and two countries (Germany and Sweden) also give guidance on sustainable sourcing.
- The conventional guidelines are in line with the above.

Dairy

- All sustainability guidelines recommend daily consumption (two to four portions) of low-fat, low-sugar dairy products.
- Some guidelines (Qatar and Sweden) recommend choosing dairy products fortified with vitamin D or plant-based alternatives fortified with calcium and vitamin D.
- The conventional guidelines are in line with the above.



Fruits and vegetables

- Sustainability guidelines all recommend consuming five portions of fruits and vegetables daily, equivalent to about 500 g.
- Some countries recommend seasonal fruits and vegetables (Brazil, Nigeria, Mexico and Spain).
- Some countries also recommend types of vegetables – e.g. Sweden prefers high-fiber vegetables as they have less environmental impact and can be stored for longer. China recommends that dark vegetables, including spinach, tomato, purple cabbage, pak choy, broccoli and eggplant account for half of vegetables consumed and should appear in every meal.
- Whole fruit is preferred over fruit juices.
- Conventional guidelines are in line with the above and frequently mention diversity in color.

Legumes, pulses and nuts

- Guidance often incorporates legumes and pulses into the meat/protein section.
- Countries outside Europe tend to give clearer and more specific guidance on consuming legumes/pulses on a daily basis.
- Pulses such as beans, peas and lentils are noted as good alternative protein sources.
- There is infrequent and non-specific guidance on nut consumption, which should be salt-free.

Carbohydrate-rich grains

- All guidelines agree that carbohydrate-rich staples are the foods that should be eaten most frequently.
- The sustainability guidelines (mostly European Union) most often mention switching from refined grain to wholegrain varieties.
- Conventional guidelines focus on consuming adequate amounts of grains – these are mainly from emerging/transitional countries.

Fats and oils

- All guidelines recommend choosing liquid, mostly unsaturated fat containing oils, rather than saturated solid fats.
- All guidelines recommend limiting the intake of trans fatty acids and saturated fatty acids (SFA).
- Newer science is challenging putting limits on total fat or saturated fat. For example, the 2015 Dietary Guidelines Advisory Committee recommends removing the 35% total fat limit for the USA, eliminating it as a nutrient of concern.²

Food containing sugar, salt/sodium

- Most guidelines recommend limiting products that contain salt or the intake of salt to less than 6 g per day (or sodium to less than 2,300 mg per day).
- Most guidelines recommend limiting products containing sugar or sugar intake. The US specifies that intake of added sugars and SFA should not exceed 10% of energy.

Beverages

- Guidance is aligned across all countries sampled.
- Water is the beverage of preference and consumption of beverages containing sugar should be limited.
- Alcohol should be consumed in moderation, if at all.

² Mozaffarian, Dariush & Ludwig, David S. (2015). "The 2015 US Dietary Guidelines: Lifting the Ban on Total Dietary Fat". *JAMA*. 2015;313(24):2421–2422. doi:10.1001/jama.2015.5941. Retrieved from: <https://jamanetwork.com/journals/jama/article-abstract/2338262>



National advisory committee guidelines that incorporate sustainability

National advisory committees help inform the final guidelines and as such provide insights into the scientific position behind country-level guidelines. However, not all elements are incorporated into final versions; therefore, the statements below are not necessarily in the official guidelines.

General advice

- Adopt a less animal-based and more plant-based diet: less meat and dairy products and more wholegrain cereal products, legumes, vegetables, and fruit- and vegetable-based meat substitutes. Reduce food waste (Netherlands).
- Try fair trade products; eat local, seasonal, organic produce; avoid waste (Germany, Netherlands).
- Reduce food waste; increase consumption of foods produced with respect for wildlife and the environment, e.g. organic food (UK).
- Opt for raw (unprocessed) food products, that are in season, rely on short supply chains and environmentally-friendly production methods, i.e. with a restriction in inputs (France).
- Drink tap water instead of bottled water (Germany, UK).

Meat, dairy and other protein sources

- Reduce meat and dairy consumption. The importance of dairy (as a source of many vitamins and minerals) to the diet of children means that care needs to be taken when criteria for sustainability are applied. Beans, pulses, fish, eggs, meat and other proteins: these foods are sources of protein, vitamins and minerals, so it is important to eat some foods from this group (UK).
- Eat less meat (Germany).

Fish

- Eat one instead of two portions of fish a week, consider oily fish. This recommendation was deemed to take sustainability into consideration (Netherlands).
- Eat less; look for fish with a sustainability label (Germany, Netherlands).
- Consume only fish from sustainable stocks (UK).

Fruits and vegetables

- Aim for five portions of fruits and vegetables a day. Choose seasonal, local produce (including juices) (Germany).
- Increase consumption of fruit and vegetables, particularly seasonal and field grown (UK).
- Buy seasonal and local fruits and vegetables that are not produced in greenhouses; buy fruits and vegetables with less packaging (France).

Generalizing food-based dietary guidelines

Dietary guidelines from different countries often do not cover all components of the diet. Therefore, we derived a generalized set of cut-offs for ease of interpreting consumption data, as shown in table 2. If a country

does not have a recommendation for a specific food group but consumption data exists, we interpreted the data using this generic table. We made some modifications for children. Although the guidance

was more often towards health improvement, we considered that achieving that guidance would also improve environmental sustainability; the impact icons show where this is the case.

Table 2. Generalized set of cut-offs used to interpret consumption data if country-level recommendations do not exist

Nutrient	Amount	General	Impact
Energy	Varies	To match requirements (by age, gender and activity)	♥ 🍀
Meat - red	No more than 500/600 g cooked meat per week (45–70 g per day); ideally don't eat every day	Restrict amount (non-ruminant preferred); add more only for nutritional adequacy.	♥ 🍀
Meat - poultry		Restrict amount (white preferred); add more only for nutritional adequacy	♥ 🍀
Meat - processed		Eat less	♥ 🍀
Fish	One to three times a week (adults 20–40 g/d, children 5–10 g/d)	Low-fat, oily fish recommended, sustainably sourced	♥ 🍀
Dairy	Two to four times a day (200–250 g toddlers, adolescent/adult 250–300 g)	Low-fat, low sugar, potentially fortified with calcium/vitamin D Plant alternatives fortified	♥
Egg	Three to four eggs a week (~180–240 g)	Loose guidance	♥
Nuts/seeds	15–18 g/day (7–8 g/day for children)	Eat salt-free nuts daily	♥
Non-meat protein	Daily consumption	Legumes and pulses (beans, peas, lentils) daily	♥ 🍀
Sugar	Less than 10% of energy	Limit, especially in beverages	♥
Fats/oils	<35% of energy in total <10% energy from SFA ~10% energy from polyunsaturated fatty acids (PUFA)	Choose liquid, unsaturated oils; limit trans-fat; reduce SFA	♥
Fruits/juices		Whole fruit preferred over juices (maximum of 150g of juice per day)	♥
Vegetables	Five portions of fruits and vegetables daily, equivalent to ~500g (toddlers 175 g, adolescents 260–350 g)	Prefer high-fiber vegetables, dark vegetables daily	♥
Grains/wholegrains	55% energy (adult: three to five servings 150 g/day, children: two to three servings 50–100 g/day)	Eat at each meal, switch from refined to wholegrain; at least half of grains to be wholegrains	♥
Sodium	<6 g/day salt (<2,300 mg Na/day)		♥
Water	~2 liters/day (varies)	Preferred beverage daily	♥ 🍀

♥ Health 🍀 Environmental sustainability



Classifying food-based dietary guidelines

We used the [2016 Pyramids, Plates and Planet report](#) by the Food and Agriculture Organization of the United Nations and the Food Climate Research Network as the reference document to classify key countries on the basis of their food-based dietary guidelines (FBDGs).

A total of 83 countries around the world (out of a possible 215) have established FBDGs; but there is a conspicuous lack of FBDGs in low-income countries, especially in Africa where only five countries have guidelines.

At the time of compilation of the report, only eight countries had included sustainability considerations in their official FBDGs. However, we note that Spain and the UK have guidance that includes sustainability aspects. These countries are included in the table of countries with sustainable FBDGs.

Table 3. Food-based dietary guidelines that incorporate sustainability

	Sweden (2015)	Netherlands (2015)	Germany (2013)	United Kingdom (2016)
Energy intake	Try to maintain energy balance by eating just the right amount.			2,000 kcal for women, 2,500 kcal for men from all food and beverages.
Meat	Eat less red meat and processed meat (no more than 500 g of cooked meat a week/70 g per day).	Eat one or two portions of meat, poultry, fish, eggs, legumes daily, maximum 500 g of meat per week, of which maximum 300 g or red meat per week.	As part of a wholesome diet, limit meat and sausage intake to not more than 300–600 g per week. White meat (poultry) is more favorable than red meat (beef, pork) and low-fat products are preferable.	Consume no more than 70 g (cooked weight) meat per day.
Fish	Eat fish and shellfish two or three times a week. Vary intake of fatty and low-fat varieties and choose eco-labelled seafood.	Eat one serving of fish weekly, preferably oily fish (e.g. salmon, herring, mackerel, eel, trout, sardines, etc.).	Consume fish once to twice a week, from recognized sustainable sources.	Aim for at least two portions of fish every week – one of which should be oily, such as salmon or mackerel.
Dairy	Choose low-fat, unsweetened products. Choose soy- or oat-based alternatives enriched with minerals and vitamins (vitamin D).	Two or three servings of dairy products per day, including milk or yogurt or 40 g of cheese, and give preference to cheeses with high calcium, less fat, less salt.	Consume milk and dairy products daily – preferably low-fat.	Have some dairy or dairy alternatives (such as soya drinks and yogurts). Choose lower fat and lower sugar options.
Eggs	No guidance.	Included in the meat group; 2–3 eggs per week.	Consume eggs in moderation.	No guidance.
Legumes / pulses	No guidance.	Eat more legumes. Eat legumes weekly.	Choose mainly plant-based foods.	Eat some beans and pulses, they count towards five a day. Pulses such as beans, peas and lentils are good alternatives to meat.
Nuts	No guidance.	Eat daily at least 15 grams of unsalted nuts daily.	No guidance.	No guidance.
Fruits / vegetables	Eat lots of fruits and vegetables (at least 500 g per day). Choose high-fiber vegetables (less environmental impact/ longer storage).	Eat at least 200 g of vegetables and 200 g of fruit daily.	Enjoy five portions of fruit and vegetables daily, as fresh as possible, cook for a short time only, or occasionally, consume one serving as a juice or smoothie.	Eat at least five portions of a variety of fruits and vegetables a day.

Spain (2016)	Brazil (2014)	Qatar (2015)	China (2016)
Balance dietary intake and physical activity both quantitatively and qualitatively in the context of the recommendations for a healthy balanced diet.			Avoiding ingesting excessive amounts of food and increasing physical activity are the best ways to maintain energy balance.
Lean white meats and poultry daily. Red and processed meat consumption should be moderate in the context of a healthy diet, choosing excellent quality products.	Try to restrict the amount of red meat.	Choose skinless poultry and lean cuts of meat. Avoid processed meats (e.g. sausages, luncheon meats).	The appropriate daily intake is set at 40–75 g of meat (poultry, pork and beef).
Eat two to three servings of fish a week.	No guidance.	Eat a variety of fish at least twice a week.	The appropriate daily intake is set at 40–75 g of fish per week.
Consume two to four servings a day of quality dairy, with priority to those low in fat and no added sugar.	Milk drinks and yogurts that have been sweetened, colored and flavored are ultra-processed foods, and as such should be avoided.	Maintain daily consumption of skimmed or low-fat milk and dairy products. Choose vitamin D fortified milk. Choose unflavored milk, laban and yogurt more often. For those who do not drink milk or eat dairy products, choose other calcium and vitamin D rich foods (e.g. fortified soy drinks, almonds, chickpeas).	Consume a variety of dairy products, equivalent to 300 g of liquid milk daily.
Eggs are an excellent source of nutrients and can be consumed daily as desired. Give priority to sustainable sources.	No guidance.		The appropriate daily intake is set at 40–50 g of eggs.
Consumption of two to three servings a week is recommended, using culinary techniques that improve their nutritional value and digestibility.		Choose legumes, nuts and seeds as alternative protein sources. Eat legumes daily and prepare with little or no added fat or salt.	Bean products and nuts should be eaten frequently in an appropriate amount for energy and essential oils.
Nuts and seeds to be consumed daily without added sugar or salt.		Choose unsalted nuts and seeds as part of a healthy snack.	Bean products and nuts should be frequently eaten in an appropriate amount for energy and essential oils.
Try and eat three servings of fruits and two of seasonal vegetables (one portion as raw vegetables with different color varieties) every day.	Eat foods mainly of plant origin. Chose seasonal and locally grown produce.	Aim for three to five servings of a variety of vegetables every day. Aim for two to four servings of a variety of fruit every day. Favor whole fruit over juices.	Daily vegetable intake should be in the range of 300–500 g. Dark vegetables, including spinach, tomato, purple cabbage, pak choy, broccoli and eggplant, should account for half this amount and should appear in every meal. Fruits should be consumed every day. The daily intake of fresh fruits, excluding fruit juice, should be between 200 and 350 g.

	Sweden (2015)	The Netherlands (2015)	Germany (2013)	United Kingdom (2016)
Carbohydrate-rich staples	Switch to whole meal. Choose wholegrain varieties for pasta, bread, grain and rice.	Replace refined cereal products with wholegrain products.	Bread, grain flakes, pasta, rice, preferably from wholegrains, and potatoes contain plenty of vitamins, minerals and dietary fiber, as well as phytochemicals. Consume these foods, preferably with low-fat ingredients.	Base meals on potatoes, bread, rice, pasta or other starchy carbohydrates. Choose wholegrain where possible.
Fats and oils	Choose healthy oils when cooking, such as rapeseed oil or liquid fats made from rapeseed oil, and healthy sandwich spreads.	Replace butter, hard margarines and cooking fats by soft margarines, liquid cooking fats and vegetable oils.	Favor vegetable oils and fats (e.g. canola oil, soybean oil and margarines produced therefrom). Be aware of hidden fat found in several meat and dairy products, pastries, sweets, fast food and convenience products. Overall, 60–80 g of fat daily are sufficient.	Choose unsaturated oils and spreads and eat in small amounts.
Protein sources	Beans, chickpeas, lentils, fish, eggs and poultry provide lots of iron and protein.	More vegetables, less or no meat. Vary between fish, legumes, meat, nuts and egg. Do not eat more dairy than necessary.		Eat some beans, pulses, fish, eggs, meat and other protein. Pulses such as beans, peas and lentils are good alternatives to meat.
Salt / sugar / SFA	Choose foods with less salt. Use less salt when cooking but choose salt with iodine when using salt. Hold back on the sweets, pastries, ice creams and other products containing lots of sugar.	Limit salt intake to 5–6 grams daily.	Use sugar and salt in moderation. Favor iodized and fluoridated salt.	Eat foods high in fat, salt and sugar less often and in small amounts.
Beverages	Cut back on sweet drinks.	Drink as much water as you like. Limit consumption of sugar-containing beverages. Do not drink alcohol – or no more than one glass daily. Drink 3 cups of tea daily and replace unfiltered coffee with filtered.	Choose water, carbonated or non-carbonated, and other beverages low in calories. Only rarely drink sugar-sweetened beverages. Consume alcoholic drinks only occasionally and only in small amounts.	Drink plenty of fluids – the government recommends 6–8 cups/glasses a day. Water, lower fat milks and lower sugar or sugar-free drinks, including tea and coffee, all count.
Other considerations				
Reference/link	Livsmedelverket, National Food Agency, Sweden. "Eating habits and dietary guidelines". Retrieved from www.livsmedelverket.se/en/food-habits-health-and-environment/dietary-guidelines/	Health Council of the Netherlands. 2015. Dutch dietary guidelines 2015. Retrieved from www.gezondheidsraad.nl/sites/default/files/201524edutch_dietary_guidelines_2015.pdf	German Nutrition Society (GDE). 10 guidelines for a wholesome diet. Retrieved from www.dge.de/fileadmin/public/doc/fm/10-guidelines-for-a-wholesome-diet.pdf	National Health System. 2016. The Eatwell Guide. Retrieved from http://www.nhs.uk/Livewell/Goodfood/Pages/the-eatwell-guide.aspx

Spain (2016)	Brazil (2014)	Qatar (2015)	China (2016)
Consume wholegrain cereals and byproducts daily, prioritizing grains and derivatives made with wholegrain flours. Moderate consumption of sugar and sugary products (<10% of energy daily).		Substitute refined grains (e.g. white bread) with wholegrain breads and cereals.	The daily amount of cereals and potatoes consumed for body energy production should be 250–400 g, including 50–150 g of wholegrains and mixed beans and 50–100 g of potatoes. The major characteristic of a balanced diet is to eat a variety of foods with cereals as the staple.
Olive oil is recommended for daily consumption. Spreadable fats are advised for only occasional consumption.	In moderation.	Use healthy vegetable oils such as olive, corn and sunflower in moderation. Avoid saturated fat and hydrogenated or trans-fat (e.g. ghee, partially hydrogenated vegetable oil) and foods made with these fats (french fries, commercially baked sweets).	Oil 25–30 g per day.
		Choose legumes, nuts and seeds as alternative protein sources. Eat legumes daily and prepare with little or no added fat or salt.	
Moderate salt intake and products high in salt (structural or added) to avoid total intake above 6 g per day.	Limit the consumption of processed foods and avoid ultra-processed foods.	Consume less than 2,000 mg of sodium per day, equivalent to 1 teaspoon or 5 g of salt.	Choose to consume less salt and fewer fried foods. The daily recommended intake for adults should be no more than 6 g of salt and 25–30 g of cooking oil. For sugar, the daily intake should be properly controlled and should be less than 50 g, or preferably less than 25 g. For trans fatty acids, the daily intake should be less than 2 g.
Water intake, along with other liquids or foods, should comprise around 2.5 liters every day – and increase in case of physical activity. Moderate consumption or avoidance of alcohol is advised.	No guidance.	Choose water more often than other types of beverages. Avoid sweetened beverages such as carbonated, energy and fruit drinks.	To keep the body well-hydrated, enough water, corresponding to 7–8 cups (1,500–1,700 ml) for adults, should be consumed every day. The drinking of plain boiled water or tea should be promoted and sugar-sweetened beverages discouraged. For adults, the amount of alcohol consumed per day should not exceed 25 g for men and 15 g for women.
Sustainable food: Sustainability in the processes of procurement, transportation, distribution and preparation of food is of great importance in maintaining the ecosystem and the health of the planet.			
Sociedad Española de Nutrición Comunitaria (SENC). 2016. Guías alimentarias. Retrieved from http://www.nutricioncomunitaria.org/es/noticia/guias-alimentarias-senc-2016	Ministry of Health of Brazil. 2014. Dietary Guidelines for the Brazilian Population. 2nd Edition. Retrieved from http://www.foodpolitics.com/wp-content/uploads/Brazilian-Dietary-Guidelines-2014.pdf	Supreme Council of Health of the State of Qatar. 2015. Qatar Dietary Guidelines. Retrieved from http://www.fao.org/3/a-az908e.pdf	Wang, Shan-Shan et al. "Dietary Guidelines for Chinese Residents (2016): comments and comparisons" Journal of Zhejiang University SCIENCE B v.17(9): 649-656; 2016 Sept. Retrieved from www.ncbi.nlm.nih.gov/pmc/articles/PMC5018612/

Table 4. Official food-based dietary guidelines by countries incorporate sustainability aspects or have considered doing so

Norway (2015)	
Energy intake	Maintain a good balance between the amount of energy you obtain through food and drink and the amount of energy you expend through physical activity. Be physically active for at least 30 minutes every day.
Meat	Choose lean meats. Limit the amount of processed meat and red meat to 500 g per week. This corresponds to two to three dinners and some cold cuts. Choose poultry, lean meat and lean meat products that are low in salt. Limit the amount of processed meat products that are smoked, salted or conserved with nitrate or nitrite, such as bacon. Red meat: from pigs, cattle, sheep and goats.
Fish	Eat fish for dinner two or three times a week. Recommendation is a total of 300–450 g of pure fish per week. At least 200 g should be oily fish such as salmon, trout, mackerel or herring. Six slices of fish equals about one dinner portion.
Dairy	Make lean dairy products part of daily diet. Limit the use of dairy products with high saturated fat, such as whole milk, cream, fatty cheese and butter. Choose dairy products with low fat, salt and little added sugar.
Eggs	
Legumes / pulses	Legumes/pulses such as beans and lentils, seeds, spices and herbs are also not included in “five a day”. These often have high levels of nutrients and belong in a varied diet. Eat a small handful of unsweetened nuts a day.
Nuts	Wholegrain products, vegetables, fruits, berries, beans, lentils, nuts and seeds are recommended as they are main sources of carbohydrates and dietary fiber.
Fruits / vegetables	Vary between different types of vegetables and fruits. Use tomato, onion, leek and garlic. Eat at least five servings (100 g) of vegetables, fruits and berries every day. Consume fresh, vacuum-packaged, frozen, and heat-treated vegetables, fruits and berries. Half of “five a day” should be vegetables.
Carbohydrate-rich staples	Potatoes are not included in “five a day” but belong in a varied diet. Potatoes contain more dietary fiber, vitamins and minerals than regular rice and pasta. Prefer boiled or baked potatoes. Choose grain products with high fiber and wholegrain content and low-fat, sugar and salt content.
Fats and oils	Choose cooking oils, liquid margarine and soft margarine, rather than hard margarine and butter. It is important to ensure a good fatty acid composition in the diet. Replace saturated fatty acids with more beneficial unsaturated fatty acids. A rule of thumb is that the smoother the margarine and the butter are at cool temperatures, the more unsaturated fat they contain.
Protein sources	
Salt / sugar / SFA	Choose foods with little salt, and limit the use of salt in cooking and food. Processed foods contribute on average to 70–80% of salt intake. Therefore, choose low-salt foods and low-salt pre-made meals. Avoid foods and drinks with a lot of sugar every day. Bread, juice and candy are the largest sources of added sugar in the diet. They add a lot of sugar and energy but few vitamins and minerals.
Beverages	Choose water. Water is required to maintain normal body functions. Normal water covers the fluid requirement without contributing to unnecessary calories and is therefore the very best drink when thirsty.
Other considerations	Vary diet with a lot of vegetables, fruit and berries, coarse grain products and fish, as well as limited amounts of processed meat, red meat, salt and sugar.
Reference/ link	Helsedirektoratet. Anbefalinger om kosthold, ernæring og fysisk aktivitet (Recommendations about diet, nutrition and physical activity). Retrieved from https://helsedirektoratet.no/Lists/Publikasjoner/Attachments/1150/Helsedirektoratets%20kostr%C3%A5d%20engelsk%20IS-2378E.pdf

France (2017)	United States (2015)
	Consume in a healthy eating pattern that accounts for all foods and beverages within an appropriate calorie level.
Limit consumption of red meat (maximum of 500g per week) and opt for poultry. Limit consumption of processed meat (maximum of 150g per week).	Consume a variety of protein sources, including lean meats and poultry.
Consume twice a week. Include one oily fish. Vary species and sources (in particular for consumers of large quantities of these products), to limit exposure to contaminants.	Consume a variety of protein sources, including seafood.
Consume 2 dairy products per day. Recommended portion sizes: 150ml for milk, 125g for yoghurt, 30g for cheese. Opt for cheeses that are rich in calcium and low in fat.	Consume fat-free or low-fat dairy, including milk, yogurt, cheese, and/or fortified soy beverages.
Can be consumed as long as their consumption is not an obstacle to respecting the other consumption guidelines.	Consume a variety of protein sources, including eggs.
Consume at least twice a week. Favor legumes that have been grown using production methods that reduce exposure to pesticides. Legumes can also be considered as substitutes for meat and poultry.	Consume a variety of protein sources, including legumes (beans and peas) and soy products.
Consume a small handful per day (without added salt).	Consume a variety of protein sources, including nuts and seeds.
Consume at least 5 per day. The recommended portion size is 80 to 100g. Consumption increase is recommended, regardless of the initial level of consumption. No more than one glass of fruit juice per day, which can count as one portion of fruit and vegetables. In that case opt for freshly squeezed fruit. All forms of fruit and vegetables are taken into consideration: fresh, frozen, dried or canned. Favor fruit and vegetables that have been grown using production methods that reduce exposure to pesticides	A healthy eating pattern includes a variety of vegetables from all of the subgroups – dark green, red and orange and fruits (especially whole fruits).
Consume wholegrain and unrefined cereal products every day, with a preference for non or minimally refined products over refined products. Favor cereals that have been grown using production methods that reduce exposure to pesticides. Only wholegrain unsweetened breakfast cereals can be included in this group. Potatoes or refined cereal products can be consumed as long as their consumption is not an obstacle to respecting the other consumption guidelines.	Consume grains, at least half of which are wholegrains.
Avoid excessive consumption. Opt for rapeseed oil, walnut oil (high in alpha-linolenic acid (ALA)) and olive oil, without increasing usual quantities of added fat. Animal oils and fats should be used in limited amounts.	A healthy eating pattern includes oils.
	Include a variety of protein sources in nutrient-dense forms. Protein sources include dairy, seafood, meats, poultry and eggs; and nuts, seeds and soy products, and legumes (beans and peas). The recommendation for protein is 5½ ounce-equivalent per day.
Limit intake of salt. Be vigilant regarding the cumulation throughout the day. Limit adding salt during cooking and eating. Use iodized salt. Limit consumption of sugar/sweetened products (sweetened beverages, breakfast cereals). Limit the consumption of sweetened and fatty foods (pastries, chocolate, milk-based desserts and ice cream).	Consume less than 10% of calories per day from saturated fats and from added sugars. Limit trans fats. Consume less than 2,300 mg per day of sodium.
The only recommended beverage is water (without restrictions in quantity). Limit the consumption of sugary and sweet tasting drinks limit to one glass per day. In this category, opt for fruit juices. Artificially sweetened beverages consumption should be limited. Tea (including herbal teas) and coffee, when not sweetened, can contribute towards water intake.	Consume alcohol in moderation, up to one drink per day for women and two for men.
<ul style="list-style-type: none"> • Ensure that the day's food intake is overall as close to the guidelines as possible, without each meal being necessarily so. • Opt for variety in all its forms: diversify the supply sources, procurement and product origins. • Avoid excessive portions and intake. • Take enough time to eat and enjoy meals. • Avoid snacking and particularly the consumption in between meals of fatty, salty and sugary/sweetened products. • Opt for raw (unprocessed) food products that are in season, rely on short supply chains and environmentally-friendly production methods. • Organic farming is a production method that limits inputs and is a means of minimising exposure to pesticides. 	Focus on variety, nutrient density, and amount. To meet nutrient needs within calorie limits, choose a variety of nutrient-dense foods across and within all food groups in recommended amounts. Shift to healthier food and beverage choices. Choose nutrient-dense foods and beverages across and within all food groups in place of less healthy choices. Consider cultural and personal preferences to make these shifts easier to accomplish and maintain. Support healthy eating patterns for all: everyone has a role in helping to create and support healthy eating patterns in multiple settings nationwide, from home to school to work to communities.
Haut Conseil de la santé publique. 2017. Repères alimentaires. Retrieved from https://www.hcsp.fr/Explore.cgi/Telecharger?NomFichier=hcspa20170216_reperesalimentairesactua2017_en.pdf	U.S. Department of Health and Human Services and U.S. Department of Agriculture. 2015. Dietary Guidelines for Americans 2015-2020, 8th edition. Retrieved from https://health.gov/dietaryguidelines/2015/guidelines/executive-summary/

Table 5. Food-based dietary guidelines by countries that do not incorporate sustainability aspects

	Mexico (2013)	Argentina (2016)	Costa Rica (2011)	Italy (2013)	Saudi Arabia (2012)
Energy intake	Moderation, eating frequency and portion sizes are important.	Exercise daily.	Maintain a healthy weight. Exercise daily.	Watch weight and be active.	Match intake of energy (calories) to overall energy needs. Limit consumption of foods with a high caloric density. Balance energy expenditure with energy intake through physical activity.
Meat	The consumption of roasted, boiled or grilled fish and poultry without skin and lean meats is recommended. Eat only moderate amounts of smoked or cured meats and foods prepared with charcoal or wood.	Poultry two times/week, red meat no more than three times/week. When eating meat remove visible fat.	Select low-fat animal-sourced foods.	No guidance.	Limit intake of foods with a high content of saturated fatty acids and cholesterol. Choose lean meat. Recommended two/three servings/day. One exchange serving = 60–90 g of red meat or chicken or fish.
Fish	See meat guidance.	Fish two times or more per week.		No guidance.	Get unsaturated fatty acids from fish. Recommended two/three servings/day. One exchange serving = 60–90 g of fish. *two/three servings of either fish, meat or chicken.
Dairy	Skimmed or semi skimmed dairy products are recommended for adults.	Include three portions per day of milk, yogurt or cheese.		No guidance.	Select low-fat milk and milk products. Recommended two/four servings/day. One serving = one cup of milk or laban (240 ml) or 30 g of cheese.
Eggs	Adults should consume animal products in moderation due to the high amount of cholesterol and saturated fat.	Include no more than one egg/day, especially for those who do not eat enough meat.		No guidance.	
Legumes / pulses	Consume a variety of legumes, such as beans, lentils, peas, etc.	Mix legumes with cereals as an alternative to replace meat on occasion. Select variety: legumes such as lentils, soy, beans, peas, chick peas, and cereals such as wholegrain rice, oats, maize, wheat, barley, rye, etc.	Eat rice and beans as the base of daily feeding.	No guidance.	Consume meat alternatives such as beans, lentils, fava beans and chickpeas. Recommended two/three servings/day. One serving = half cup cooked legumes.
Nuts	No guidance.	At least once a week eat a handful of nuts without salt (peanuts, nut, almonds, hazelnuts, chestnuts, etc.) or seeds without salt (chia, sunflower, sesame, linseed, etc.).		No guidance.	Consume unsaturated fatty acids in the form of nuts.
Fruits / vegetables	Consume seasonal and raw (if possible) fruit and vegetables.	Eat five portions of fruits and vegetables of different colors and varieties daily. Eat half a plate of vegetables at lunch time and dinner and two to three fruits per day.	Eat five portions of fruits and vegetables of different colors and varieties daily.	Eat more vegetables, tubers and fruits.	Consume freely or according to recommended allowance. Consume fruits and vegetables of different colors and textures throughout the day, both as meals and snacks. Fruits: two/four servings/day; one serving = medium sized apple or orange or bananas or kiwi or half cup of juice (120 ml) or half cup of dried fruits. Vegetables: two/three servings/day; one serving = cup of vegetables or cup of juice or half cup of cooked vegetables.

India (2011)	Thailand (2001)	Nigeria (2006)	Colombia (2014)	Indonesia (2014)
Avoid overeating to prevent overweight and obesity.	Eat a variety of foods from each of the five food groups and maintain proper weight.	Total food intake should take into consideration a person's level of physical activity. Individuals who do manual work need to consume more food than those who do sedentary work.	To maintain a healthy weight, reduce the consumption of packaged products, fast foods, soft drinks and sweetened drinks.	Perform adequate physical activity and maintain a normal weight.
Moderate the consumption of animal foods containing high fat, SFA and cholesterol. Prefer fish to meat, poultry and limit/avoid organ meats such as liver, kidney, brain, etc.	Eat lean meats regularly. Avoid consumption of meat that has visible fat.	Meat to be consumed in moderation.	To prevent anemia, schoolchildren, adolescents and young women should eat offal once per week.	Eat high-protein foods (animal or vegetable source).
Eat fish more frequently (at least 100–200 g/week).	Eat fish regularly.	Fish to be consumed in moderation.		Eat high-protein foods (animal or vegetable source).
Choose low-fat dairy foods instead of regular whole fat dairy foods.	Drink milk in appropriate quality and quantity for one's age. Milk is good for everyone.	No recommendations on dairy in general guidelines.	To favor muscle, bone and tooth health, eat eggs, milk and dairy products daily.	
Eggs have several important nutrients but are high in cholesterol. Limit the consumption to three eggs/week. However, egg whites may be consumed in good amounts.	Eat eggs regularly.	Eggs to be consumed in moderation.		Eat high-protein foods (animal or vegetable source).
Eat foods rich in alpha-linolenic acid, such as legumes, green leafy vegetables, fenugreek and mustard seeds. Increase consumption of fruits and vegetables, legumes, wholegrains and nuts.	Eat legumes and pulses regularly.	Diet should contain as wide a variety of foods as possible, e.g. cereals, legumes, roots/tubers, fruits, vegetables, fish, lean meat, local cheese (wara).	To complement diet, eat pulses like beans, lentils, peas and chickpeas at least two times per week.	
Increase consumption of nuts.				
Increase consumption of fruits and vegetables, taking into consideration nutrient requirements. It is recommended that every individual should consume at least 300 g of vegetables (green leafy vegetables: 50 g; other vegetables: 200 g; roots & tubers: 50 g) in a day. In addition, fresh fruits (100 g), should be consumed regularly.	Eat plenty of fruits and vegetables regularly.	Vegetables and fruits should be consumed at every meal. Liberal consumption of whatever fruit is in season is encouraged.	To improve digestion and prevent heart disease, include whole fruits and fresh vegetables in each meal.	Eat plenty of vegetables and fruits.

	Mexico (2013)	Argentina (2016)	Costa Rica (2011)	Italy (2013)	Saudi Arabia (2012)
Carbohydrate-rich staples	Consume vegetables, fruits, legumes and wholegrain cereals as a source of fiber.			Eat more cereals, vegetables, tubers and fruit.	Consume grains with little or no added sugar, fat or salts. Select wholegrains or cereals. Limit processed grain consumption. Nutrient-fortified and enriched cereal should be major sources of calories in the diet. Cereals and bread: six to 11 servings/day. One exchange serving = slice of bread (25 g) or half cup of cooked cereal or breakfast cereal or four to six medium-sized biscuits.
Fats and oils	Prefer to use vegetable oils.	Eat raw oil, nuts and seeds as condiments.	Select healthy fats.	Choose high-quality fats and limit the amount eaten.	Use oven or the barbecue to cook instead of frying in oil or fat. Reduce foods of poor nutritional value such as food enriched with saturated fats and hydrogenated fat. Unsaturated fatty acids to come from vegetables, fish, legumes and nuts. Limit intake of foods with a high saturated fatty acid and cholesterol content.
Salt/sugar/SFA	Consume non-caloric sweeteners, and foods high in sugars, cholesterol, saturated fats, trans fatty acids and sodium in moderation.	Limit the consumption of sugary beverages and foods with high amounts of fat, sugar and salt.	Eat less sugars and decrease the consumption of salt.	Consume only small amounts of salt. Consume appropriate amounts of sugars, sweets and sugar-sweetened beverages.	Limit the intake of salt (sodium chloride) to <2.3 g per day. Use iodized salt, especially in cities that are not sea side or that are in mountain areas. Reduce foods of poor nutritional value such as those enriched with salt and sugars.
Beverages	Drink pure water as the main beverage.	Drink two liters of liquids daily without sugar, prefer simple water.	Drink six to eight glasses of water daily.	Drink plenty of water every day. Consume alcoholic drinks only in limited amounts.	Consume 1.5 liters or six cups of water daily. Consume whole fruits and vegetables instead of juice.
Other considerations					
Reference/link	SEGOB Diario Oficial de la Federación. 2013. "NORMA Oficial Mexicana NOM-043-SSA2-2012, Servicios básicos de salud. Promoción y educación para la salud en materia alimentaria. Criterios para brindar orientación". Retrieved from http://dof.gob.mx/nota_detalle.php?codigo=5285372&fecha=22/01/2013	Ministry of Health of Argentina. 2016. Guías alimentarias para la población Argentina. Retrieved from http://www.msal.gob.ar/images/stories/bes/graficos/0000000817/cnt-2016-04_Guia_Alimentaria_completa_web.pdf	Ministry of Health of Costa Rica. 2011. Guías alimentarias para Costa Rica. Retrieved from https://www.ministerio.desalud.go.cr/gestores_en_salud/guias_alimentarias/guia_alimentarias_2011_completo.pdf	Food and Agriculture Organization of the United Nations. 2003. "Food-based dietary guidelines – Italy". Retrieved from http://www.fao.org/nutrition/education/food-based-dietary-guidelines/regions/countries/italy/en/	Ministry of Health of Saudi Arabia. 2012. Dietary Guidelines for Saudis. Retrieved from https://www.moh.gov.sa/en/Ministry/MediaCenter/Publications/Pages/Publications-2013-01-15.aspx

India (2011)	Thailand (2001)	Nigeria (2006)	Colombia (2014)	Indonesia (2014)
Use a combination of wholegrains, grams and greens.	Eat adequate amounts of rice or alternative carbohydrate sources. Rice is the staple food of the Thai people. Unpolished rice is more nutritious than highly milled rice. Rice and starchy foods should be consumed daily and in appropriate quantities to maintain energy balance.	Bread, grains and tubers to be consumed at every meal.		Eat a variety of staple foods.
Ensure moderate consumption of edible oils and animal foods and use little ghee/butter/Vanaspati.		Limit fat intake from animal foods.	Be heart-healthy: eat nuts, peanuts and avocado; reduce the consumption of vegetable oils and margarine; and avoid animal fats like butter and lard.	Limit consumption of sweet, salty and fatty foods.
Minimize the use of processed foods rich in salt, sugar and fats. Restrict salt intake to minimum. Use always iron-fortified iodized salt (double fortified salt). Since, the taste for salt is acquired, its consumption could be restricted from an early age. Prefer fortified processed foods.	Avoid sweet and salty foods.	Limit intake of salt, bouillon cubes and sugar.	To maintain a healthy weight, reduce the consumption of packaged products, fast foods, soft drinks and sweetened drinks. To maintain normal blood pressure, reduce the consumption of salt and foods high in sodium like processed meats, canned foods and packaged products.	
Drink plenty of water and drink other beverages in moderation. Milk is an excellent beverage for all age groups as it is a rich source of nutrients. Drink natural and fresh fruit juices instead of carbonated beverages. Prefer tea over coffee. Avoid alcohol.		Drink plenty of water.	To maintain a healthy weight, reduce the consumption of packaged products, fast foods, soft drinks and sweetened drinks.	Drink enough safe water.
			Eat natural and diverse foods, as indicated in the plato colombiano saludable. To live healthily, do at least 30 minutes of physical activity every day.	Eat a variety of foods. Eat breakfast every day. Read food labels. Wash hands with soap and running water. Perform adequate physical activity and maintain a normal weight.
National Institute of Nutrition of India. 2011. Dietary Guidelines for Indians. 2nd edition. Retrieved from http://ninindia.org/dietaryguidelines/forninwebsite.pdf	Food and Agriculture Organization of the United Nations. 2010. "Food-based dietary guidelines – Thailand". Retrieved from http://www.fao.org/nutrition/education/food-based-dietary-guidelines/regions/countries/thailand/en/	Food and Agriculture Organization of the United Nations. 2001. "Food-based dietary guidelines – Nigeria". Retrieved from http://www.fao.org/nutrition/education/food-dietary-guidelines/regions/countries/nigeria/en/	Food and Agriculture Organization of the United Nations. 2018. "Food based dietary guidelines – Colombia". Retrieved from http://www.fao.org/nutrition/education/food-based-dietary-guidelines/regions/countries/colombia/en/	Food and Agriculture Organization of the United Nations. 2014. "Food-based dietary guidelines – Indonesia". Retrieved from http://www.fao.org/nutrition/education/food-based-dietary-guidelines/regions/countries/indonesia/en/

3. Defining population targets for diet improvements

The next stage of our process was to select population age segments of interest in the 12 countries and identify scientific literature detailing studies that demonstrate findings on respective dietary needs and common food categories with excesses or deficiencies.

If the target segment did not have enough data, we tabulated adult or general population data as available. The list of segments is shown below.

We added the three Food and Land Use Coalition (FOLU) countries of Colombia, Indonesia and Ethiopia

later in the process. For Ethiopia, it was possible to get some information on toddlers and children, as well as adults. For Colombia and Indonesia, the data gathered is for adults.

Table 6. Selection of population segments by age in 12 countries

Region	Toddlers (1–2y)	Children/adolescents (3–18y)	Adults (18–69y) (or general population)	Seniors (70+)
North America		USA	USA	USA
Latin America	Mexico	Mexico	Brazil Mexico	Brazil
Europe	Italy Spain UK	Italy Spain UK	Italy France Spain UK	Italy France UK
Middle East			Saudi Arabia	
Asia	China	China	India China Thailand	
Africa		Nigeria	Nigeria	



4. Consumption data

The information sought on each segment was consumption at food group level and in some cases, individual nutrients. Not all food categories and selected nutrients have data available on actual consumption for every segment specified; therefore, data gaps are inevitable due to lack of studies or accessible information. In some cases, the scientific data targets a sub age group, such as adolescents, so this was documented to assist interpretation.

Figure 1 shows the food categories or nutrients we selected for these data searches. We sourced data from

global databases such as the Global Dietary Database (GDD) or scientific journal papers. The ideal sources are country-level dietary intake studies, which are also used by the GDD. In some cases, consumption data is unavailable and proxy data is necessary, for instance, we use egg or poultry consumption averaged per capita per year at a country level for some countries. Some data gaps, such as the split between total cereals and wholegrain intake, are potentially misleading. For instance, wholegrain is considered underconsumed in most countries; this data is available on the GDD. However, it is likely that in some countries, total cereal

consumption is too high and therefore any intervention based on this data would need to incorporate this understanding. Another potential issue is with meat consumption, as studies do not always differentiate between types of meat or only give red and processed meat, not poultry, such as in the GDD. Recommendations are usually made on total meat; therefore, comparing intake and dietary gap is not straightforward. In these cases, we only flag clear overconsumption with the knowledge that the EAT-Lancet targets for meat consumption in the future will be much lower and will allow for a stricter interpretation at that point.

Figure 1. Food groups and nutrients selected to investigate per country/population segment

Energy intake	Meat (split by red, white and processed)	Fish	Dairy
Egg/egg products	Pulses/non-animal source protein	Nuts/seeds	Vegetables
Fruit and fruit juices	Cereals (where possible split into refined/wholegrain)	Fats/oils/PUFA	Protein
Sodium/salt	Sugars/sweet products	Saturated fatty acids (SFA)	Water as beverage





5. Gap identification

Table 7 shows the gaps found in the data, with a gap being defined as the difference between the best data discovered and that of the actual consumption level.

Empty blue circles show underconsumption and filled blue circles show overconsumption based on the level or range given as a target either by the originating country guidance or by the generic criteria set in table 2. At this point, we did not judge the distance off the target; however, if we found conflicting data or a large variance based on gender, then this is represented by empty green circles.

Consumption within the target is represented by filled green circles. In some cases, we did not find data after a light search (empty grey circle) or a more in-depth search (filled grey circle).


Overall, we discovered better data sources for food groups than for nutrients, as can be seen by the larger number of grey circles on the right-hand side of table 7.

To note, it is understood that the GDD will release a new version within two years, which would complete this table for many more foods/nutrients. Most of the data has been collated, so it would be preferable to supersede what has been found here, as the GDD process is more rigorous in data quality and comparability as they also have access to non-public data for this purpose.

Some of the dietary gaps identified by food group were similar across the countries and age groups studied:

- For almost all countries, there is **low consumption of fruits, vegetables, nuts, seeds and wholegrains.**
- The results are **more diverse for energy, meat, fish, dairy and eggs.**
- Countries can be loosely characterized into **three groups:**
 - 1)** Overconsumption of calories and meat, but underconsumption of fish, dairy and eggs.
 - 2)** Reasonable calorie consumption, with overconsumption of meat and/or underconsumption of fish, dairy and eggs in some countries.
 - 3)** Underconsumption of calories and all protein sources. All countries would benefit from diversifying protein sources.
- Some results show distinct differences by age, indicating **likely segmentation of the population** and therefore a more specific dietary gap.

Table 7. Heat table showing the simplified gap analysis per country and food group /nutrient

		Focus country	Population segment	Energy intake	Meat-red	Meat-poultry	Meat-processed	Fish	Dairy	Eggs	Nuts/seeds	Fruit-whole
AFRICA	Nigeria	 <12y	○	○	○	●	○	○	○	○	○	○
			○	●	●	●	●	○	○	○	○	○
	Ethiopia (FOLU)		○	○	●	●	●	○	○	○	○	○
		 10y	○	○	○	●	●	○	○	○	○	○
		 <3y	○	○	○	●	●	○	○	○	○	○
ASIA	China	 <3y	●	●	●	●	○	○	○	●	○	○
			●	●	●	●	○	○	●	○	○	
	Thailand		●	●	●	●	○	○	●	●	●	
	India		○	○	○	○	○	○	○	○	○	○
		 1-3y	○	○	○	○	○	○	○	○	○	○
		 4-6y	○	○	○	○	○	○	○	○	○	○
	Indonesia		●	●	●	●	○	○	○	○	○	

 Overconsumed
 Underconsumed
 Mixed

		Focus country	Population segment	Energy intake	Meat-red	Meat-poultry	Meat-processed	Fish	Dairy	Eggs	Nuts/seeds	Fruit-whole
EUROPE	Italy			●	●	●	●	●	●	○	○	●
		<3y		●	●	●	●	●	●	○	○	●
		3-10y		●	●	●	●	●	●	○	○	●
		10-18y		●	●	●	●	●	●	○	○	○
				●	●	●	●	●	●	○	○	○
	Spain			●	●	●	●	●	●	○	○	○
		<3y		●	●	●	●	●	●	○	○	○
		Adolescents		●	●	●	●	●	●	○	○	○
	France			●	●	●	●	●	○	○	○	○
		11-18y		●	●	●	●	○	○	○	○	○
				●	●	●	●	○	○	○	○	○
	UK			●	●	●	●	●	○	○	○	○
		<3y		●	●	●	●	○	○	○	○	○
		Adolescents		○	●	●	●	○	○	○	○	○
				●	●	●	●	○	○	○	○	○

Overconsumed
 Underconsumed
 Mixed

		Focus country	Population segment	Energy intake	Meat-red	Meat-poultry	Meat-processed	Fish	Dairy	Eggs	Nuts/seeds	Fruit-whole
MIDDLE EAST	Saudi Arabia		●	●	●	●	○	●	○	○	●	
NORTH AMERICA	USA		●	●	●	●	○	○	●	●	○	
			●	●	●	●	○	○	●	○	○	
		 12-18y	●	●	●	●	○	○	●	○	○	
		 <12y	●	●	●	●	○	○	●	○	○	
LATIN AMERICA	Mexico		●	●	●	●	○	○	●	●	○	
		 4-13y	●	●	●	●	○	○	●	○	○	
		 <4y	●	●	●	●	○	○	●	○	○	
	Brazil		●	●	●	●	○	○	●	○	○	
		 >71y	●	●	●	●	○	○	●	○	○	
	Colombia		●	●	●	●	○	●	●	○	○	

Overconsumed
 Underconsumed
 Mixed

	Fruit-juices	Vegetables-total	Non-meat protein	Refined grains	Wholegrains/fiber	Fats	Oils/PUFA	Protein	Sodium	Added sugars	SFA	Water
	●	○	○	○	○	○	○	○	○	●	○	
	●	○	○	●	○	●	○	●	●	●	○	
	●	○	○	●	○	●	○	○	●	●	○	
	●	○	○	●	○	●	○	○	●	●	○	
	●	○	○	●	○	●	○	○	●	●	○	
	●	○	○	●	○	●	○	○	●	●	○	
	●	○	○	○	○	●	○	○	●	●	○	
	●	○	○	○	○	○	○	○	●	●	○	
	●	○	○	●	○	○	○	○	●	●	○	
	●	○	●	●	○	○	○	○	●	●	○	○
	●	○	○	○	○	○	○	○	○	●	○	

● Within recommendations ○ No data found after first search ● No data found after multiple searches

6. Gap prioritization

The gap analysis of 15 countries comparing dietary guidelines with actual intake data demonstrates many potential dietary gaps between what is consumed and what is recommended. Therefore, it is necessary to prioritize the most important and impactful gaps.

We planned two waves of prioritization, one based on science and a later prioritization oriented towards FReSH business solutions (size of the prize, regulatory implications, ability to impact). We created a guidance note to support the first wave of dietary gap scoring for prioritization within the Dietary Shifts group.

The second prioritization wave is occurring as part of the Dietary Shifts Transformational Goal. We designed this first wave to look at the gaps from an impact perspective, incorporating elements of size of population affected, impact on health and environment and a sense of how well addressed this gap may already be due to other interventions besides FReSH. The prioritization process we created and the first-round criteria we selected can be found in table 8.

Table 8. Criteria used to make an initial prioritization of dietary gaps found

CRITERIA		SCORE	
1	Gap vs current activity	Already many impactful initiatives ongoing (>5 found easily)	1
		Only few impactful initiatives ongoing (2–5 found)	2
		Not much ongoing yet (0–1 found)	3
2	Size of population affected with gap (% of country's total population). Added weight +1 for children.	Small: <25%	1
		Medium 25–50%	2
		Large >50%	3
3	Benefit of closing gap on health (based on ranking in Global Burden of Disease). Added weight +1 if food group is main source of single nutrient.	Low (gap falls after top 10 for country/not on list)	1
		Medium (gap falls within top 5–10 for country)	2
		High (gap falls within top 5 for country)	3
4	Impact of closing gap on the environment (+ or – to indicate whether the impact is positive or negative)	Low (hard to measure, large uncertainty, or only marginal change reported for >1 environmental impact category (e.g. climate, biodiversity, water) in >1 study)	1 + or -*
		Medium (substantial changes in >1 environmental impact category in >1 study)	2 + or -*
		High (substantial changes in >2 environmental impact categories in >2 studies)	3 + or -*
* where + indicates a likely avoided impact related to the dietary shift needed to fill the gap, and – indicates a likely increase in impact with respect to the dietary shift needed to fill the gap			

In order to minimize bias, at least three member companies put each dietary gap country list through the prioritization process. Although we designed the guidance for the prioritization to minimize bias

and potential variance through interpretive differences and standardize assumptions, there is still room for scientific debate on some of the gaps, especially in terms of environmental impact.

Therefore, three independent assessments increased the likelihood of understanding complications and allowed discussion towards consensus.

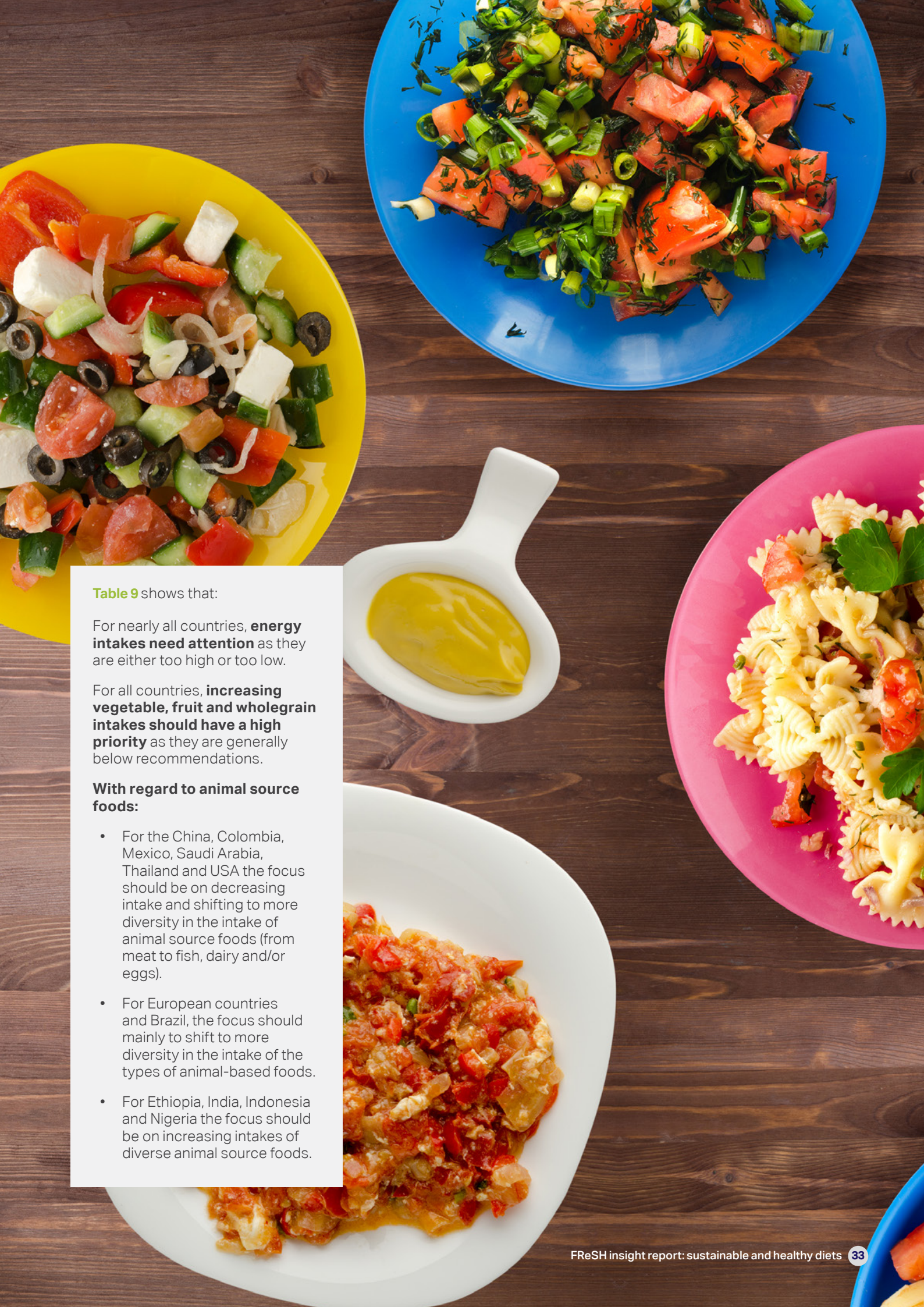


Table 9 shows that:

For nearly all countries, **energy intakes need attention** as they are either too high or too low.

For all countries, **increasing vegetable, fruit and wholegrain intakes should have a high priority** as they are generally below recommendations.

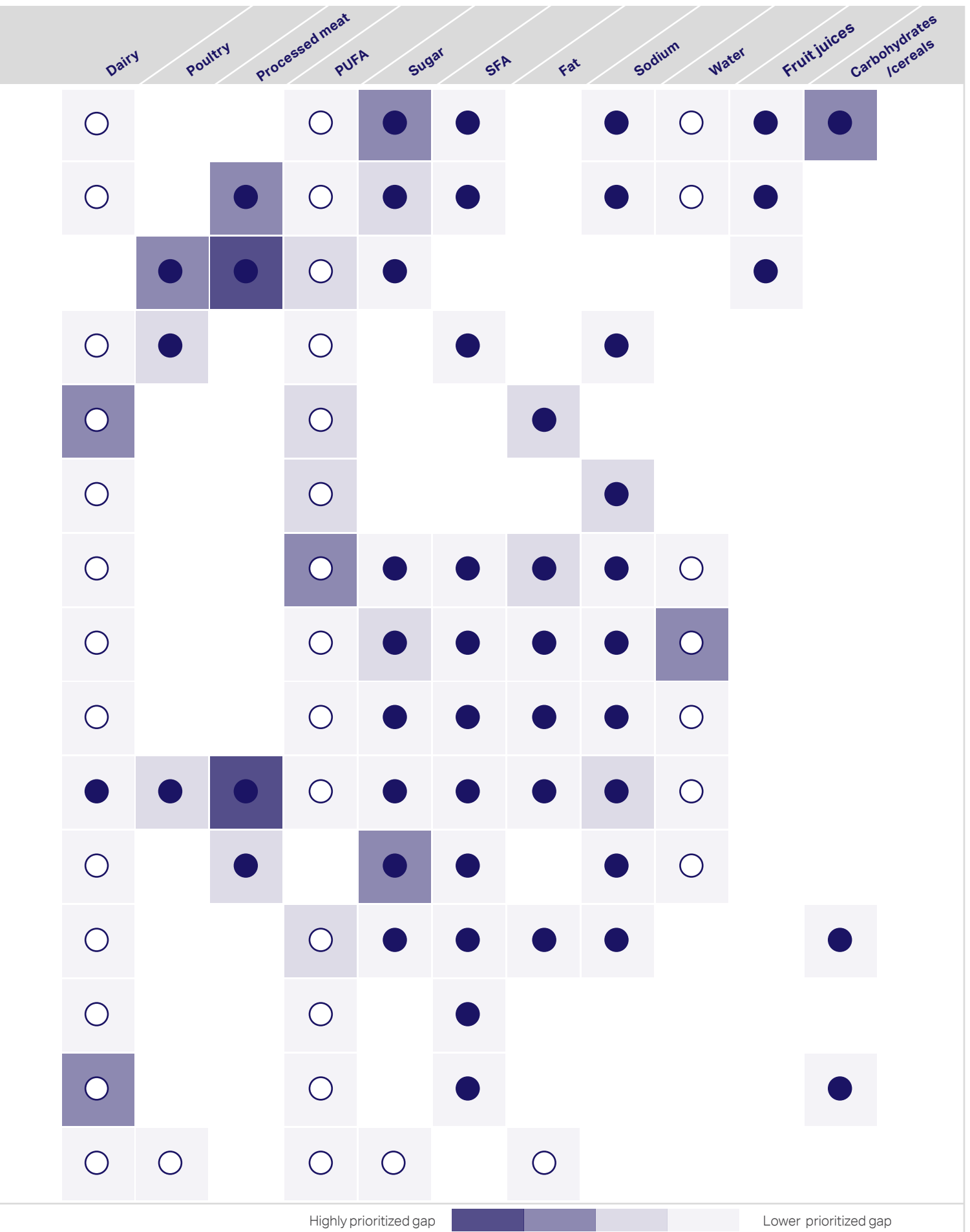
With regard to animal source foods:

- For the China, Colombia, Mexico, Saudi Arabia, Thailand and USA the focus should be on decreasing intake and shifting to more diversity in the intake of animal source foods (from meat to fish, dairy and/or eggs).
- For European countries and Brazil, the focus should mainly to shift to more diversity in the intake of the types of animal-based foods.
- For Ethiopia, India, Indonesia and Nigeria the focus should be on increasing intakes of diverse animal source foods.

Table 9. Prioritized dietary gaps by country

Focus country		Vegetables	Wholegrains	Fruit	Energy	Fish	Legumes (NMP)	Nuts/seeds	Meat	Egg	Protein
Eat less energy and animal source foods and change type	USA	○	○	○	●	○	○	○	●	○	
	Mexico	○	○	○	●	○	○		●	○	
	Colombia	○	○	○	●	○	○		●	○	
	Saudi Arabia	○	○		●	○	○	○		○	
	Thailand	○	○		●		○				
	China	○	○	○	●	○	○			○	○
Change type of animal source foods	France	○	○	○		●	○	○			●
	UK	○	○	○	●	○	○			○	●
	Spain	○	○	○		●	○	○	●		●
	Italy	○	○			●	○	○	●	○	●
	Brazil	○	○	○	●	○		○	●	○	
Eat more and change type of animal source foods	Indonesia	○		○	○		○	○		○	○
	Nigeria	○	○	○	○	○	○	○	○	○	○
	Ethiopia	○		○	○		○	○	○	○	○
	India	○	○	○	○	○	○	○	○	○	○

Group/nutrient currently overconsumed
 Group/nutrient currently underconsumed



Highly prioritized gap Lower prioritized gap

7. Emerging areas for nutrition

It is understood that country-level nutrition recommendations can lag the latest science, perhaps by up to a decade in some cases. Therefore, recognizing new and emerging science is important as these may supersede current recommendations in the near future. Earlier in this report, we mention the recommendation from the 2015 US Dietary Guidelines to drop total fat limits in the overall US diet.³ These guidelines also recommend dropping cholesterol as a nutrient of concern. Other countries have recently elevated certain nutrients in their concern, for instance, vitamin D in the UK now has a reference nutrient intake; in other instances foods listed as a concern have been removed, such as giving peanuts and eggs to children 6-12 months old.

Another aspect to consider is that food-based dietary guidelines are related to the average nutrient content of those foodstuffs. Emerging science is identifying that average nutrient contents of key foodstuffs may be reduced with the onset of climate change, for example reductions in protein, zinc and iron in food crops grown in a high CO₂ atmosphere.⁴ Models extrapolating this information for global impact estimate that an additional 175 million people could become zinc deficient and 122 million protein deficient, and 1.4 billion people would be at a higher risk of iron deficiency,⁵ creating new dietary gaps.

Moving forward, it will be important to challenge the gaps we have identified against recent science to ensure they are indeed still considered a high priority and to track new developments to ensure the business solutions tackling dietary gaps remain relevant and impactful.



³ Mozaffarian, Dariush & Ludwig, David S. (2015). "The 2015 US Dietary Guidelines: Lifting the Ban on Total Dietary Fat". *JAMA*. 2015;313(24):2421–2422. doi:10.1001/jama.2015.5941. Retrieved from: <https://jamanetwork.com/journals/jama/article-abstract/2338262>

⁴ Myers, Samuel S. et al. (2014). "Increasing CO₂ threatens human nutrition". *Nature* volume 510, pages 139–142 (05 June 2014). Retrieved from: <http://www.nature.com/articles/nature13179>

⁵ Smith, Matthew R. & Myers, Samuel S. (2018). "Impact of anthropogenic CO₂ emissions on global human nutrition". *Nature Climate Change* volume 8, pages 834–839 (2018). Retrieved from: <https://doi.org/10.1038/s41558-018-0253-3>

8. Key takeaways

- **Only eight countries include sustainability considerations in their official food-based dietary guidelines;** but Spain, and the UK have general guidance that includes some sustainability aspects.
- **For all countries, vegetables, fruit, nuts, seeds and wholegrain intakes are generally below recommendations** and have been identified as priority gaps.
- **The types of guidance for sustainable and healthy consumption vary by country,** examples being to adopt a less animal-based and more plant-based diet; to reduce food waste and spoilage; to try fair trade products; to eat local, seasonal, organic produce and to increase the consumption of foods produced with respect for wildlife and the environment.
- **In most countries, there is either an over- or underconsumption of energy.**
- **Diversifying protein sources in most countries would likely be beneficial,** with certain countries exceeding their animal source protein recommendations (e.g. Mexico, USA) and others that would benefit from an increase in animal source foods (e.g. Ethiopia, Nigeria). Therefore, we have identified protein diversification as a priority gap.



9. Conclusion and outlook

Conclusion

This report summarizes the 2017 findings and conclusions of the FReSH Healthy and Sustainable Diets group. It currently assists FReSH industry members as a guidance for possible intervention areas for dietary shifts and business solutions to close dietary gaps to benefit people's health within planetary boundaries.

Dietary guidelines and dietary advisory committees at the country level can and do incorporate sustainability in some manner alongside nutrition and health. By 2017, only eight countries had included sustainability considerations in their guidelines, with several others publishing updated guidance that includes some sustainability aspects. The types of guidance for sustainable and healthy consumption include advice to adopt a less animal-based and more plant-based diet; to reduce food waste and spoilage; to try fair trade products; to eat local, seasonal, organic produce; to increase the consumption of foods produced with respect for wildlife and the environment; to look for logos for sustainable use of resources; and to drink tap water instead of bottled water.

When comparing actual consumption data found in the literature with the country level or generalized recommendations, we found several patterns. Almost all countries do not consume enough fruits, vegetables, nuts and seeds and wholegrains. In terms of calories and protein, the countries can be loosely characterized into three groups: 1) overconsumption of calories and meat; 2) reasonable calorie consumption, with some meat reduction; and 3) underconsumption of calories and meat/protein. All countries would benefit from diversifying their protein sources.

We recognize that there are many dietary gaps across the globe. In the future, it is understood that both the Global Dietary Database and the EAT-Lancet report will provide more analysis; but the early identification and prioritization of gaps was an important element of the FReSH process to identify where industry can have the most impact.

Outlook

FReSH recognizes the significant challenge of shifting diets. We are just at the beginning of identifying how industry can play a positive role. We created the overarching Transformational Goal of "Dietary Shifts" to address this topic fully. It can be separated into three streams: improving nutrition in packed products (reducing sugar, salt and fat, increasing fortification), sustainable and healthy protein production and consumption; and addressing the underconsumption of fruits, vegetables, nuts, seeds and wholegrains. FReSH is now planning country-level pilot programs with the aim of testing ideas and interventions. The understanding gained from this step will guide where and how to act in the longer term.

We will run pilot projects in several countries, each tackling a different dietary gap as an entry point, translating this report into action on the ground. These projects will also build on the science-based targets for healthy and sustainable food systems taken from the independently researched work on planetary boundaries by the EAT-Lancet Commission, to be published early 2019. FReSH member companies will collaboratively build scalable, science-driven business solutions for these pilot markets, working from fork to farm across the whole value chain.

In the broader FReSH project, teams working on the three other Transformational Goals will also be developing solutions to complement the Dietary Shifts Goal.

These goals are to:

- Assess the true cost of food
- Reduce food loss and waste
- Address nutrition security in supply chains.

By working together, FReSH can explore system-level change via these four transformational goals towards our ambition to achieve "healthy, enjoyable diets for all, produced responsibly, within planetary boundaries by 2030."

Acknowledgements

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The authors would like to thank the companies participating in the Healthy and Sustainable Diets group and their representatives who greatly enhanced the outcome of the report with their valuable contributions, as well as Dr Fabrice DeClerck, Science Director, EAT and Maya Rebermark, Communications Manager, EAT, for their contributions to the report.

Disclaimer

This report was compiled by the member companies working within the Healthy and Sustainable Diets group of FReSH as a practical guide towards identifying dietary gaps that FReSH could tackle from an industry perspective. The information contained in this report is accurate to the best of FReSH's knowledge at the time of compilation in 2017. This report therefore is not meant to be used, nor should it be used, as a standalone source of information on dietary gaps or to supersede other more comprehensive reports on this topic by other parties.

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