Food Fortification of Different Food Products

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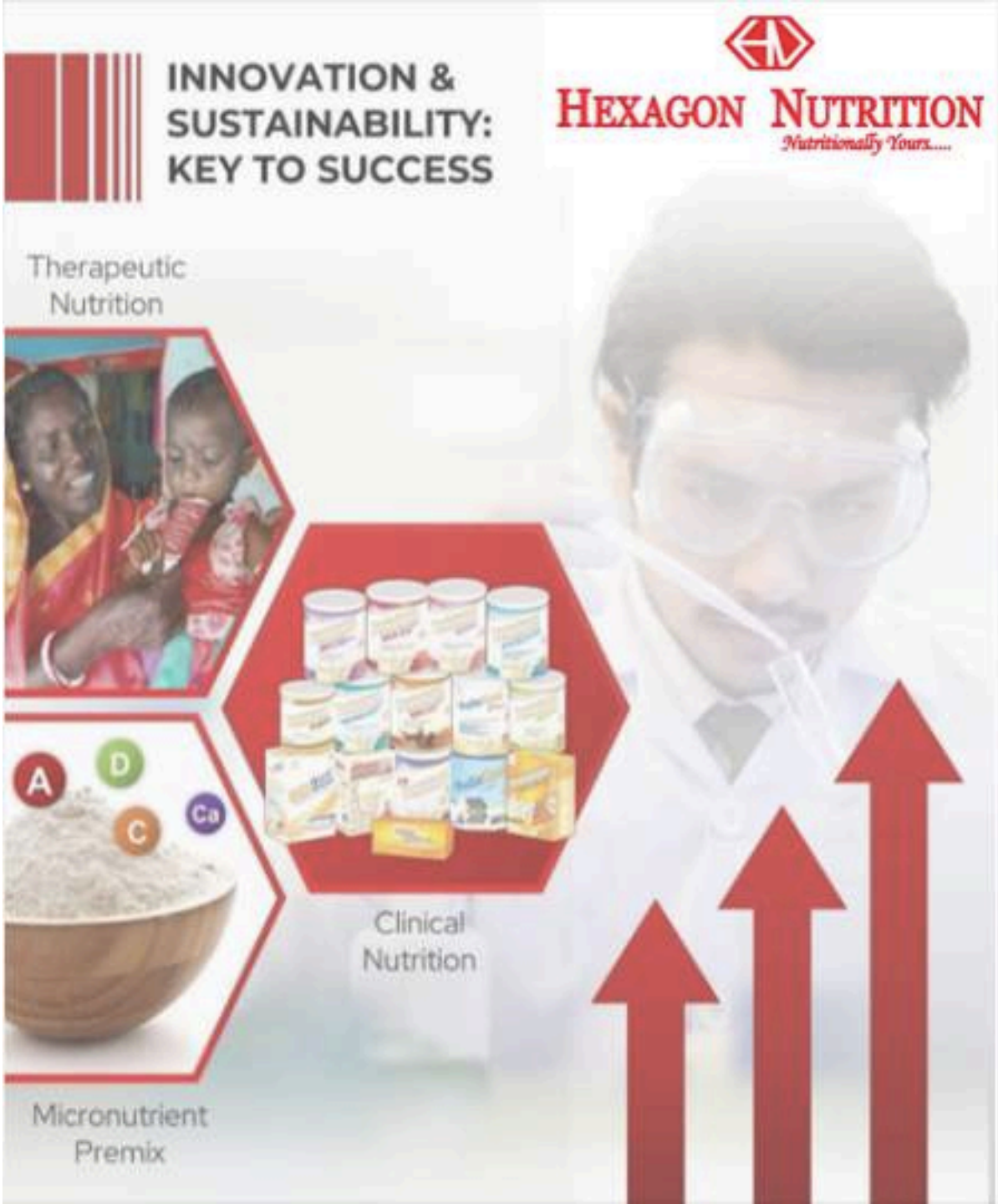
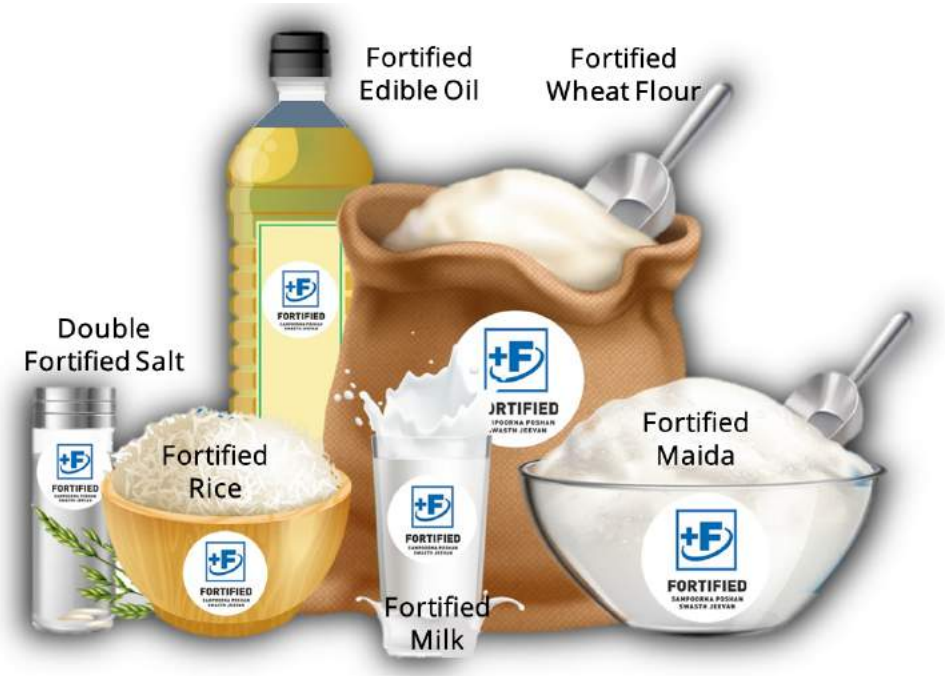
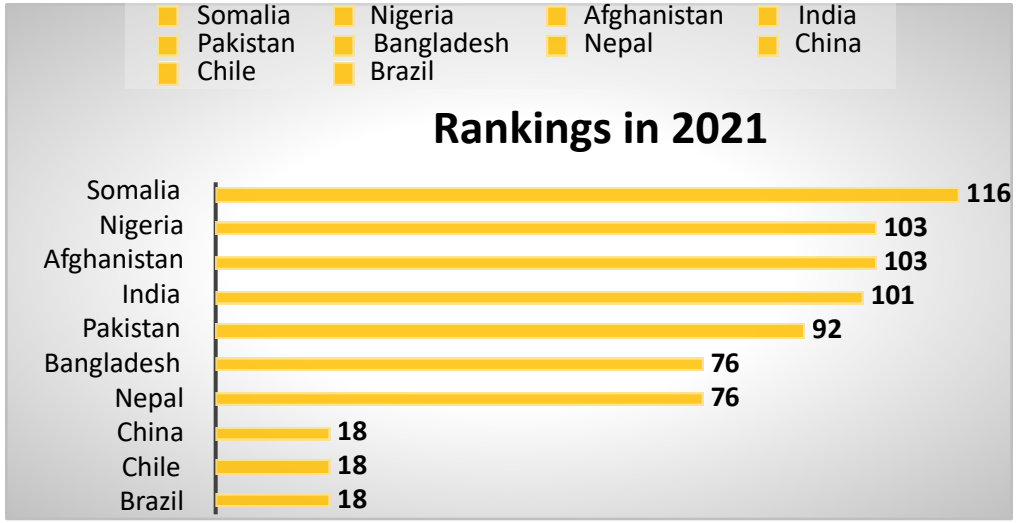


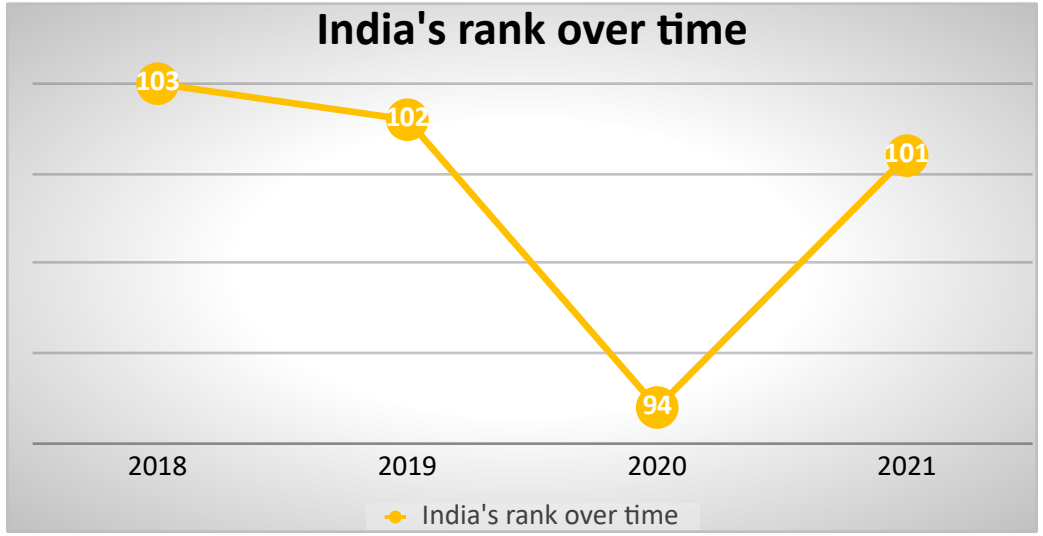
Understanding Food Fortification

- Food fortification or enrichment is the process of adding vitamins and minerals to food.
- Fortification, especially of staples like wheat flour, oil, milk etc., is considered to be a good public health policy / strategy to provide micronutrients to reduce dietary deficiencies across population Groups.
- Food fortification offers a tremendous opportunity toward improving the micronutrient status of populations

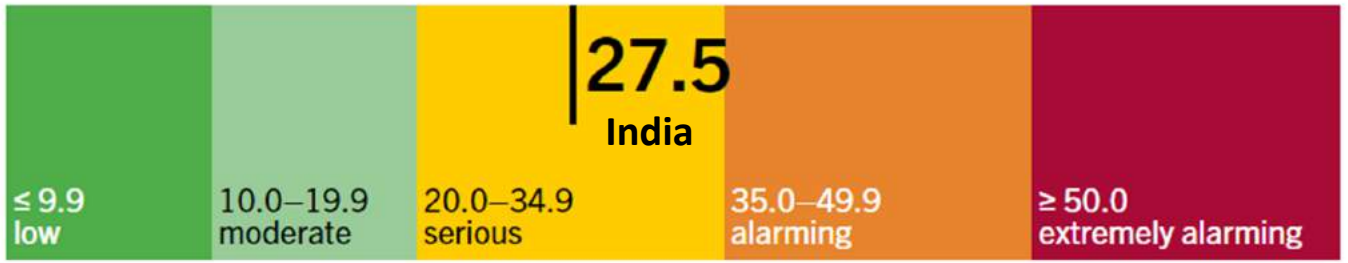


Global Hunger Index 2021





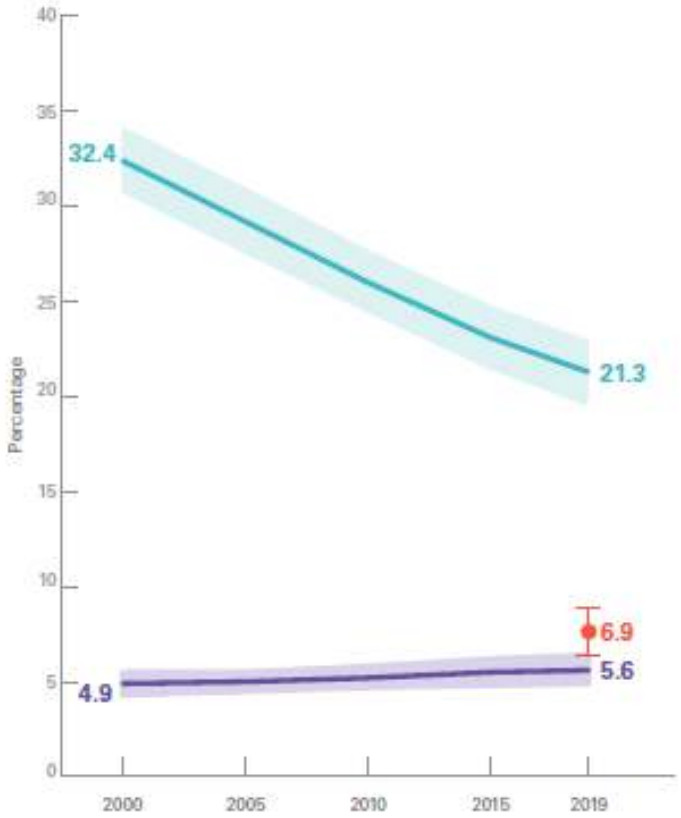
Source: The Global Hunger Index Report, 2021



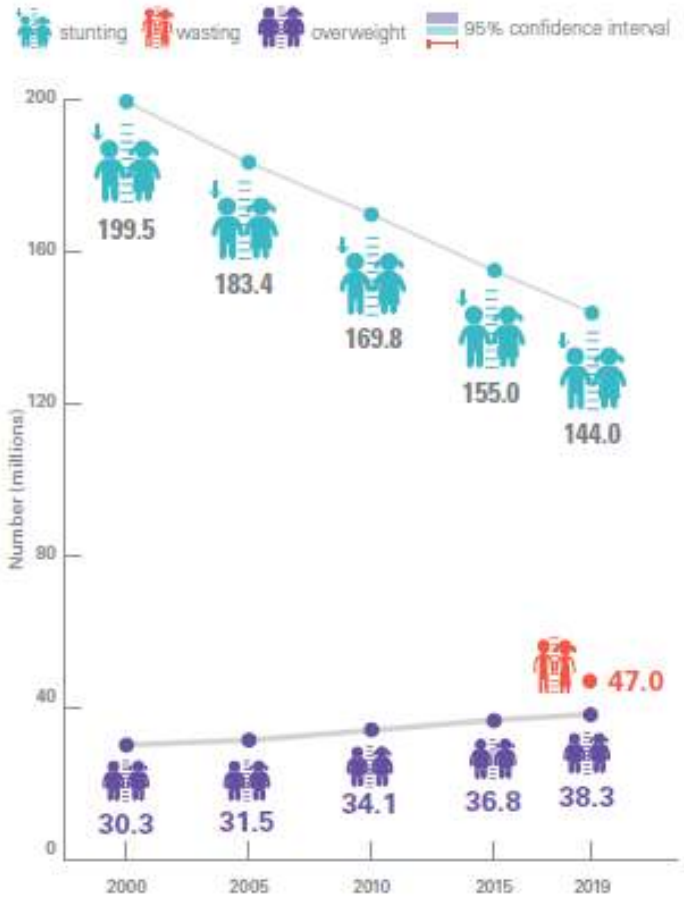
Prevalence of Child Malnutrition- Globally

Malnutrition rates alarming !

Stunting is declining too slowly while Wasting still impacts lives of many young children



Percentage of stunted, overweight and wasted children under 5, global, 2000–2019

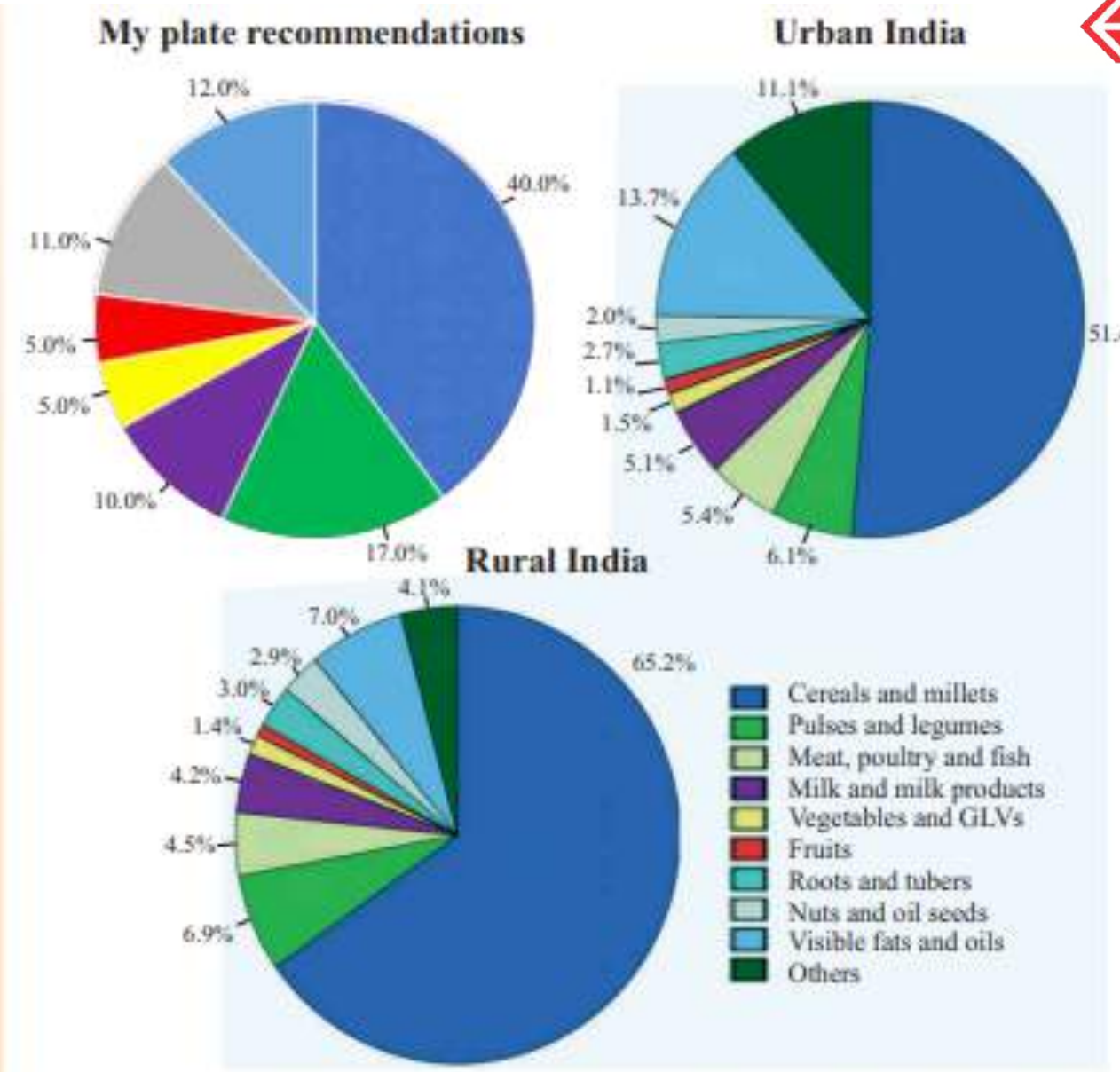


Number (millions) of stunted, overweight and wasted children under 5, global, 2000–2019

Image and data source: The UNICEF/WHO/WB Joint Child Malnutrition estimates, www.who.int, 2020

Indian diets are lacking in foods naturally rich in micronutrients !

Mean Percent of energy from various food group in Urban and rural India (pooled) ADULTS



Note: Other foods include chips, biscuits, chocolates, sweets and juices

Data Source: What India Eats Report,2020
https://www.nin.res.in/nutrition2020/what_india_eats.pdf

Strategic Advantages of Fortification

Staple foods that are consumed regularly by all

Fortification is a proven, simple, cost-effective technology

Preventive, population-wide approach, through which the fortified foods can be made available to the entire population

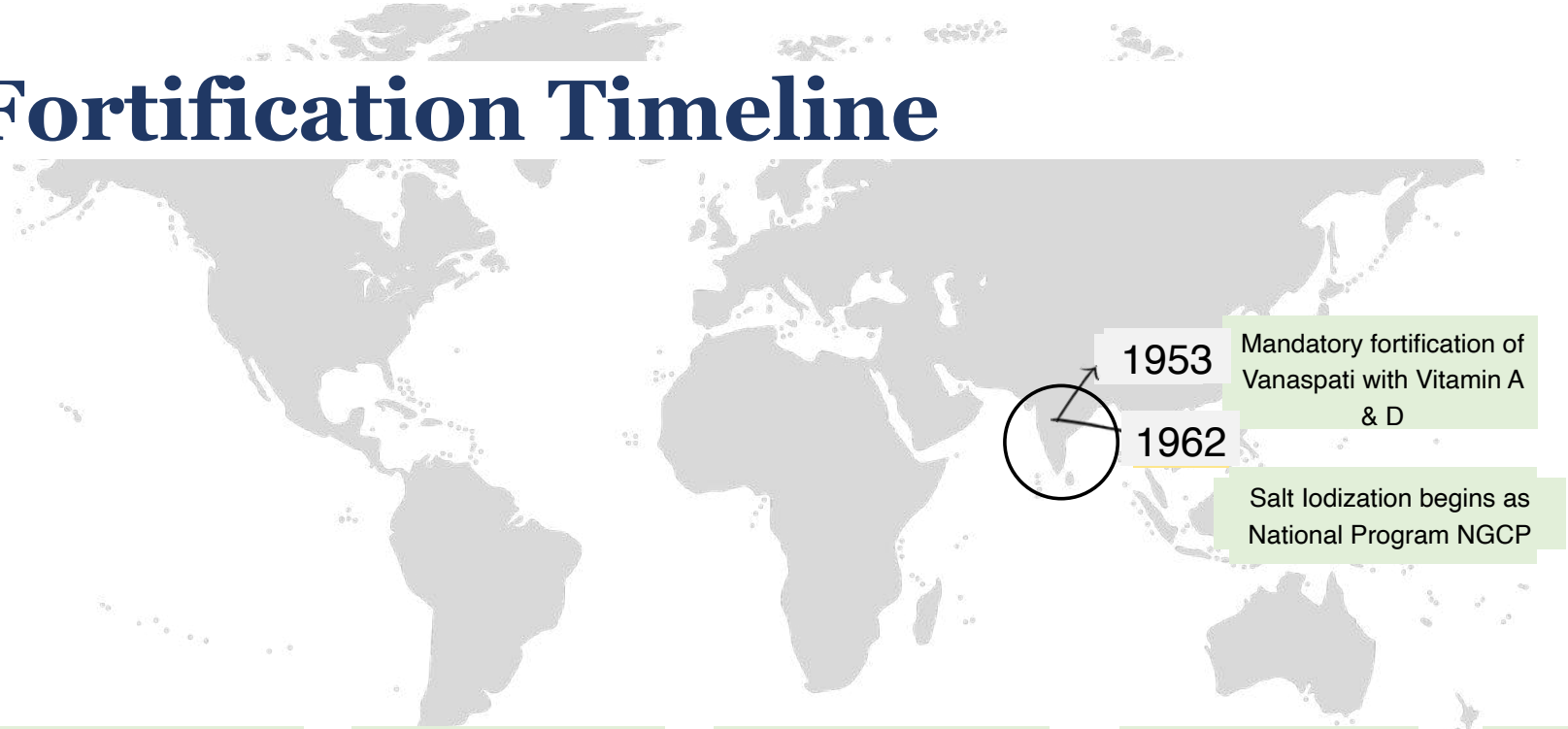
Micronutrients are added in very low doses, fortification poses no risk of excessive intake

There is no change in the color, taste, texture, or quality of staples

No change in Behaviour

Micronutrients added to staple foods have high stability during cooking and storage.

Food Fortification Timeline



1953 Mandatory fortification of Vanaspati with Vitamin A & D

1962 Salt Iodization begins as National Program NGCP

1918 Mandatory fortification of oils, fat and milk with Vitamin D in Canada

1923 Mandatory salt iodization in Switzerland and USA

1933 Mandatory fortification of flour with Vitamin B1 in Canada

1934 Vitamin D fortification of margarine and other dairy products

1940' Fortification of Cereal products with Vitamin B1,B2 and B3 became common practice in many countries 1941 mandatory with B3 in US

1954 Flour fortified in Chile with B vitamin and Iron

1974 Beginning of Sugar fortification with Vitamin A in Guatemaia

1992 Wheat and maize flour fortification in Venezuela

1998 Folic acid fortification mandated in the USA

2000 Mandatory fortification in many countries in Africa - Nigeria

2003 South Africa mandates fortification of wheat flour, maize meat, brown bread and white bread

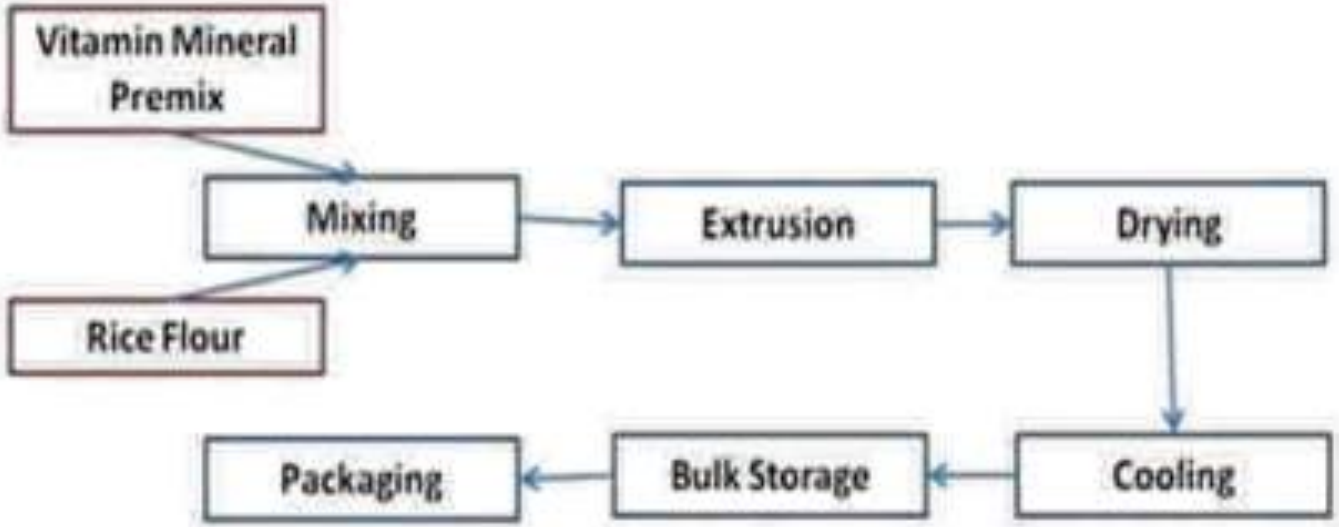
A report from the Ministry of women and child development suggests that Salt Iodisation in India alone has contributed to 1.4% GDP growth by preventing Brain damage in children

Foods that are currently being fortified in India

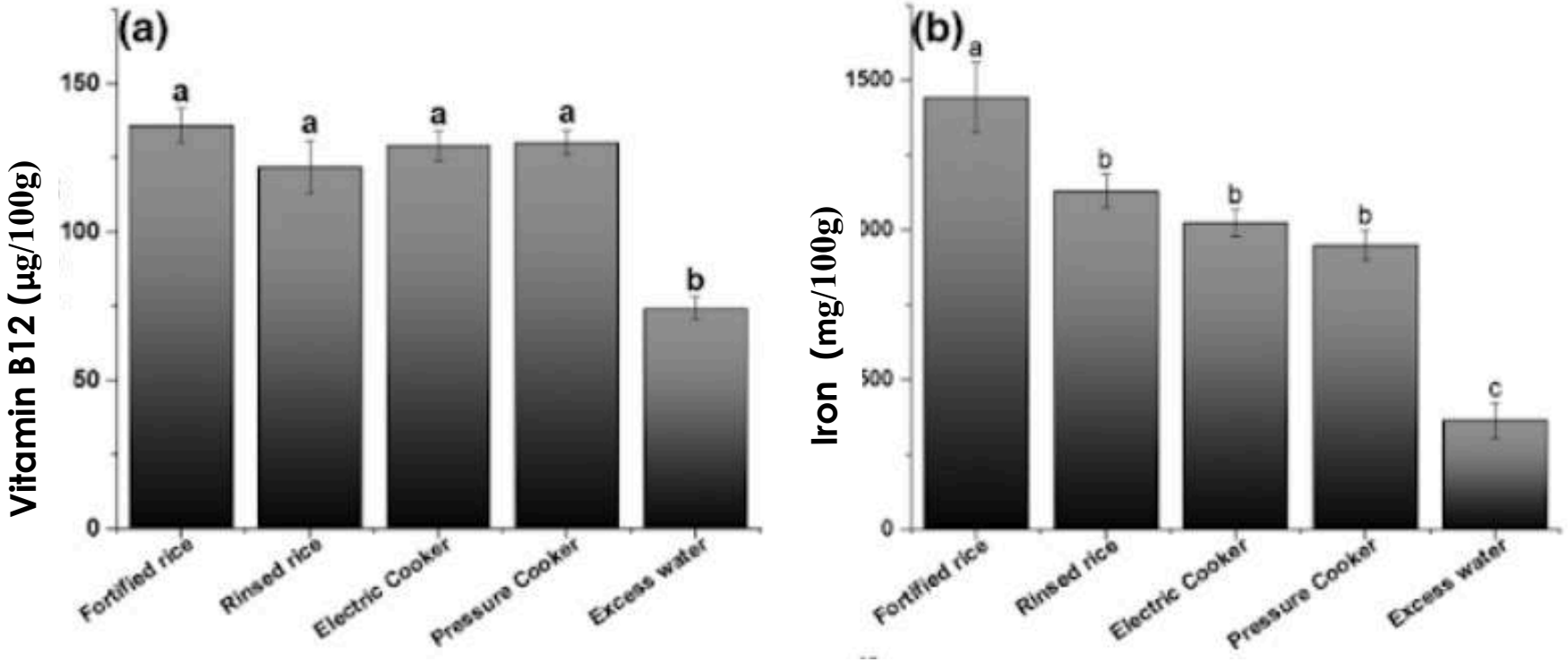
(Regulated by FSSAI)

Rice Fortification

- Rice is the staple food of 65 percent of the Indians.
- Staple food for poorer sections of the society
- Commonly fortified with Iron, Folic acid, Vitamin B12.
- Rice fortification is cost effective as well .



	Nutrient	Level of fortification per Kg
1	Ferric pyrophosphate	28 mg - 42.5 mg
	Or Sodium Iron (III)Ethylene diamine tetra acetate Trihydrate (Sodium feredetate-NaFe EDTA)	14 mg- 21.25 mg
2	Folic acid	75 mg - 125 µg
3	Vitamin B12- Cyanocobalamine or Hydroxycobalamine	0.75 mg - 1.25 µg



Nutrient Retention of Fortified Rice after being cooked (Indian Study)

Retention, stability, iron bioavailability and sensory evaluation of extruded rice fortified with iron, folic acid and vitamin B12, Y Jyrwa et.al

Wheat Flour Fortification

- India ranked second, with the consumption of 102 million metric ton of wheat in 2019 .
- Wheat too is a major staple crop
- Fortified with Iron, Folic acid, Vitamin B12.
- Wheat fortification is cost effective.

Sources- FFRC website & WHEAT MARKET - GROWTH, TRENDS, COVID-19 IMPACT, AND FORECASTS (2021 - 2026), Mordor Intelligence

Fortification of milk

- India has very high burden of Vitamin A and D deficiencies. Both Vitamins are Fat Soluble
- Fortification of milk with Vitamin A & D is a strategic move to tackle micronutrient deficiency.
- India is largest producer of milk in the world with 146.3 million tones of production and per capita availability of 322 grams per day

Fortification of Edible Oil

- Deficiencies of vitamin A & D are high prevalence in India.
- Fortified edible oil is expected to provide 25%-30% of the recommended dietary allowances for vitamins A& D.

Double Fortified Salt (DFS)

- India's National Institute of Nutrition (NIN) has developed DFS.
- In 2009, the Ministry of Health and Family Welfare has endorsed addition of iron in double fortified salt at 0.8-1.1 mg/g of salt in your daily diet

Success of Iodization of Salt in India
92% of the population consumes iodized salt in India.

Cost of Fortification of Staple Foods

Staples	Specifications (Food Fortification Regulation, FSSAI, 2018)	Cost of Fortification*
Milk	Vitamin A (Retinyl acetate/Retinyl palmitate)- 270 mcg RE- 450mcg RE per lt of milk Vitamin D (Cholecalciferol/Ergocalciferol)- 270 mcg RE-450mcg RE per lt of milk	Per 1 Lt Less than 1 Paisa
Oil	Vitamin A (Retinyl acetate/Retinyl palmitate)- 6 mcg RE- 9.9mcg RE per gm of oil Vitamin D (Cholecalciferol/Ergocalciferol)- 0.11 mcg RE-0.16mcg RE per gm of oil	Per 1 Lt Paisa 10.0
Flour	Iron (Ferrous citrate/Ferrous lactate/Ferrous sulphate/Electrolytic iron/Ferrous fumarate/Ferrous bisglycinate)- 25mg-42.5mg per kg of flour OR Iron (As Sodium Iron EDTA)- 14mg-21.25mg per kg of flour Folic acid- 75mcg-125mcg per kg of flour Vitamin B12 (Cyanocobalamin)- 0.75mcg-1.25mcg per kg of flour	Per 1 kg Less than 5 paisa
FRK	Iron (Ferric pyrophosphate)- 28mg-42.5mg per kg of FRK OR Iron (As Sodium Iron EDTA)- 14mg-21.25mg per kg of FRK Folic acid- 75mcg-125mcg per kg of FRK Vitamin B12 (Cyanocobalamin)- 0.75mcg-1.25mcg per kg of FRK	Per 1 kg Less than 10 Paisa

Fortification of Processed Foods-Breakfast Cereal

Food Safety and Standards (Fortification of Foods) First Amendment Regulations, 2020

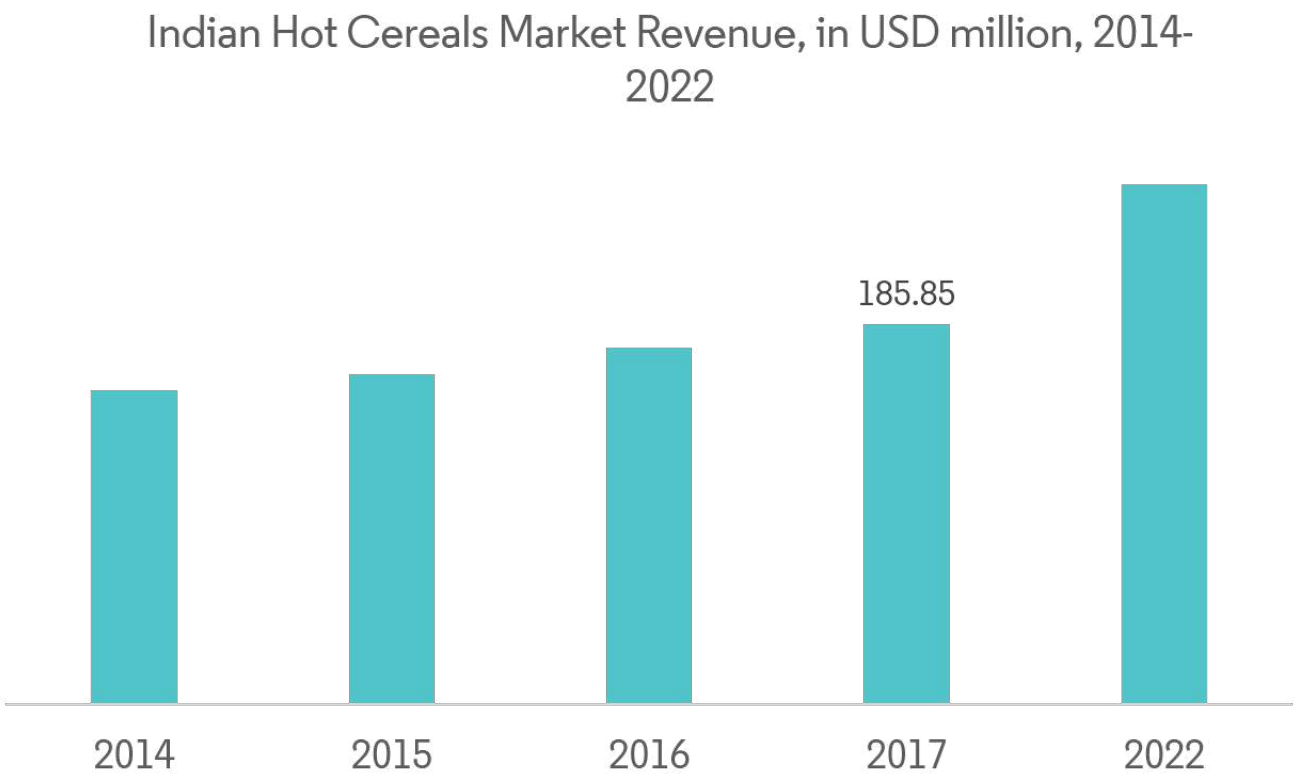
Category	Nutrients & Standards
Cereal products like breakfast cereals	Iron- 1.4mg to 2.7mg per 100g)
	folic acid (8µg to 16µg per 100g)
	Vitamin B12 (0.08µg to 0.16µg per 100g)

Breakfast cereals may also be fortified with following micronutrients.

Sl. No.	Nutrients/Source	Level of Fortification per 100 kcal
1	Zinc (mg)	0.3 -0.6
2	Vitamin A (µg RE)	15 -30
3	Thiamine (Vitamin B1) (mg)	0.04-0.08
4	Riboflavin (Vitamin B2) (mg)	0.04-0.08
5	Niacin(Vitamin B3) (mg)	0.05-1.0
6	Pyridoxine (Vitamin B6) (mg)	0.05-0.1

Breakfast Cereals – Market Insights

- India Breakfast Cereals Market is segmented by Type as Ready to eat, and Ready to cook.
- Indian Breakfast Cereals Market is expected to grow at CAGR of 6.50% between 2021-2026



Data source – Mordor Intelligence

Fortification of Processed Foods-Pasta & Noodles

Food Safety and Standards (Fortification of Foods) First Amendment Regulations, 2020

Category	Nutrients & Standards
Pasta & noodles	Iron- 1.4mg to 2.7mg per 100g)
	folic acid (8µg to 16µg per 100g)
	Vitamin B12 (0.08µg to 0.16µg per 100g)

Instant noodles and pasta may also be fortified with following micronutrients.

Sl. No.	Nutrients/Source	Level of Fortification per 100 kcal
1	Zinc (mg)	0.3 -0.6
2	Vitamin A (µg RE)	15 -30
3	Thiamine (Vitamin B1) (mg)	0.04-0.08
4	Riboflavin (Vitamin B2) (mg)	0.04-0.08
5	Niacin(Vitamin B3) (mg)	0.05-1.0
6	Pyridoxine (Vitamin B6) (mg)	0.05-0.1

Market Insights: Noodles Industry, India

- Noodles Market size is estimated to be $17 billion in 2019, growing at a CAGR of 3.4% during the forecast period 2020-2025.

"Noodles Market Forecast (2020-2025)", by Industry ARC, covers an in-depth analysis of the following segments of the Noodles Market.

The Food Safety and Standards (Fortification of Foods) First Amendment Regulations, 2020 is not applicable on processed foods High in Fat, Sugar and Sodium i.e., HFSS Foods

Emergence of Non-Maida noodles in Indian market is increasing !

Fortification of Processed Foods-Bakery Wares

Food Safety and Standards (Fortification of Foods) First Amendment Regulations, 2020

Category	Nutrients & Standards
Bakery items like bread, biscuits, rusks, buns	Iron- 1.4mg to 2.7mg per 100g)
	folic acid (8µg to 16µg per 100g)
	Vitamin B12 (0.08µg to 0.16µg per 100g)

Bakery items may also be fortified with following micronutrients, (individually or in combination)

Sl. No.	Nutrients/Source	Level of Fortification per 100 kcal
1	Zinc (mg)	0.3 -0.6
2	Vitamin A (µg RE)	15 -30
3	Thiamine (Vitamin B1) (mg)	0.04-0.08
4	Riboflavin (Vitamin B2) (mg)	0.04-0.08
5	Niacin(Vitamin B3) (mg)	0.05-1.0
6	Pyridoxine (Vitamin B6) (mg)	0.05-0.1

Market Insights: Bakery Industry, India

- The Indian bakery market stood at a value of nearly USD 7.60 billion in 2020. The market is further estimated to grow at a CAGR of 8.5% between 2021 and 2026 to reach a value of USD 12.39 billion by 2026.

- Biscuits and cookies industry in India accounts for nearly 72% of the sales in the Indian bakery market.

Sources:Indian Bakery Market: By Product Type: Biscuit, Bread, Cakes and Pastries, Indian Rusk; By Distribution Channel: Convenience Stores, Supermarkets and Hypermarkets, Online, Others; Regional Analysis; Historical Market and Forecast (2016-2026); Market Dynamics; Competitive Landscape; Industry Events and Developments

Fortification of Processed Foods-Fruit Juices

Food Safety and Standards (Fortification of Foods) First Amendment Regulations, 2020

Category	**Nutrients & Standards**
Fruit juices	6mg to 12mg of Vitamin C per 100ml

Other Food Applications that are being fortified

Nutrition Bar

Gummies

Seasoning Mix

Nutritional Supplement

Plant based beverages

Thank you

Finally, in the words of Gabriel Mistral

Many things we need can wait.
The child cannot.
*Right now, is the time his **bones** are being formed,*
*his **blood** is being made and*
*his **senses** are being developed.*
To him, we cannot answer—" Tomorrow."
*His name is **today***