



FISH FOR HEALTH



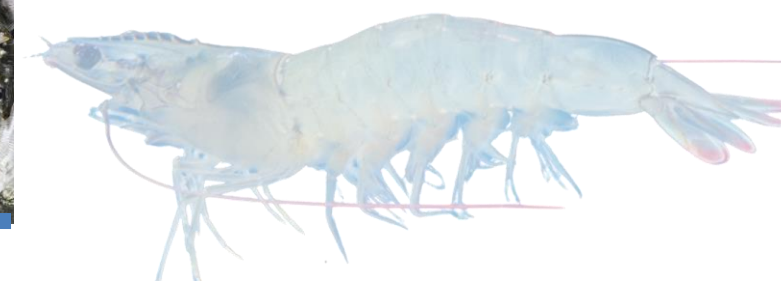
Fish for health: improving the nutritional value of fish & shrimp for health & human consumption

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MALNUTRITION

represents

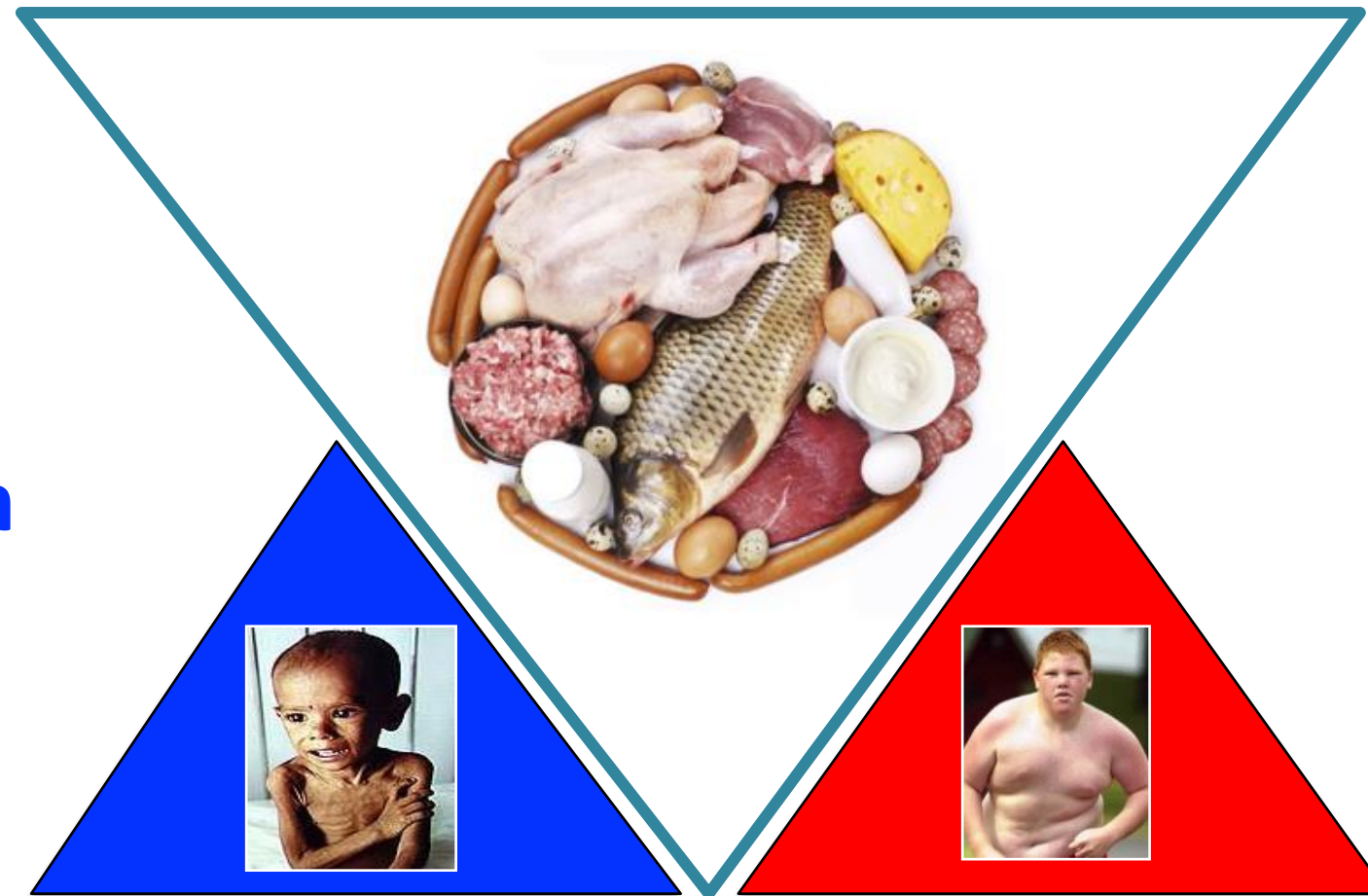
The World's Greatest Preventable Health Challenge

The double-burden of Malnutrition



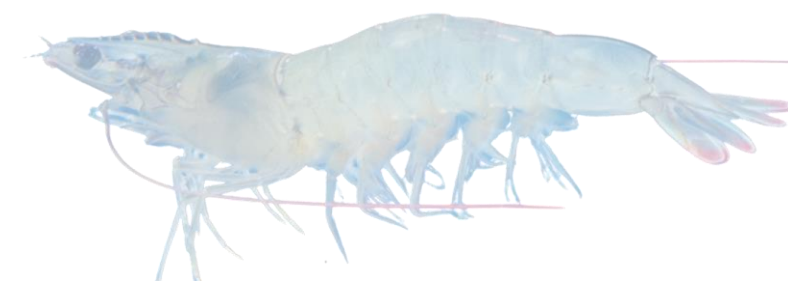
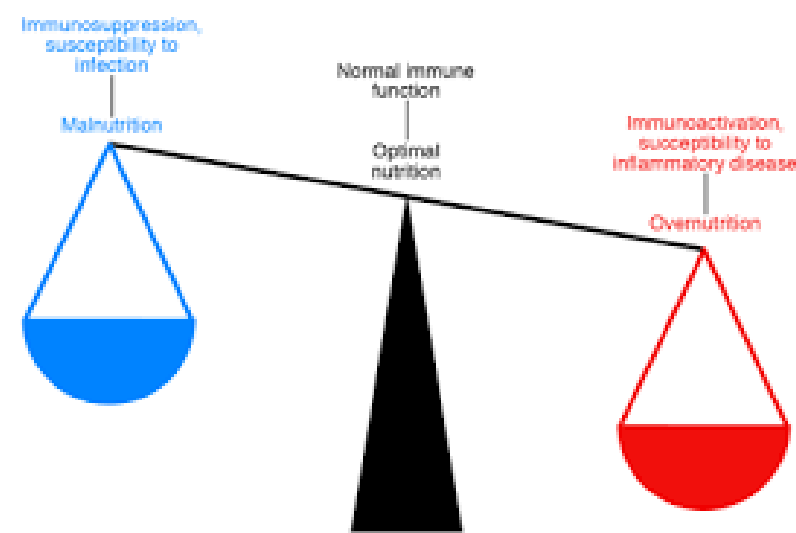
Under-nutrition

- Wasting
- Stunting
- Underweight
- Vitamin & mineral deficiency



Over-nutrition

- Obesity
- Heart disease
- Hypertension
- Stroke
- Diabetes





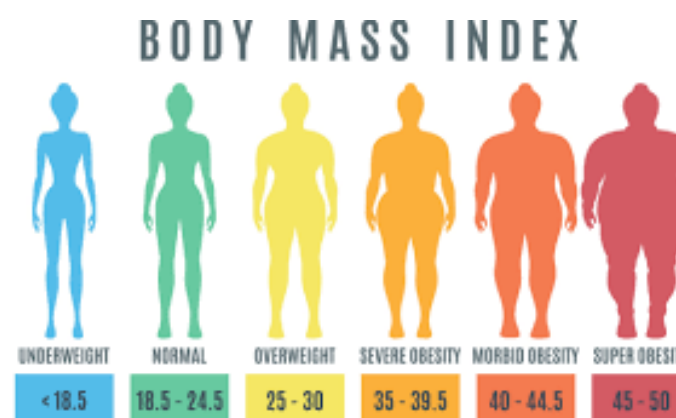
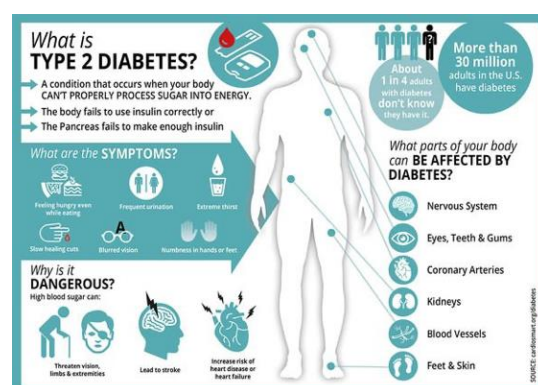
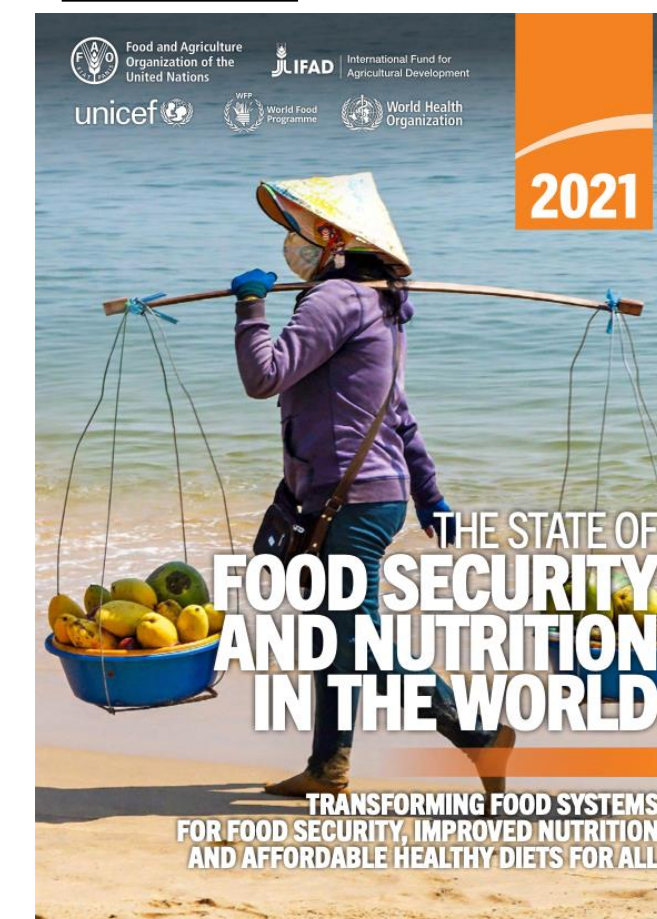
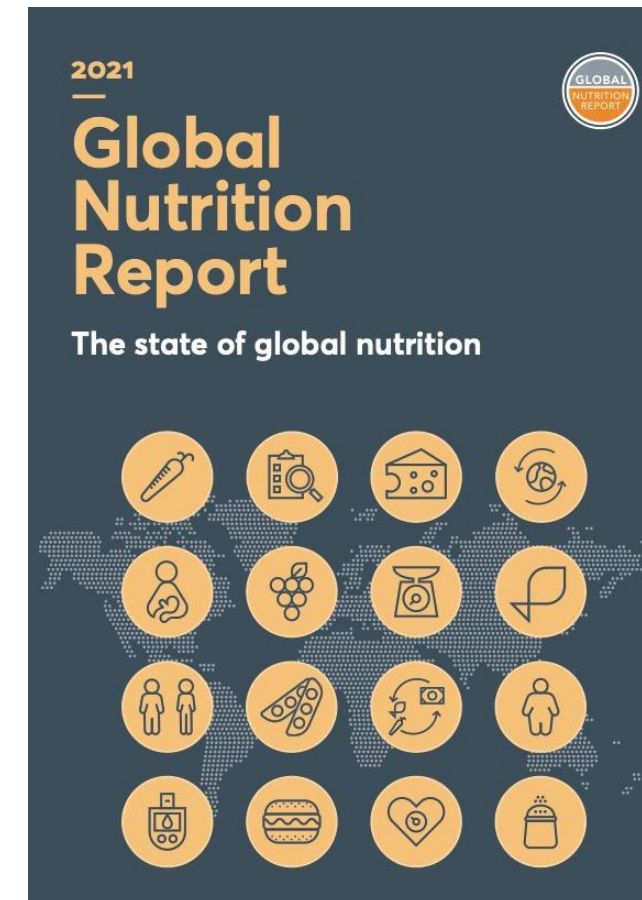
Global scale of **Malnutrition**

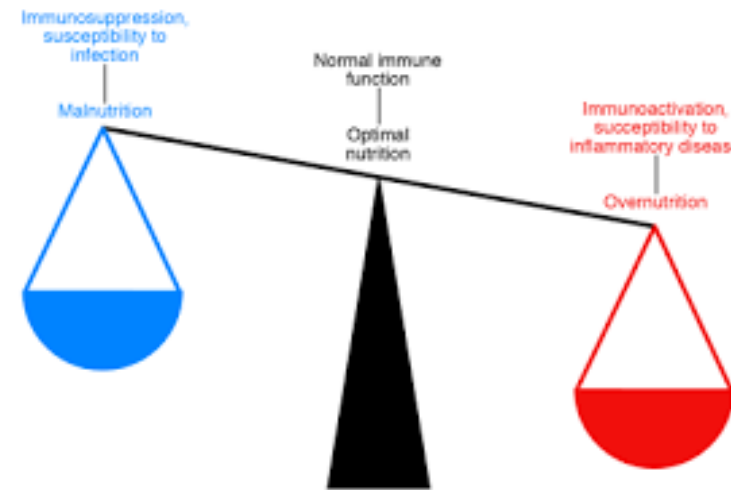
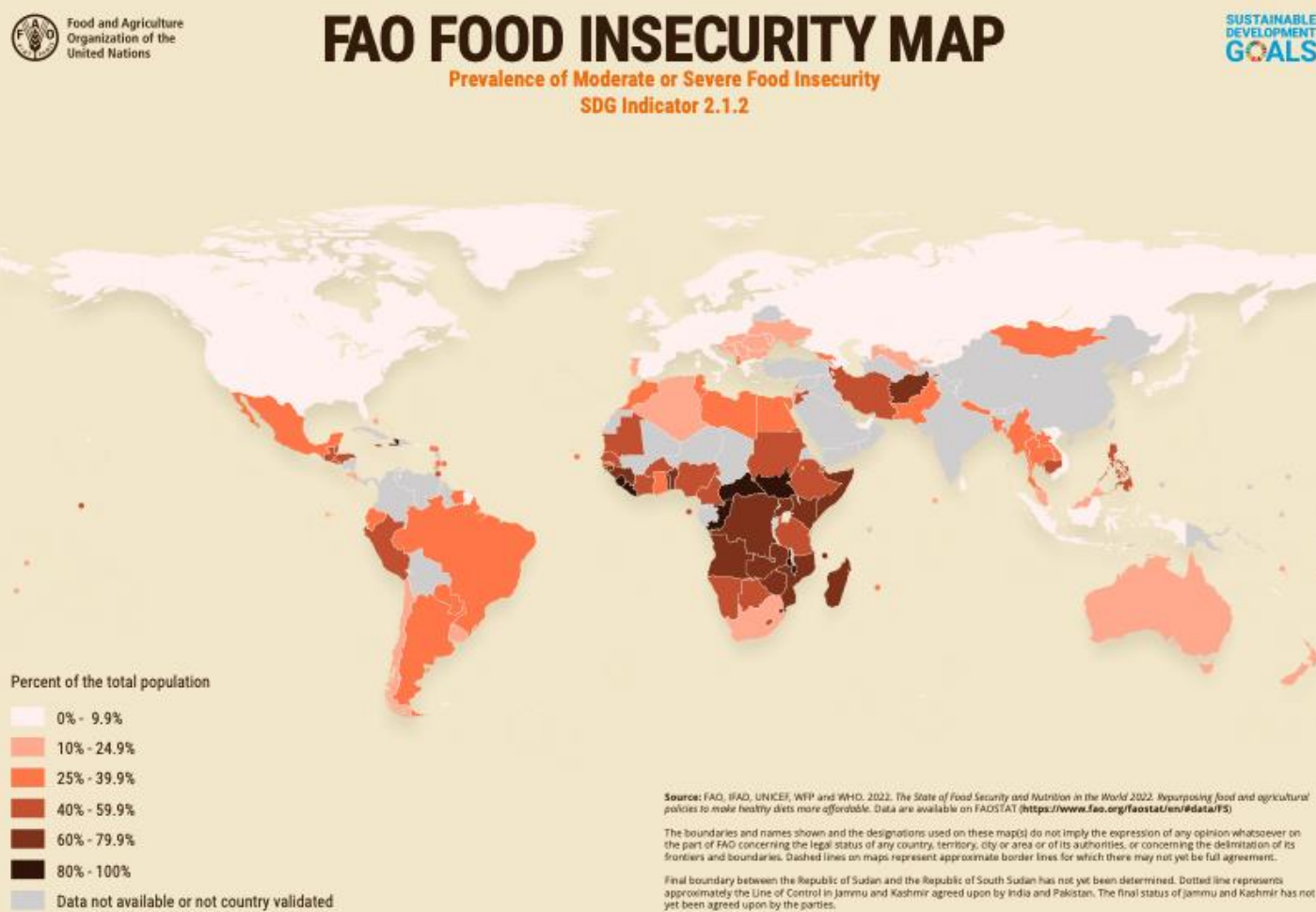
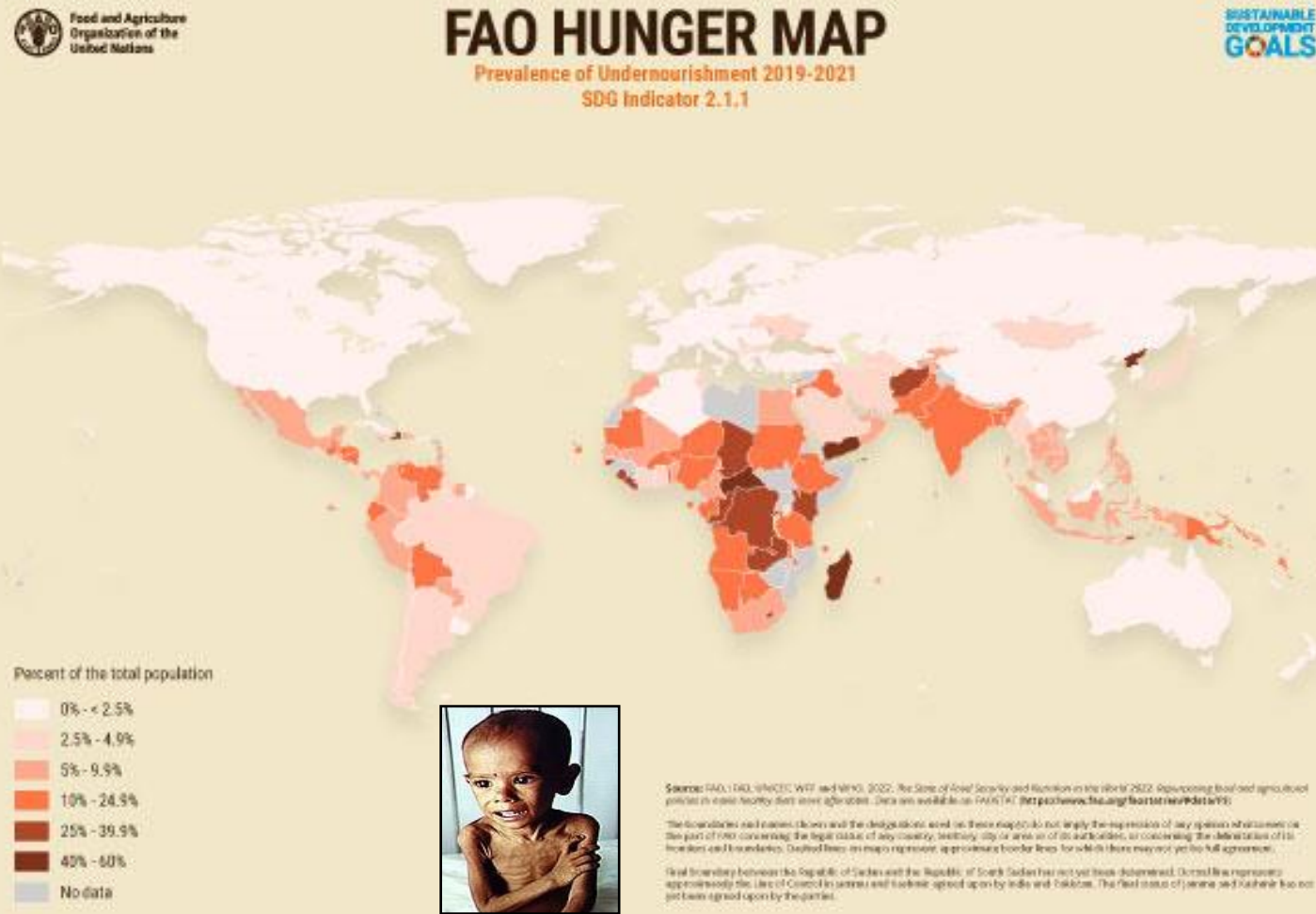
CHILDREN

- Stunted - **149.2 million** children or **22%** of all children
 - Wasted - **45.5 million** children or **6.7%** of all children
 - Low birth weight - **20.5 million** or **14.6%** of all live births
-
- **Overweight** - **38.9 million** children or **5.7%** of all children

ADULTS

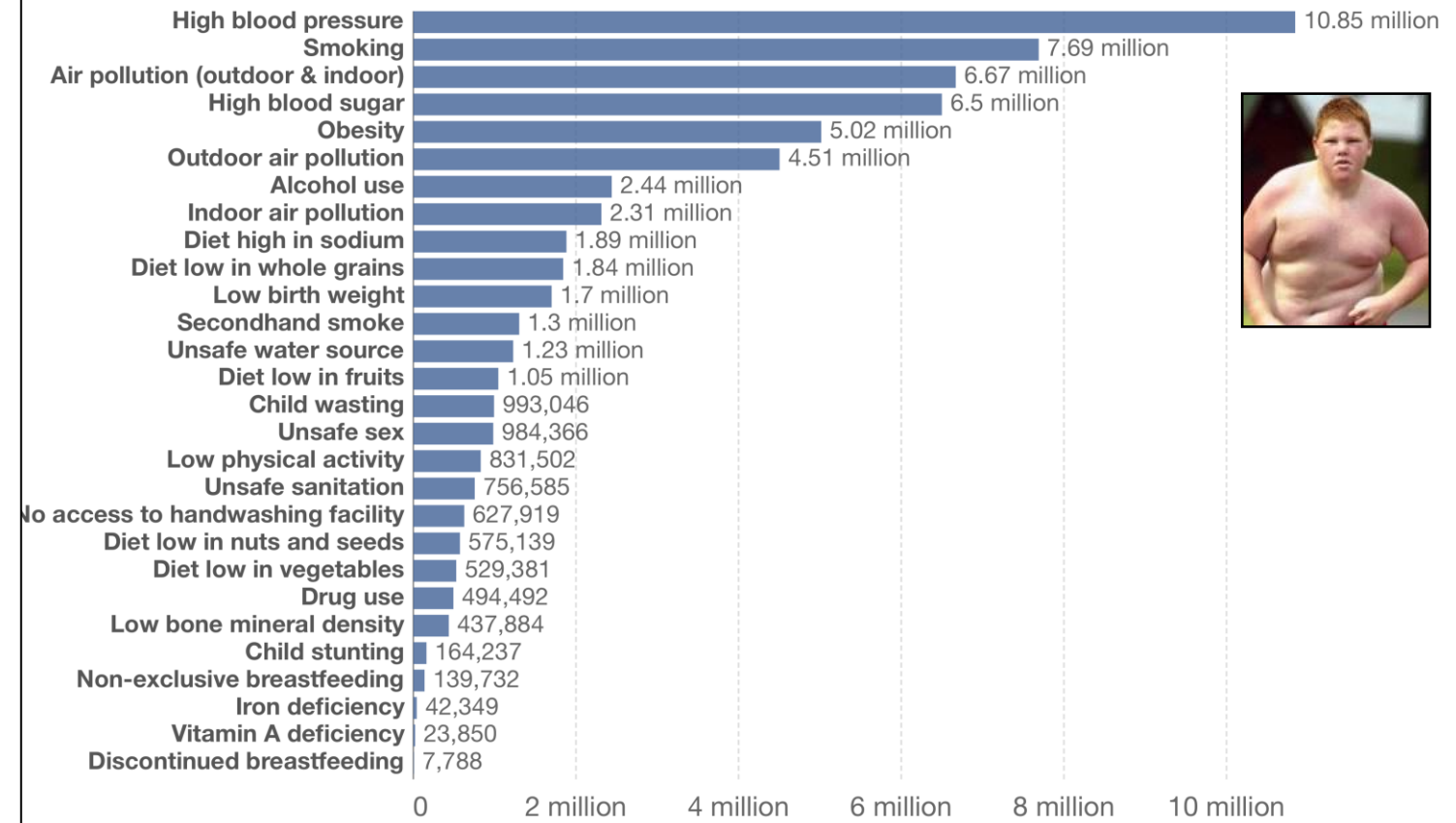
- Underweight – **451.8 million** people
 - Anemia - **571 million** girls and women
-
- **Overweight** - **2.2 billion** with **772 million** affected by obesity
 - **Raised blood pressure** – **1.2 billion** people
 - **Diabetes** – **538.7 million** people





Number of deaths by risk factor, World, 2019

Total annual number of deaths by risk factor, measured across all age groups and both sexes.

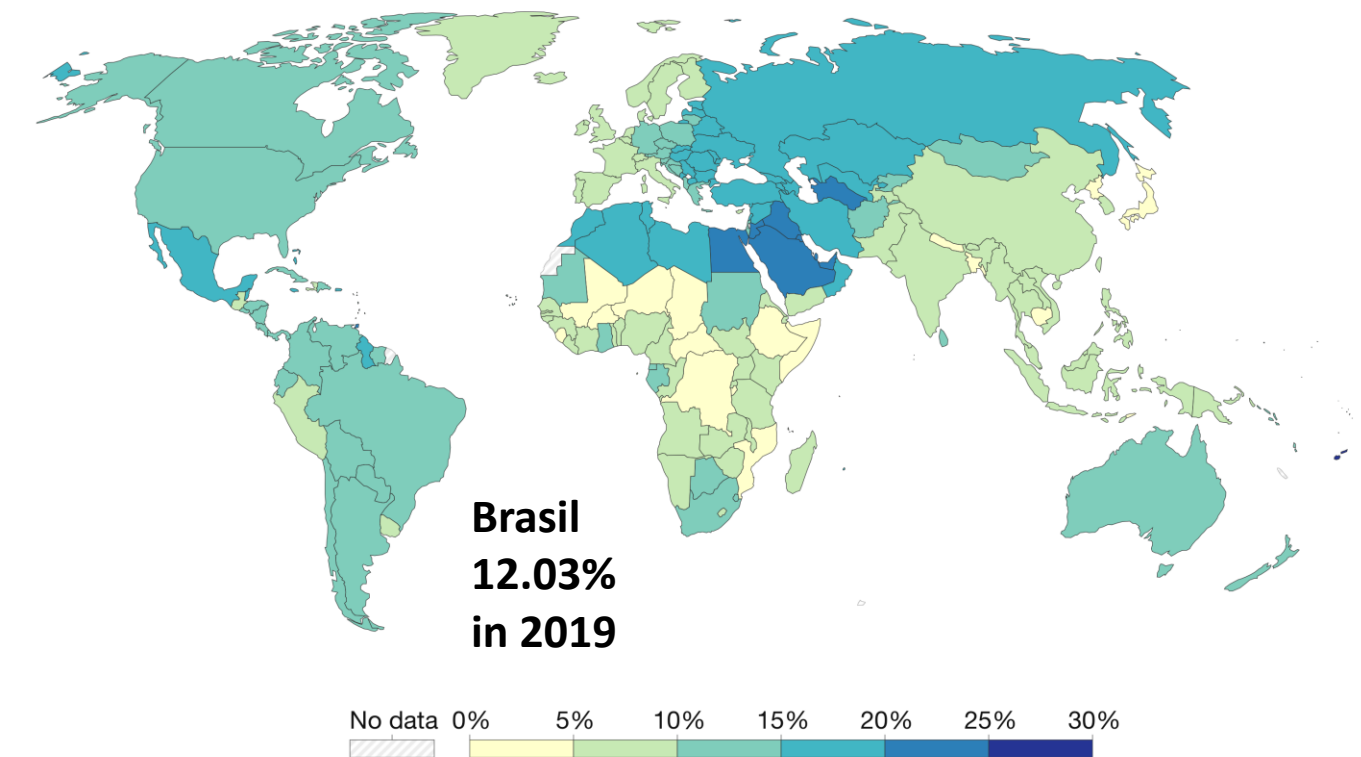


Source: IHME, Global Burden of Disease (2019)

OurWorldInData.org/causes-of-death • CC BY

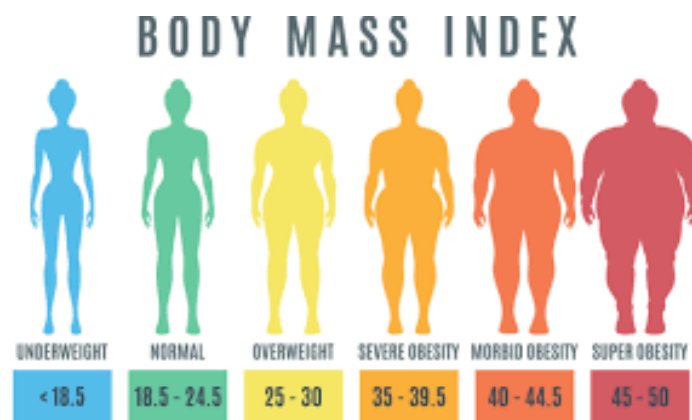
Share of deaths attributed to obesity, 2019

Obesity is defined as having a body-mass index (BMI) equal to or greater than 30. BMI is a person's weight in kilograms divided by their height in meters squared. Shown is the share of total deaths, from any cause, with obesity as an attributed risk factor.



Source: IHME, Global Burden of Disease (2019)

OurWorldInData.org/obesity • CC BY



Overnutrition & Obesity

Over past 50 years there has been a rapid increase in over-nutrition and associated ailments;

Including obesity, coronary heart disease, diabetes and hypertension;

Due primarily to the increased consumption of lower cost fast-foods, red meats & dairy produce, together with a less active & sedentary lifestyle



Fast Foods

Include food items that can be prepared & served quickly

- **processed red meat products:** hot dogs, hamburgers, sausages, bacon, ham, spam, corned beef;

- **processed & refined carbohydrates:** biscuits, cookies, donuts, pancakes, muffins, crackers, bread, pizza, pasta;

- **fried foods:** french fries, hash browns, fried chicken, chicken nuggets;

- **sugary drinks, sweets, cheeses & ice cream:**

The Rise of Fast Foods

- lower cost and affordability

- bigger portion sizes

- taste and accessibility

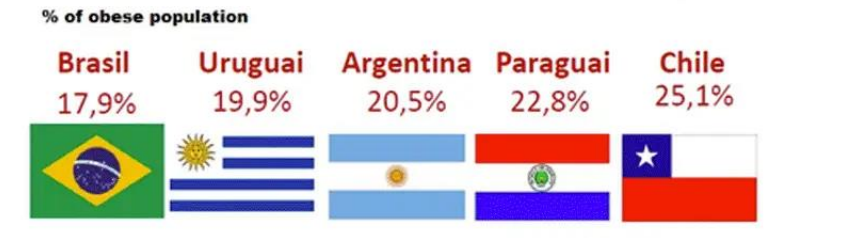
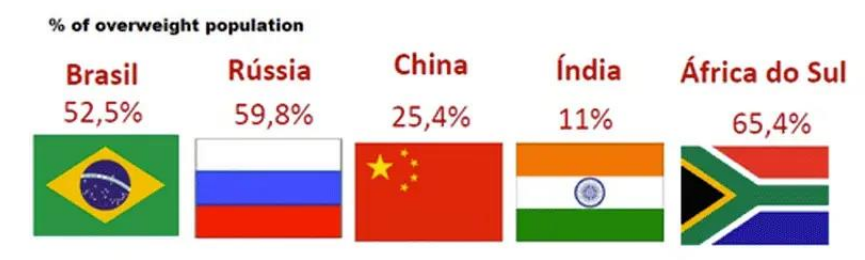
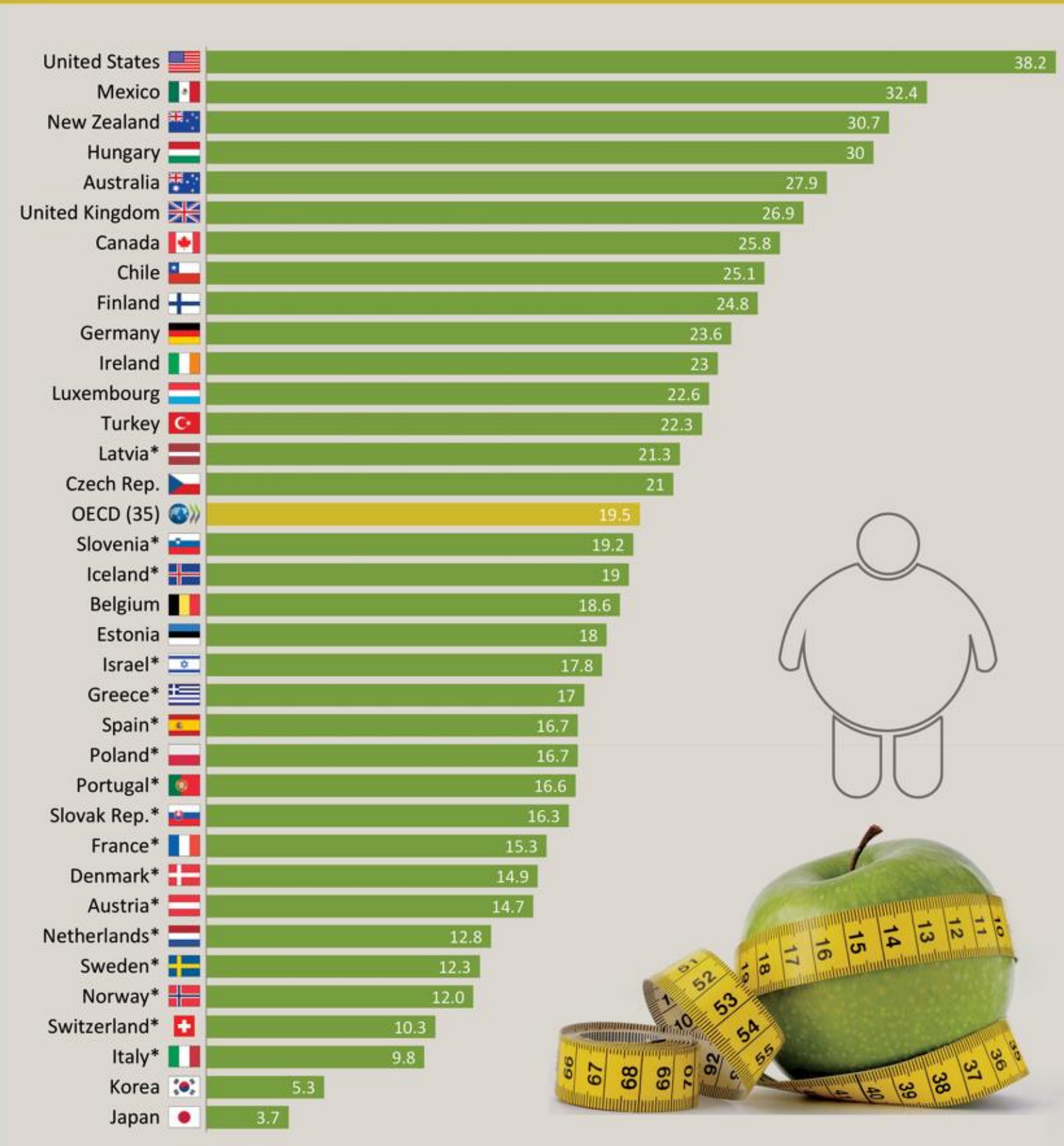
- increased convenience & ability to purchase on-line





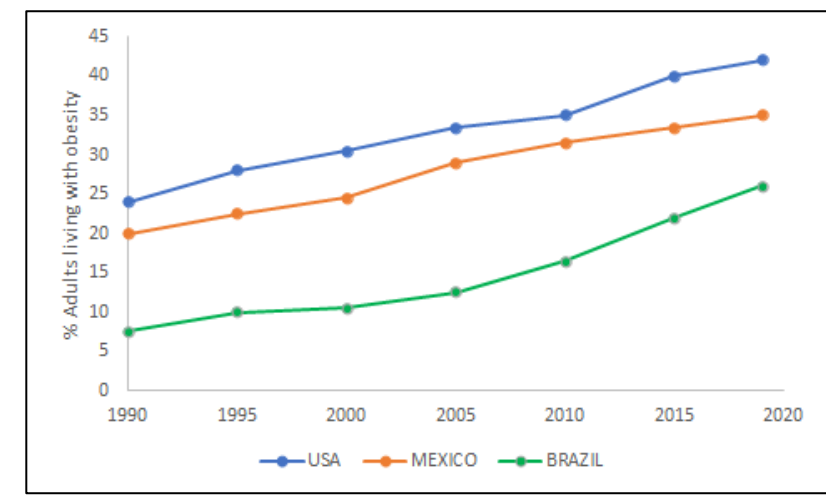
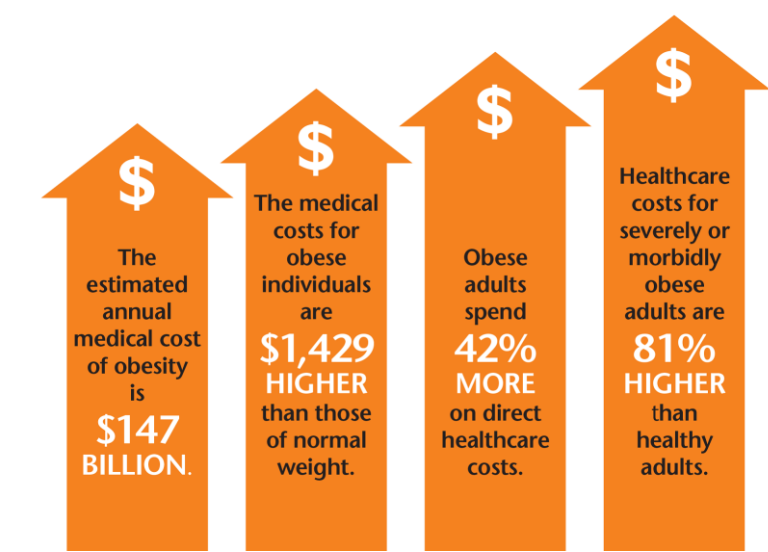
Obesity rates

As % of total adult population (aged 15 years and over), 2015 or nearest year



Source: Ministry of Health Brazil

Soaring medical costs associated with treating obesity & associated ailments

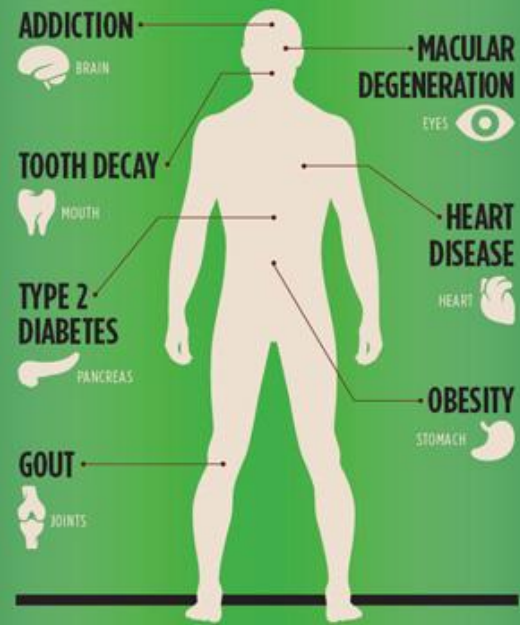


Note: * means that self-reported height and weight data are used in these countries, while measured data in other countries.
 Source: OECD (2017), OECD Health Statistics 2017 (Forthcoming in June 2017).
www.oecd.org/health/obesity-update.htm



HEALTH EFFECTS OF ADDED SUGAR

CONSUMING EXCESS SUGAR CAN NEGATIVELY AFFECT YOUR BODY IN MANY WAYS.



LOOKING FOR SUGAR?
It goes by many names.

- BROWN RICE SYRUP
- CORN SYRUP
- HONEY
- FRUIT NECTAR
- MAPLE SYRUP
- MALT SYRUP
- AGAVE NECTAR
- MOLASSES
- EVAPORATED CANE JUICE
- CORN SYRUP SOLIDS
- GLUCOSE
- SUCROSE
- SUGAR**
- FRUCTOSE
- FRUIT JUICE CONCENTRATE
- GALACTOSE
- GLUCOSE-FRUCTOSE SYRUP
- CRYSTALLINE FRUCTOSE
- MALTOSE
- DEXTRROSE
- HIGH-FRUCTOSE
- CORN SYRUP

If a sweetener is listed in the first three ingredients, the drink is loaded with sugar.

Americas – contribution of sugars & sweeteners to total energy supply in 2019

Colombia	601 (20.1%), 2,992 calories
Guatemala	459 (18.0%), 2,556 calories
Costa Rica	500 (16.7%), 2,996 calories
Honduras	443 (16.5%), 2,678 calories
Nicaragua	413 (15.8%), 2,620 calories
El Salvador	423 (15.4%), 2,739 calories
USA	591 (15.3%), 3,862 calories
Suriname	423 (15.3%), 2,758 calories
Cuba	505 (15.0%), 3,375 calories
Uruguay	477 (15.0%), 3,209 calories
Chile	442 (14.3%), 3,078 calories
Mexico	426 (13.5%), 3,163 calories
Argentina	433 (13.1%), 3,304 calories
Bolivia	276 (11.2%), 2,464 calories
Canada	407 (11.5%), 3,539 calories
Brazil	405 (12.5%), 3,246 calories
Ecuador	269 (10.5%), 2,563 calories
Peru	217 (7.7%), 2,786 calories

What is TYPE 2 DIABETES?

A condition that occurs when your body CAN'T PROPERLY PROCESS SUGAR INTO ENERGY.

- The body fails to use insulin correctly or
- The Pancreas fails to make enough insulin

More than 30 million adults in the U.S. have diabetes. About 1 in 4 adults with diabetes don't know they have it.

What are the SYMPTOMS?

- Feeling hungry even while eating
- Frequent urination
- Extreme thirst
- Slow healing cuts
- Blurred vision
- Numbness in hands or feet

Why is it DANGEROUS?

High blood sugar can:

- Threaten vision, limbs & extremities
- Lead to stroke
- Increase risk of heart disease or heart failure

What parts of your body can BE AFFECTED BY DIABETES?

- Nervous System
- Eyes, Teeth & Gums
- Coronary Arteries
- Kidneys
- Blood Vessels
- Feet & Skin

SOURCE: cardiomart.org/diabetes

LIVELIGHTER FACTS ABOUT SUGARY DRINKS

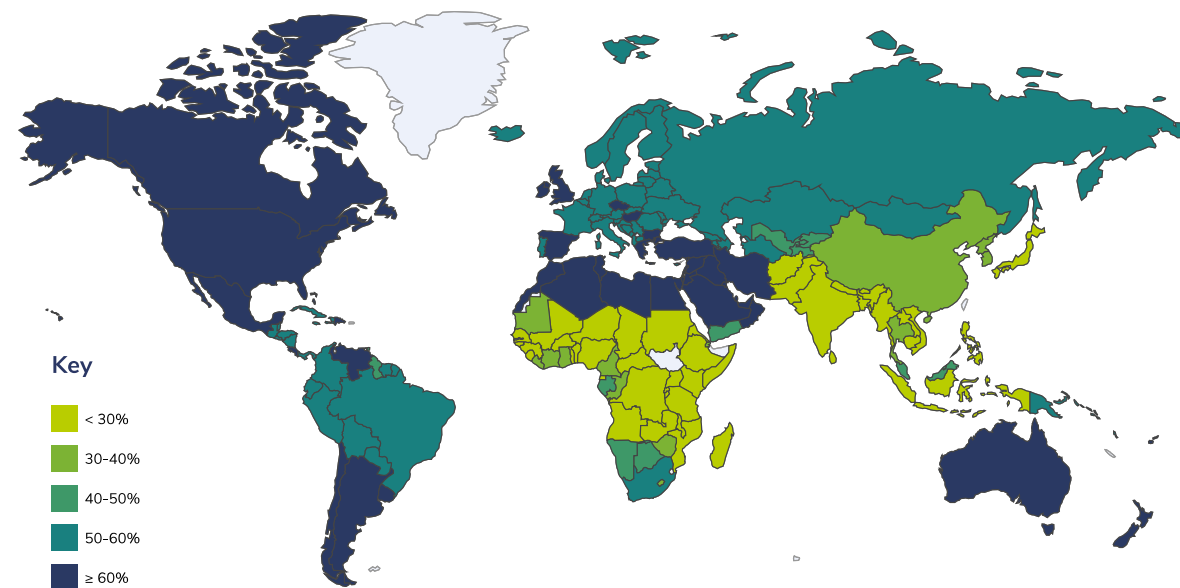
- 6.5KG WEIGHT GAIN IN ONE YEAR
- 1.28 BILLION LITRES
- 47% OF CHILDREN
- DRINKING A SUGARY DRINK EACH DAY
- 23 KILOS OF SUGAR
- \$1095
- AUSTRALIA IS IN THE TOP 10 COUNTRIES FOR PER CAPITA CONSUMPTION OF SUGARY DRINK

COVID-19 and Obesity: The 2021 Atlas

The cost of not addressing
the global obesity crisis
March 2021

2. Prevalence of overweight in adults

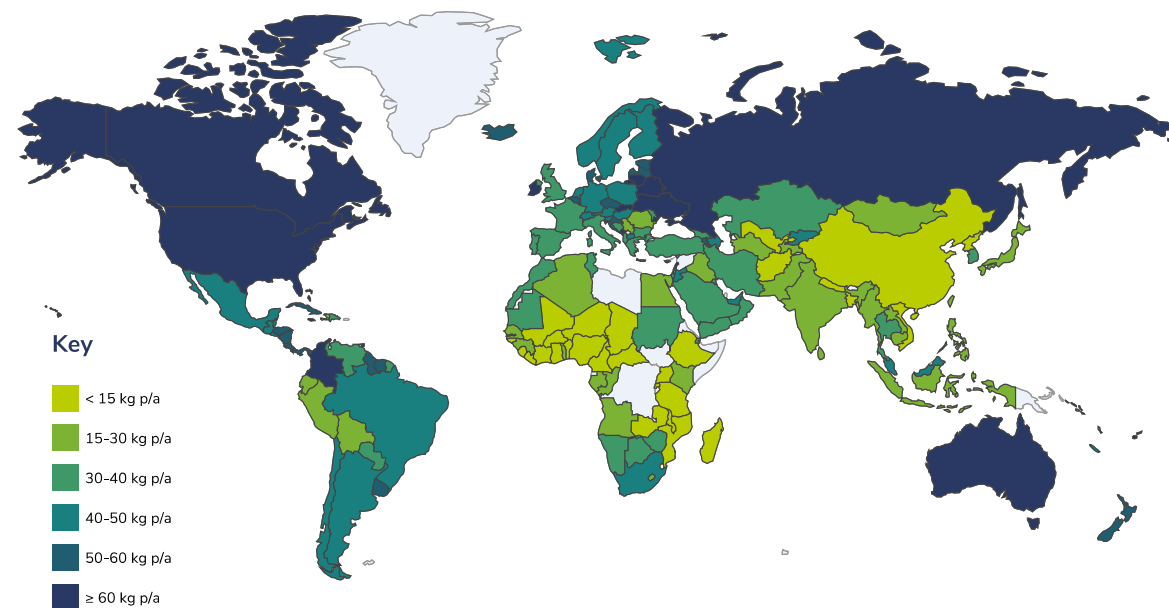
Adult overweight BMI > 25kg/m²



Source: World Health Organization, Global Health Observatory.

11. Consumption of sugars

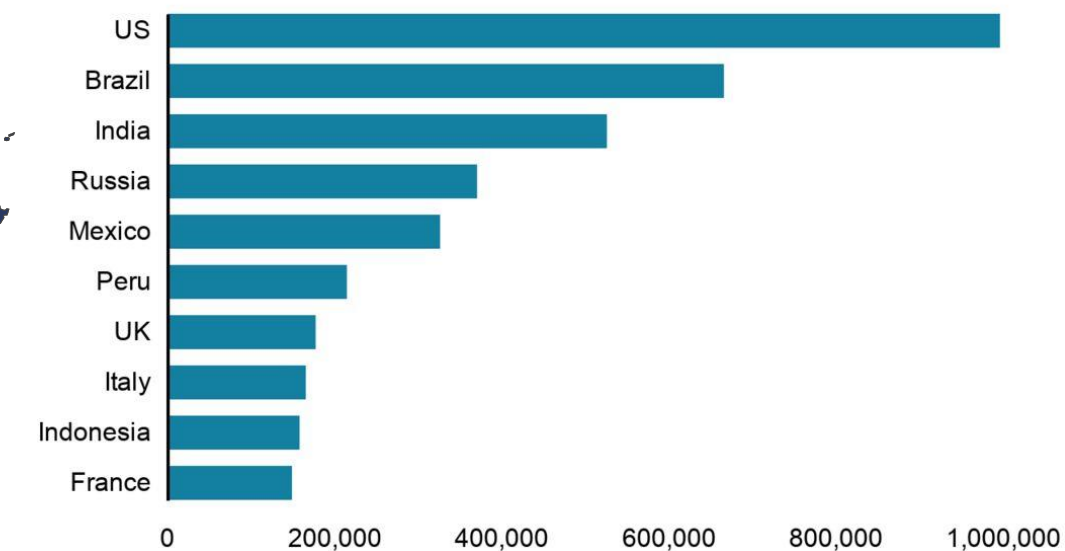
Kilograms per person per year



Source: UN Food and Agriculture Organization, Food Balance Sheets.



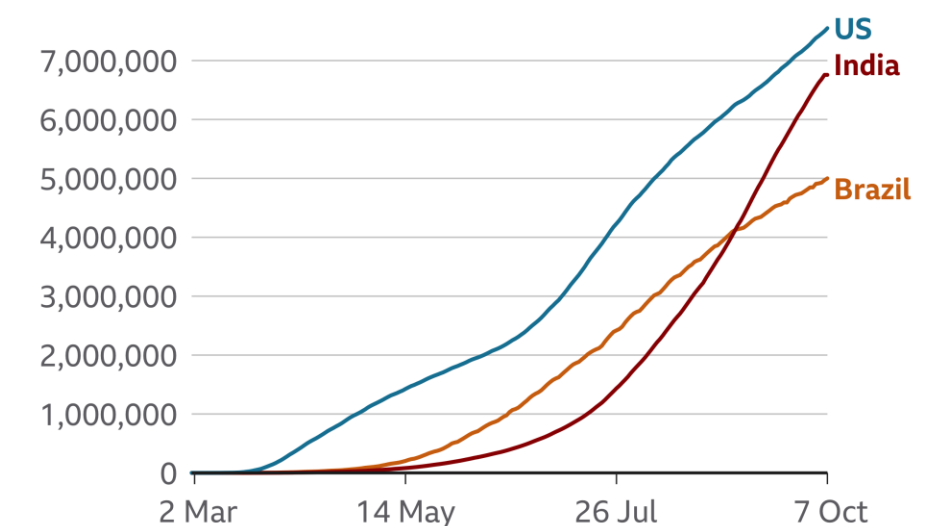
Top 10 countries for recorded Covid deaths



Source: Johns Hopkins University, data as of 4 May

Brazil has third-highest number of cases

Total number of officially confirmed cases of coronavirus

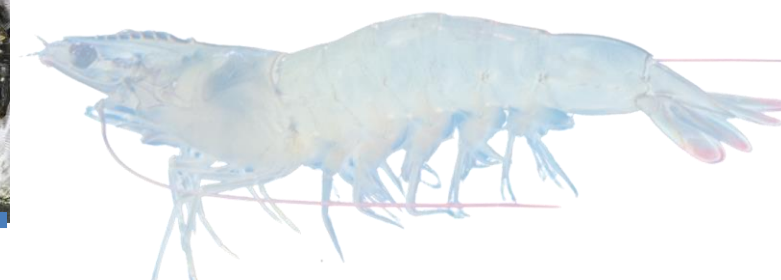


Source: Johns Hopkins University, data to 7 October

Global importance of aquatic foods in human nutrition as a much needed healthy food source

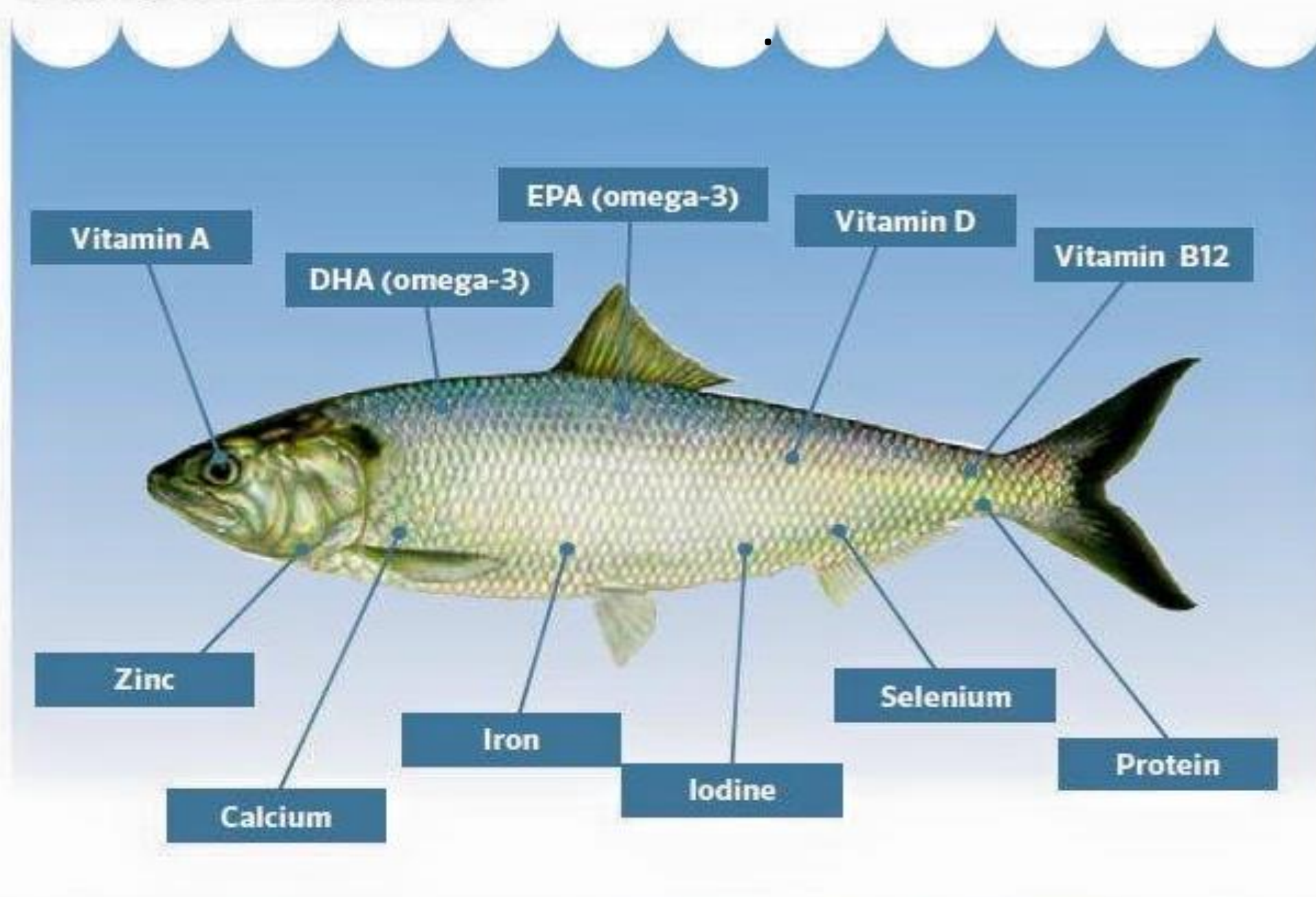


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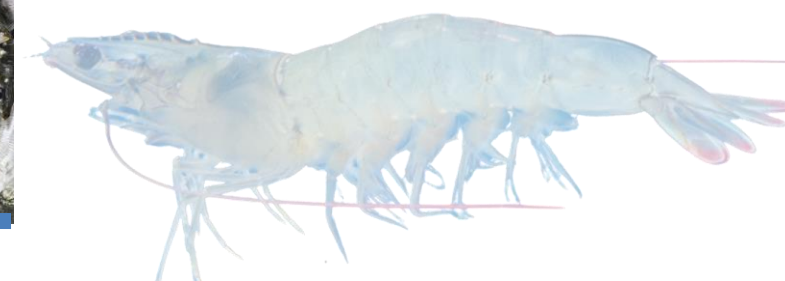


Global importance of aquatic foods in human nutrition as a much needed healthy food source

Fish: Nature's superfood



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Nutrient content of different foods

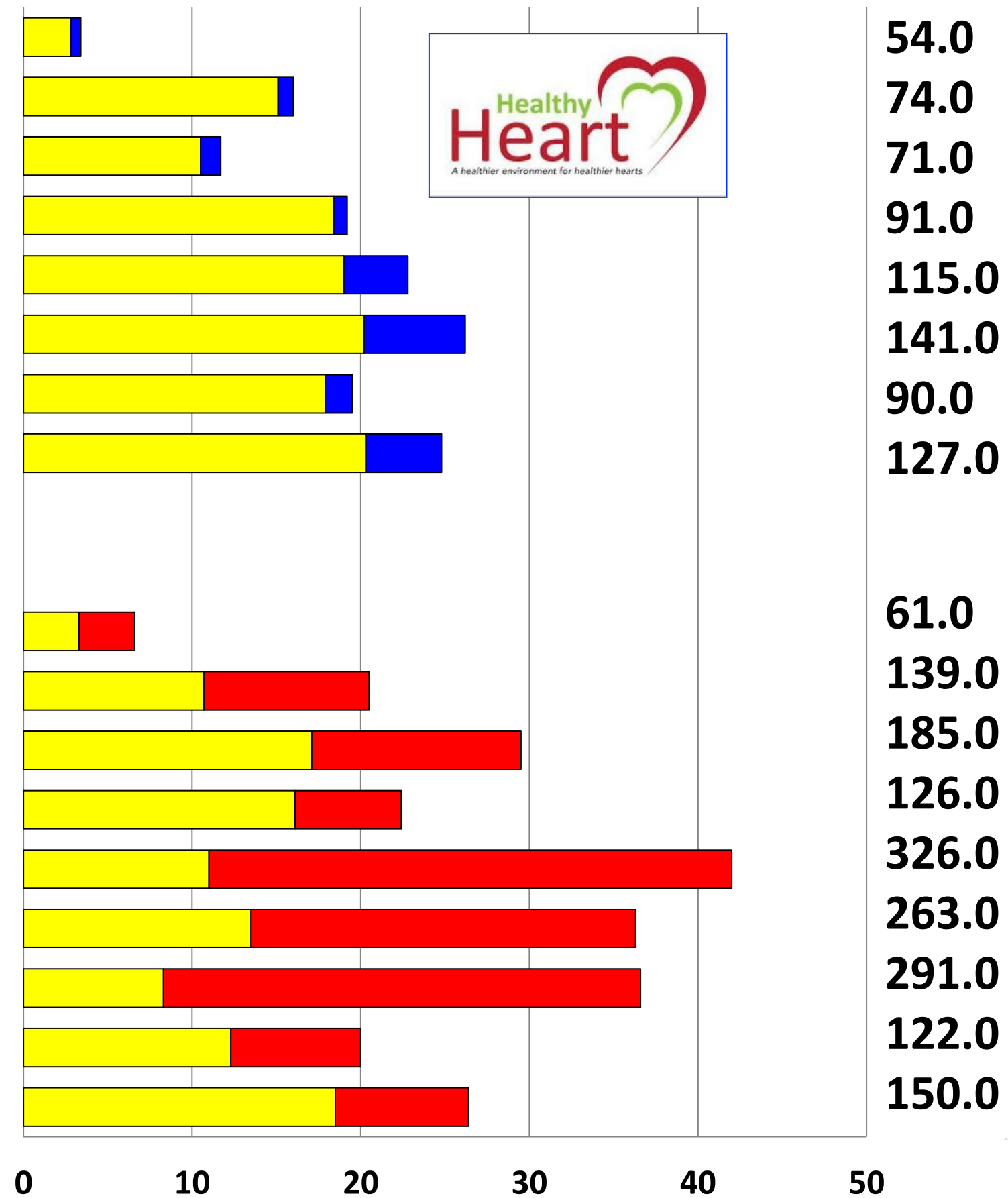
Protein  Fat  n-3  n-6

kcal/100g

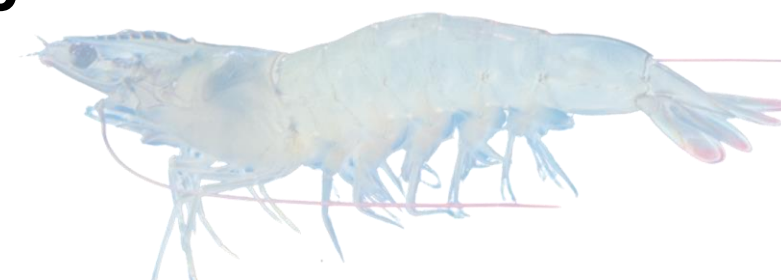


Aquatic plants
 Cephalopods frozen
 Molluscs frozen
 Crustaceans frozen
 Marine fishes fillet
 Pelagic fish fillet
 Demersal fish fillet
 Freshwater/diadromous fish fillet

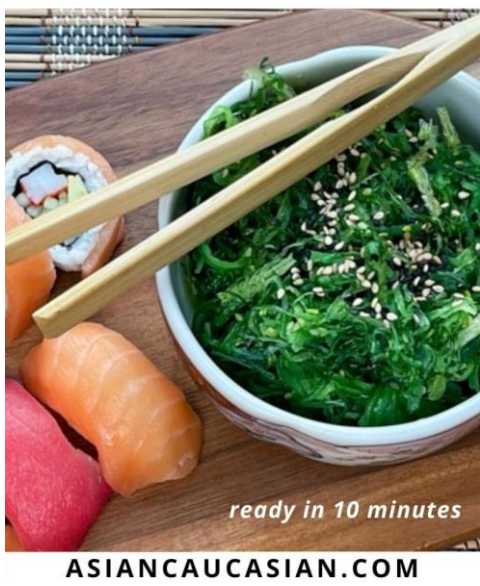
Cows milk
 Hens egg
 Poultry meat
 Turkey meat
 Pig meat
 Mutton & lamb
 Duck meat
 Chicken meat
 Beef boneless



Tacon & Metain (2013)

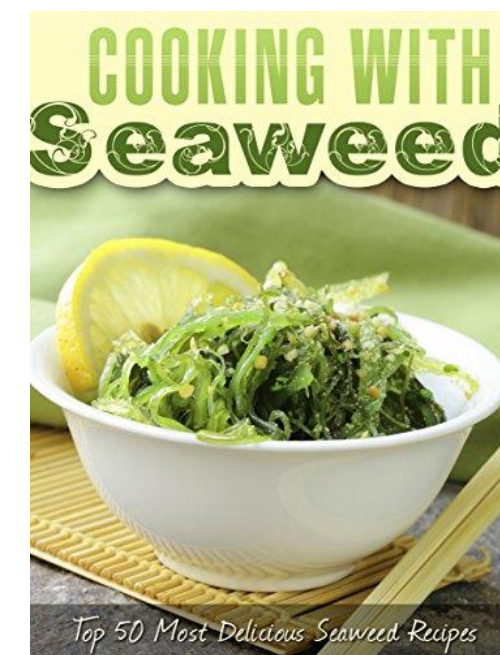


Japanese Seaweed Salad



EDIBLE AQUATIC PLANTS OR SEA VEGETABLES

- **Essential amino acids:** red seaweeds > green seaweeds > brown seaweeds; taurine, glutamic acid;
- **Essential fatty acids:** omega-3 PUFA, EPA;
- **Dietary soluble & insoluble fiber;**
- **Essential minerals:** iodine, iron, zinc, copper, magnesium, potassium, calcium);
- **Essential vitamins:** vitamin C, vitamin E, vitamin B₁₂, thiamin, riboflavin, niacin, pyridoxine, inositol & folic acid (MacArtain et al. 2007; Pereira, 2011)

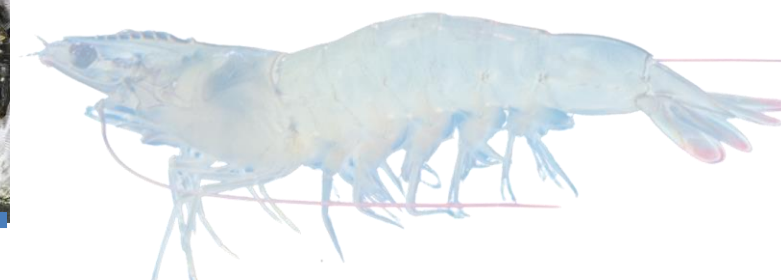


HEALTH ATTRIBUTES OF FISH & SEAFOOD



Reported **health benefits** of consuming fish & fishery products, including:

- **Reduced risk of death from coronary heart disease & stroke (FAO/ WHO, 2011; Forouhi et al. 2018; He 2009; Hellberg et al. 2012; Verbeke et al. 2005; Wallin et al. 2012),**
- **Reduced risk of diabetes (Wallin et al. 2012),**
- **Increased duration of gestation & improved visual & cognitive development (Hellberg et al. 2012),**
- **Improved neurodevelopment in infants & children when fish is consumed before & during pregnancy (FAO/ WHO, 2011), and**
- **Reduced risk of thyroid cancer in women through seaweed consumption (Michikawa et al. 2012).**





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Global importance of aquatic foods in human nutrition as a much needed healthy food source

Reviews in Fisheries Science, 21(1):22-38, 2013
Copyright © Taylor and Francis Group, LLC
ISSN: 1064-1262 print / 1547-6553 online
DOI: 10.1080/10641262.2012.753405



Fish Matters: Importance of Aquatic Foods in Human Nutrition and Global Food Supply

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²Stockholm Resilience Centre, Stockholm University, Stockholm, Sweden

In a world where nearly 30% of humanity is suffering from malnutrition and over 70% of the planet is covered with water, aquatic foods represent an essential component of the global food basket to improve the nutrition, health, and well being of all peoples.

REVIEWS IN FISHERIES SCIENCE & AQUACULTURE

<https://doi.org/10.1080/23308249.2022.2124364>



REVIEW

Contribution of Fish and Seafood to Global Food and Feed Supply: An Analysis of the FAO Food Balance Sheet for 2019

Albert G. J. Tacon

Aquahana LLC, Kailua, Hawaii, USA

Fish for Health: Improved Nutritional Quality of Cultured Fish for Human Consumption

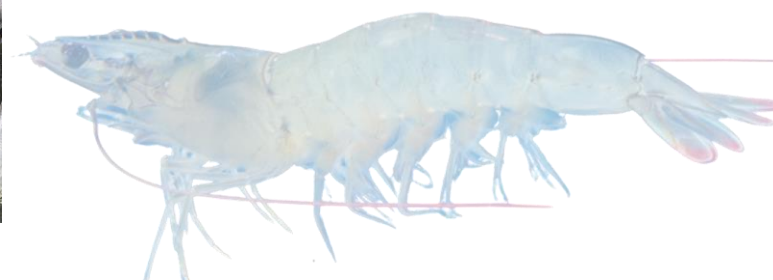
Albert G. J. Tacon, Daniel Lemos & Marc Metian

To cite this article: Albert G. J. Tacon, Daniel Lemos & Marc Metian (2020) Fish for Health: Improved Nutritional Quality of Cultured Fish for Human Consumption, Reviews in Fisheries Science & Aquaculture, 28:4, 449-458, DOI: [10.1080/23308249.2020.1762163](https://doi.org/10.1080/23308249.2020.1762163)

To link to this article: <https://doi.org/10.1080/23308249.2020.1762163>



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In most Asian & African countries fish represents the cheapest source of animal protein

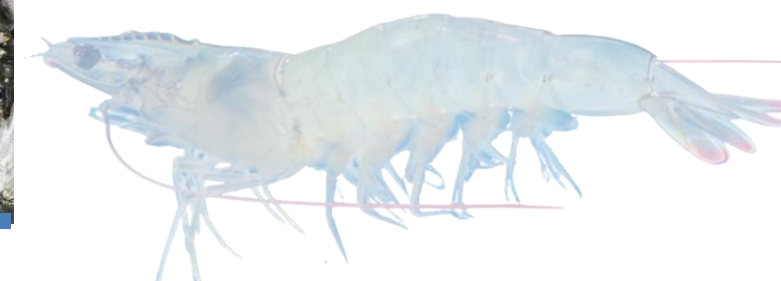




Table 4. Top aquaculture country producers and capture fisheries landings in 2020 (values given in metric tonnes; FAO 2022c).

Top aquaculture producers	2020	Top capture fisheries landings	2020
China	70,483,538	China	13,445,983
Indonesia	14,845,014	Indonesia	6,989,382
India	8,641,286	Peru	5,675,209
Viet Nam	4,614,692	India	5,522,714
Bangladesh	2,583,866	Russian Federation	5,081,017
Korea Rep	2,327,903	USA	4,253,236
Philippines	2,322,831	Viet Nam	3,421,880
Egypt	1,591,896	Japan	3,215,130
Chile	1,505,486	Norway	2,603,574
Norway	1,490,412	Chile	2,182,768
Total aquaculture production	122,580,187	Total capture fisheries landings	91,420,562

Source: Tacon, 2022

Brasil 16th



630,200

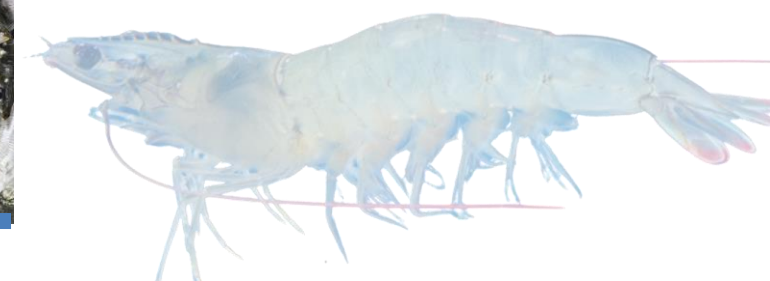
Brasil 27th



709,391 E



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Not all fish are created equal

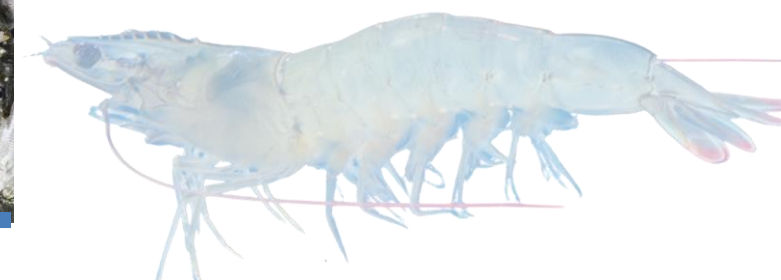
Nutritional composition & potential health value depends upon:

- Species & part consumed: fillet, whole, head, offal
- Source: wild, farmed, recreational fishery, marine, freshwater
- Country of origin & method of production
- Cooking method prior to consumption
- Nutrient composition of the feed used if farmed



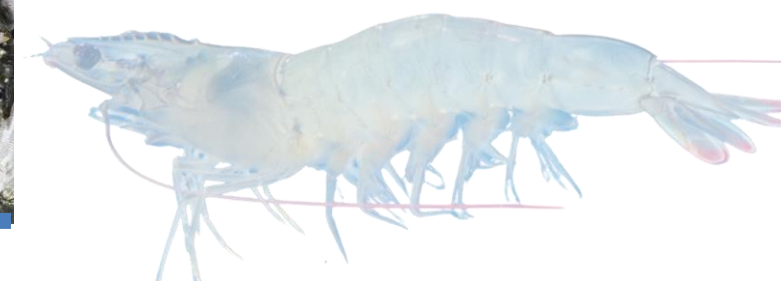
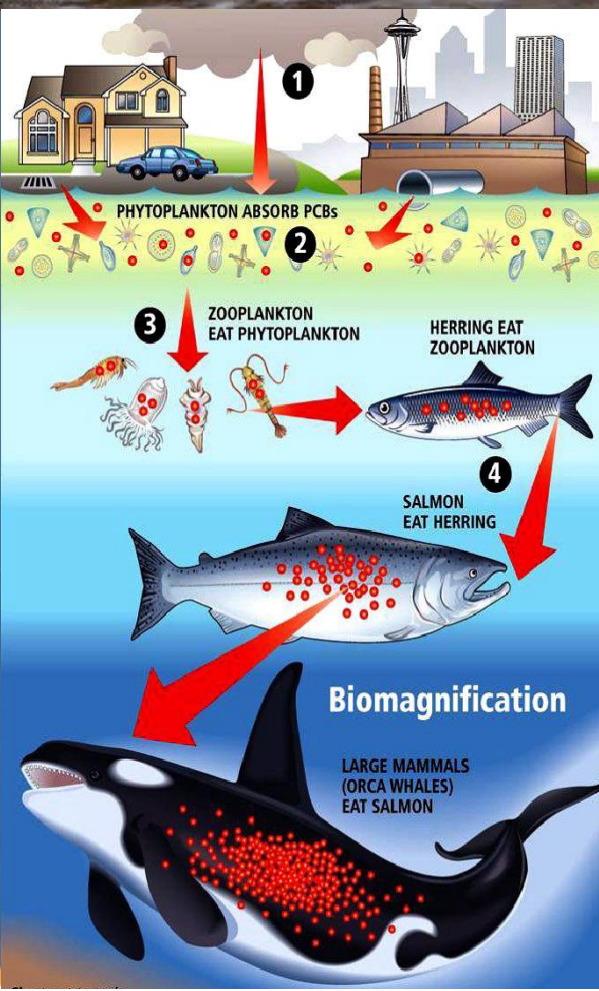
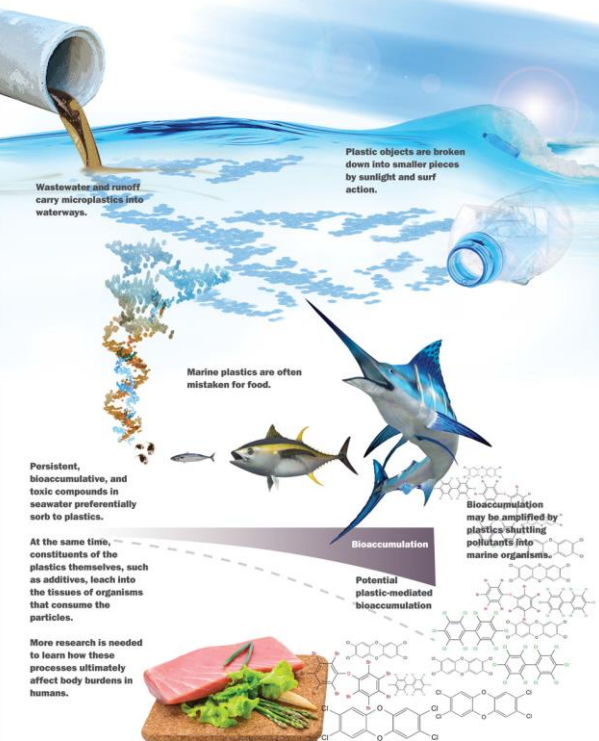
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Potential Health risks of fish & seafood consumption

- Risk from the consumption of raw and/or unprocessed fish & seafood contaminated with **viable pathogenic organisms, including parasites, nematodes, cestodes, trematodes, bacteria, and toxins** (depending on species), these risks can be eliminated through proper cooking & handling (FAO/WHO, 2003; Hellberg et al. 2012).
- Risk from the presence of **environmental contaminants** (depending upon species & origin), including **heavy metals (Hg, Cd, As), persistent organic pollutants (POPs - PCBs, dioxins), veterinary drug residues, and micro-plastics** (Berntssen et al. 2010; Domingo et al. 2007; FAO/WHO, 2011; Hellberg et al., 2012; Tacon & Metian 2008; Verbeke et al. 2005; VKM, 2014).





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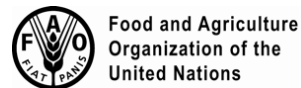
FAO Fisheries and Aquaculture Report No. 978

FIPM/R978(En)
ISSN 2070-6987

Report of the

JOINT FAO/WHO EXPERT CONSULTATION ON THE RISKS AND BENEFITS OF FISH CONSUMPTION

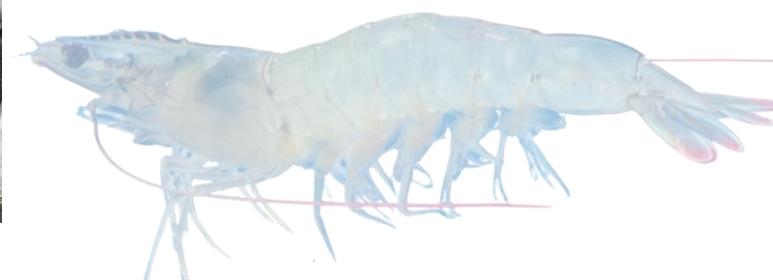
Rome, 25–29 January 2010



Notwithstanding the above mentioned risks, it is generally believed that the **higher nutritional value and potential health benefits** derived from **increased fish consumption** far out-way the **potential negative risks to human health** (FAO/WHO, 2003, 2011; VKM, 2014).



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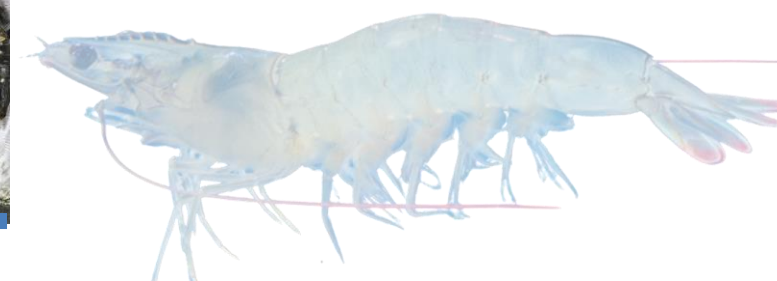


BAD NEWS



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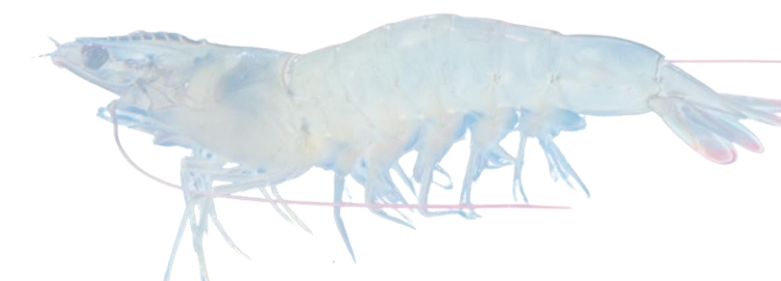
Contribution of fish to animal protein supply in the Americas - 2019



Bolivia:	2.1%	El Salvador:	7.9%
Argentina:	3.0%	Nicaragua:	8.4%
Honduras:	3.5%	Canada:	9.1%
Brazil:	4.4%	Mexico:	9.5%
Cuba:	4.5%	Panama:	10.4%
Guatemala:	4.5%	Costa Rica:	12.3%
Paraguay:	4.6%	Venezuela:	13.4%
Comobia:	5.3%	Suriname:	14.6%
Uruguay:	5.5%	Peru:	16.5%
Chile:	7.1%	Guyana:	18.4%
Ecuador:	7.1%		
USA:	7.1%		
		World	16.5%



FAO, 2022





Contribution of fish & seafood to animal protein supply - 2019



South America

Northern America

Central America

Oceania

Europe

World

Africa

Asia



5.6% (Brazil 4.4%) 

7.2% (USA 7.1%)

9.1% (Mexico 9.5%)

10.5% (Australia 8.7%)

11.1% (Norway 22.6%)

16.5%

20.3% (Egypt 27.3%)

21.9% (China 21.7%)



FAO, 2022

Cambodia: 69.6%
Kiribati 65.5%
Sierra Leone 61.3%
Bangladesh: 60.1%
Solomon Islands 58.8%
Maldives: 56.2%
Indonesia: 55.6%
Ghana: 53.8%
Sri Lanka: 49.4%

Gambia 44.0%
Côte d'Ivoire: 44.3%
Congo DPR: 43.6%
Cameroon: 41.0%
Lao DPR: 40.0%
Thailand: 38.4%
Malaysia 37.5%
Nigeria: 35.9%
Seychelles 35.7%

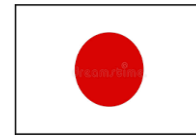
Angola: 35.5%
Senegal: 34.5%
Myanmar: 34.0%
Japan: 33.9%
Togo: 33.4%
Uganda: 31.0%
Korea Rep: 30.3%
Rwanda: 28.8%
Philippines: 28.0%





Per capita food supply in Japan, USA & Brasil in 2019

(FAO Food Balance Sheets, 2022)



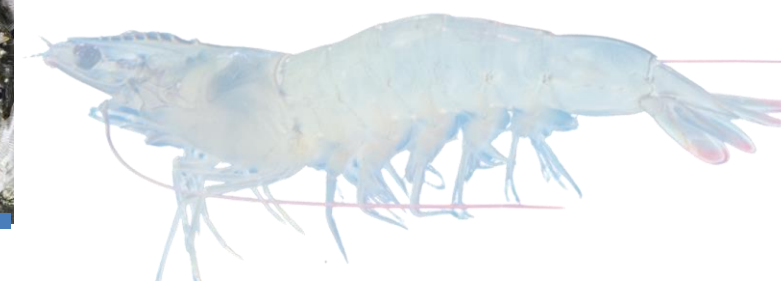
	JAPAN	WORLD	BRASIL	USA
Calories (kcal/day)	2,691	2,963	3,246 +	3,862 ++
Fish & seafood (kg/year)	46.06 ++	19.91	8.95	22.13
Fish & seafood (g protein/day)	16.68	5.47	2.43	5.40
Fish & seafood (g fat/day)	5.76 ++	1.22	0.46	1.29
Fish % animal protein supply	33.9 ++	16.5	4.4	7.1
Animal protein (g/day)	49.17	33.16	54.86 +	75.93 ++
Animal fats (g/day)	35.74	38.89	62.76 +	81.11 ++
Terrestrial meat (kg/year)	51.11	43.16	99.53 +	128.44 +
Sugar & sweeteners (kg/year)	26.39	26.07	42.14 +	66.11 ++
Sugar & sweeteners (% total cal)	9.2	7.8	12.5 +	15.3 +



NEW PROJECT

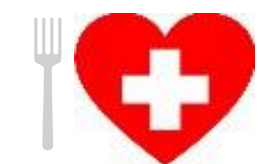


FISH FOR HEALTH





FISH FOR HEALTH



The aim of the project is to promote the increased use of farmed fish & seafood products as a more healthy alternative to the consumption of processed red meat products & fast-foods in the fight against obesity, coronary heart disease & diabetes



FISH FOR HEALTH



2022-2027

Início 1/10/2022





PESCADO PARA SAÚDE



O projeto tem como objetivo a promoção e o aumento do consumo de peixes e alimentos de origem aquática (Pescado) como uma alternativa mais saudável para as carnes vermelhas processadas e as 'fast-foods' no combate à obesidade, doenças do coração e males associados no Estado de São Paulo;



PESCADO PARA SAÚDE



2022-2027

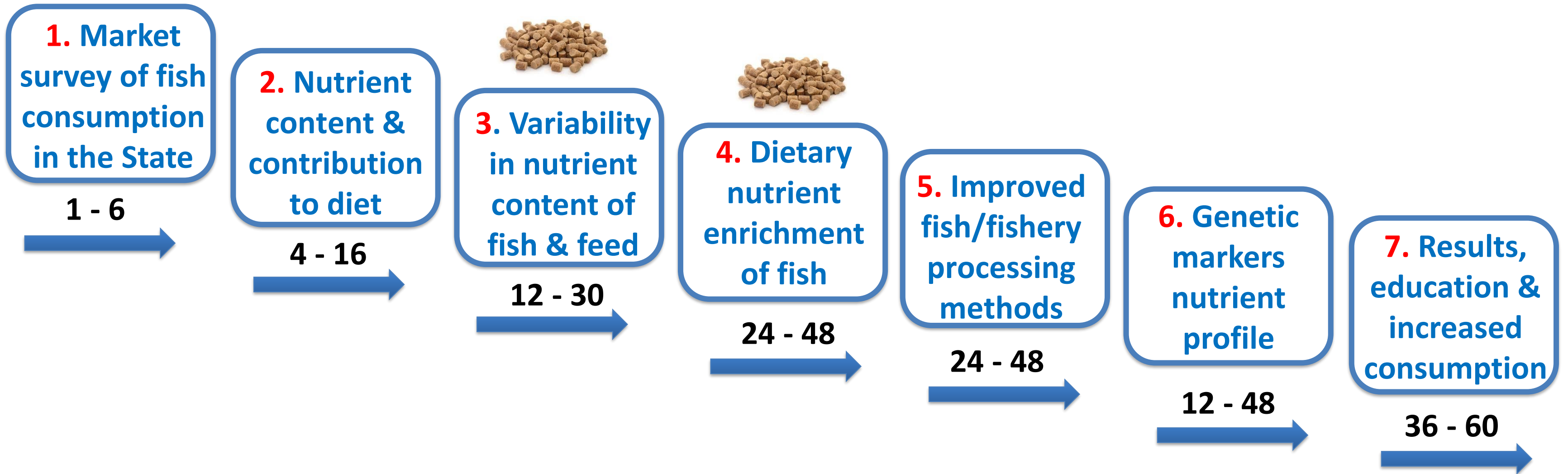
Início 1/10/2022



Main project research tasks



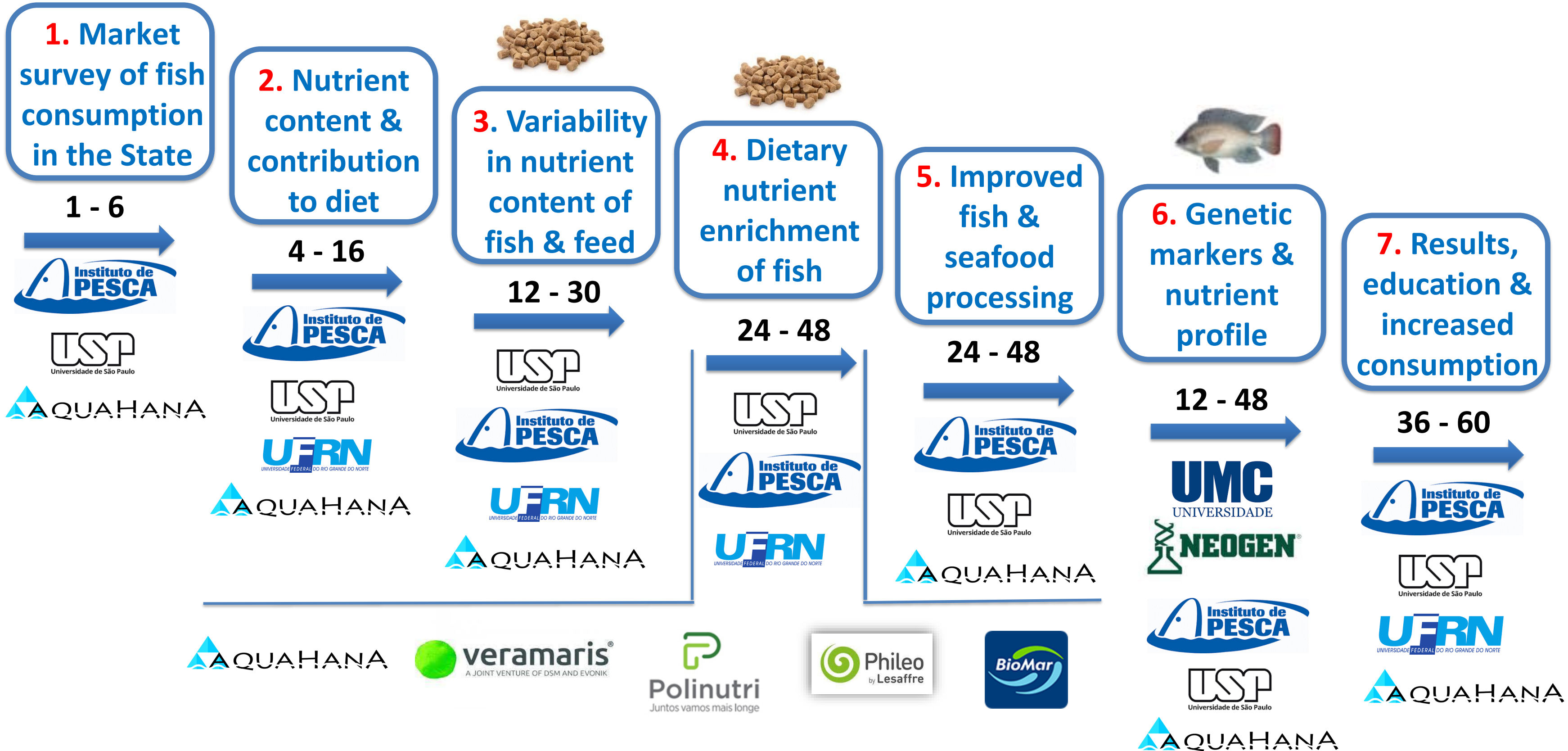
FISH FOR HEALTH



Main project research tasks



FISH FOR HEALTH





PESCADO PARA SAÚDE



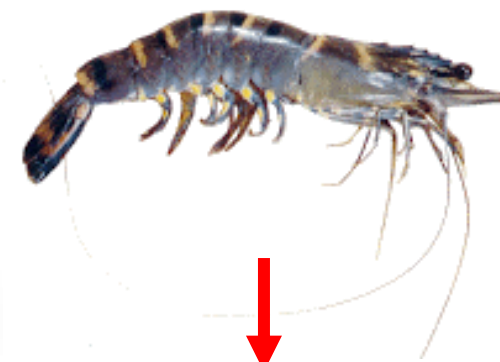
Realization that the **nutritional profile** of the cultured fed fish or shrimp can be **augmented & tailored** to meet the needs of the consumer through the use of supplemental omega-3 fatty acids level (EPA/DHA), trace minerals (iron, zinc, selenium, iodine, chromium), vitamins (A, D, E), and/or fillet protein/lipid/calorific energy content;



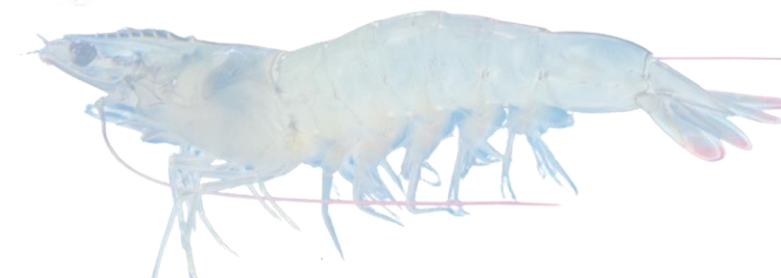
Nutrients



Optimum nutrient & health benefits

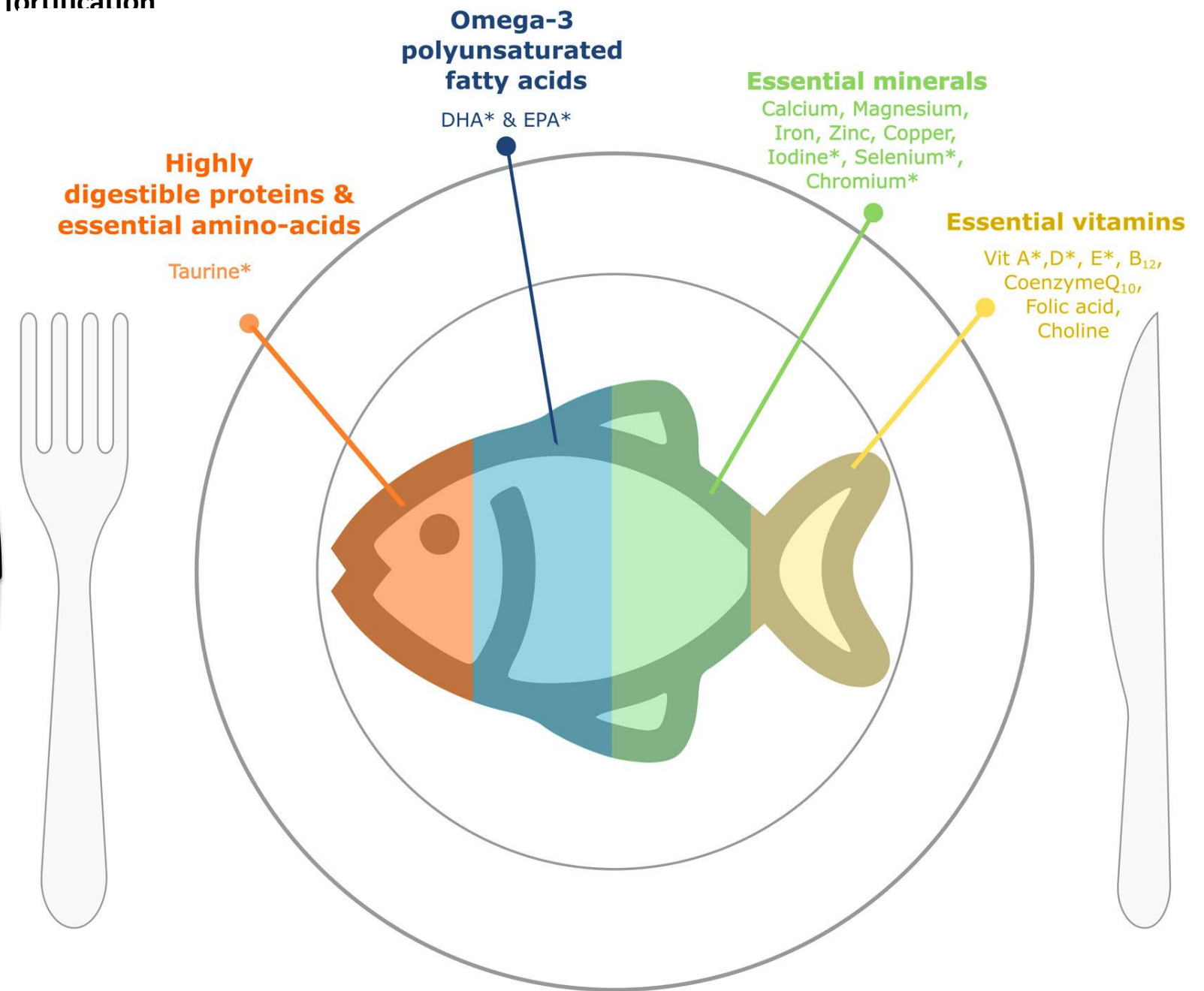
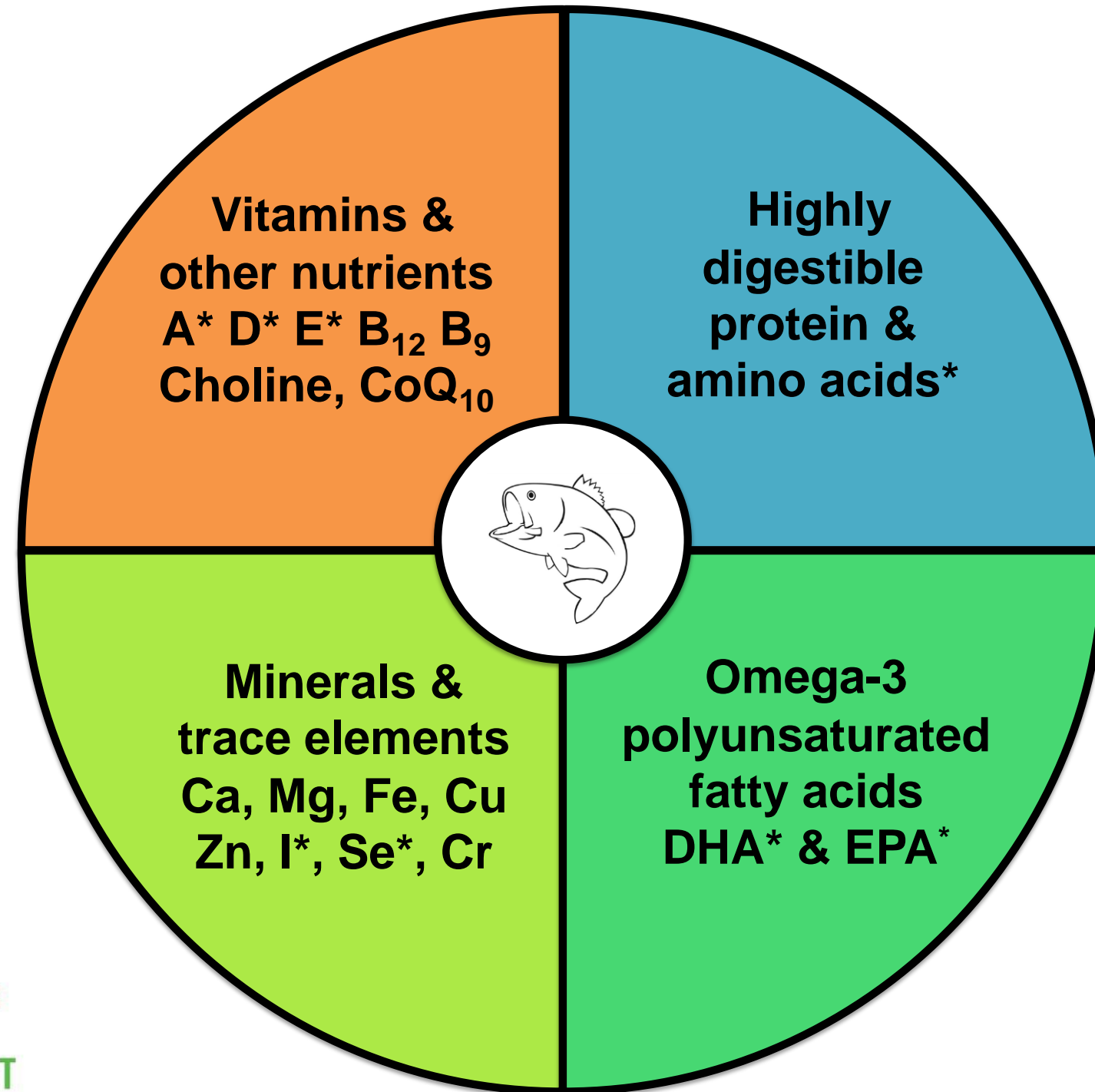


Contaminants



Farm Fish: A Superfood with many health attributes

¹ Tissue levels in farmed fish which have been shown to be able to be manipulated through dietary fortification



* Nutrient levels shown to be enhanced through dietary fortification

Figure 2. Farmed fish: a superfood with multiple health attributes.



Production of lower-priced fish products





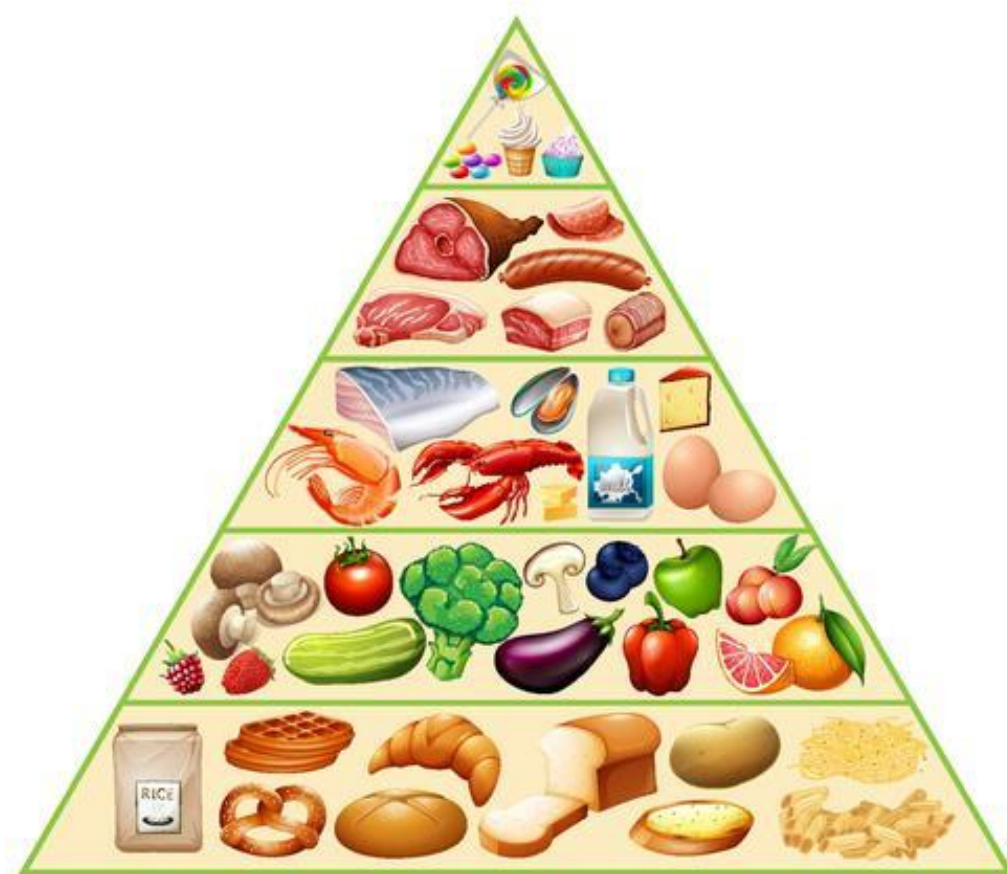
FISH FOR HEALTH



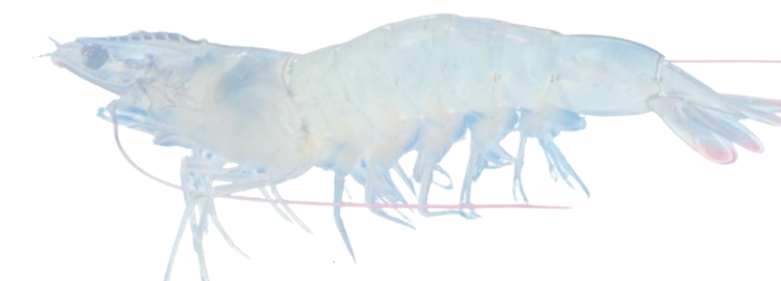
Increased Public Awareness



Urgent need to increase public awareness and understanding concerning the **nutritional merits & health-benefits of increased consumption of fish and seafood products**, including the inclusion of fish and aquatic foods as an essential component of a healthy diet and national dietary nutrient requirement guidelines, **as well as the dangers of high intakes of processed foods and fast-foods on overweight, obesity, coronary heart disease, diabetes & associated ailments.**



Healthy Food Pyramid







**DIA NACIONAL
DA SAÚDE
E NUTRIÇÃO**



**Come fresco
come saludable**



**Pescado é
Saúde**

**aproveitamento
integral do pescado**



**América Latina y el Caribe
Sin Hambre 2025**

