Nutrient Profiling: Designing a Healthier Future for Global Benefit

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Imprint

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Nutrient Profiling: A tool for answering the nutritious food dilemma?

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Suray, a young mother living outside the city of Aaron in Malawi, wants what is best for her four children. Her health visitor often emphasizes the importance of eating 'right' when she comes to weigh her 8-month-old daughter. Suray ponders each purchase during daily trips to the market at 6 a.m., unsure about what a good choice would be for her family and what she can afford. This is a question all mothers face, wherever they are in the world. What does a nutritious food look like?

> **"This is a question all mothers face. What does a nutritious food look like?"**

"A review of the literature shows that the concept of a nutritious food is not based on any consistent standards or criteria."[1] This statement represents a challenge to the global nutrition community, governments developing and implementing nutrition policy, and mothers purchasing food for their families. The literature also indicates challenges regarding the availability and application of food-based dietary guidelines (FBDGs). Such guidelines are necessary to illustrate healthy diets that fit both the culture and the context of varying population groups.[2] Eighty-five countries currently claim to have FBDGs (21 percent are low- and middle-income countries [LMICs]), but few can say that these have been fully adopted.[3] The Global Report states that if these 85 countries had indeed fully implemented these guidelines, premature mortality could be reduced by 12 percent.[3] So, it would seem that such guidelines are often poorly understood at present, and difficult to apply.[2] Below, we will address why tools and guidance at a country level on what constitutes a healthy diet are important, and how nutrient profiling (NP) can be a useful tool to help consumers make informed food choices.

In sub-Saharan Africa, small and medium-sized enterprises (SMEs) constitute 85 percent of the food supply chains and supply 77 percent of all food consumed.[4] At *Sight and Life*, we have the privilege of engaging closely with many of these SMEs. We perceive a desire from many of them to support their governments' calls to produce more nutritious and affordable food. Their position in the food supply chain undoubtedly gives them a vital role in meeting the nutritional needs of their populations – one that cannot be ignored.

> **"In sub-Saharan Africa, SMEs constitute 85 percent of the food supply chains"**

These companies face many challenges when developing more nutritious foods. One such challenge is the question of what a healthy food looks like in a given country. Answering this question requires in-depth knowledge and understanding of the respective population's nutritional requirements, the local food supply, the population's food habits, and the available economic resources.

The challenge of developing affordable, nutritious foods

This challenging issue catalyzed *Sight and Life's* current work on NP in LMICs, and stimulated the idea for this Special Report. In particular, it was in the context of our work on the OBAASIMA project in Ghana that we saw a willingness on the part of SMEs to engage in developing more affordable, nutritious foods, but where we quickly came to realize the many obstacles to achieving this aim. One such challenge was the use of NP models that were developed initially to prevent obesity in high-income countries (HICs) but were not necessarily applicable in a country such as Ghana. As concluded by Drewnowski, these models tend to penalize dietary energy by giving lower ratings to foods contain-

The OBAASIMA symbol guarantees the nutritional quality of a wide range of food products sold in Ghana

ing excessive calories, fat, sugar, and salt. Such energy-driven NP models need to be reconceptualized for use in LMICs, where hunger, undernutrition, and micronutrient deficiencies persist as major public health concerns.[5]

OBAASIMA

Launched in February 2013 as a public–private partnership, OBAASIMA is a demand-driven approach aiming to address micronutrient malnutrition among Ghanaian women of reproductive age. It does so by creating a distinctive front-of-package seal that guarantees an acceptable nutrition profile while easily identifying fortified food products that provide a good source of 18 vitamins and minerals. Today, the OBAASIMA seal not only provides a clear assurance to consumers of a high-quality, safe, and nutritious food that adheres to the minimum fortification standards, but also serves as a model for engaging the private sector in LMICs to alleviate micronutrient deficiencies. However, even after almost 10 years of the implementation of OBAASIMA, the question of identifying a 'healthy food' in an LMIC remains a challenge for many food companies and a challenge for governments.

"Even after 10 years of OBAASIMA, the question of identifying a 'healthy food' in an LMIC remains a challenge"

Potential applications for nutrient profiling

NP, defined by the World Health Organization as "the science of ranking or classifying foods based on their nutrient composition for reasons related to preventing disease and promoting health," has been developed over the past decade primarily to address the increasing issue of noncommunicable diseases in wealthy societies.[6] NP can have many purposes. These include identifying products that may be fortified; stipulating guidance for product formulation and reformulation; providing direction for marketing to consumers; regulating the availability of particular foods in public institutions such as hospitals and schools; and categorization of foods for taxation (or subsidy) purposes based on nutrient content.[7]

Throughout this Special Report you will hear more about how current NP models are being applied. But what is apparent from our work at *Sight and Life* is that while originally directed at HICs, NP models also have the potential to address the needs of LMICs, which suffer from stunting and micronutrient deficiencies – a major and continuing public health burden. The purpose of NP models, as illustrated by WHO, is to address such public health concerns. Thus, NP models intended for use in LMICs must address all forms of malnutrition. Inadequate intakes of vitamin A, the B vitamins, calcium, iron, iodine, and zinc, and the frequent lack of high-quality protein intakes, together with overweight and obesity, must be considered.[5] Without taking these parameters into account, LMICs will continue to face challenges in adapting and utilizing NP modeling to their contexts. The creation of regional or national criteria for acceptable amounts of critical nutrients in the form of an NP model is a key step towards policy formulation, behavior change strategies, and compliance for LMICs working to address the double burden of malnutrition.

"The creation of regional or national criteria for acceptable amounts of critical nutrients is a key step towards policy formulation"

Nutrient profiling: A step in the journey to defining a healthy food

NP is not the definitive solution to increasing the consumption of nutritious foods; many approaches and guidelines exist. It is also the case that the nutritional value of the food we eat is not the only determinant of our food decisions. Food choice is complex. Determinants of food choice include hunger and taste, affordability, access and education, and cultural factors including our attitudes, beliefs, and understanding regarding food.[8] Our diet is also affected by portion sizes, the frequency of consumption, and dietary diversity. However, if adapted to a country's specific context and

unique nutritional needs, NP models can support the increased availability of nutritious food.

In this Special Report

We would like to thank everyone who has generously contributed to this Special Report, starting with Adam Drewnowski, who introduces a NP manual suitable for global use, taking OBAASIMA as a case study.

Through key interviews, Esi Foriwa Amoaful and Christoph Meyer, government representatives from Ghana and Germany respectively, share their perspectives on the use and application of NP models at a national level. We hope you will also enjoy hearing Inoshi Sharma of the Food Safety and Standards Authority of India (FSSAI) describe the upcoming Indian NP regulation.

We dig into practical examples of the application of NP models with Ana María Ronco and Miguel Llanos of the Institute of Nutrition and Food Technology (INTA) in Chile, and Simón Barquera and Mariel White from Mexico's National Institute of Public Health. Further, we hear from World Food Programme colleagues and SHAIS Foods on how the Good Food Logo in Zambia has engaged local SMEs in developing and creating demand for more nutritious foods.

We are delighted to share the experience of the CEO of Yedent Agro Group of Companies, Samuel Kwame Ntim-Adu, on collaborating with the OBAASIMA seal in Ghana. To further explore the OBAASIMA project, *Sight and Life's* Food Technologist Daniel Amanquah takes you through his experience of working across the food chain to get products to market.

Food reformulation presents challenges that Jörg Spieldenner tackles in his overview on the topic, entitled The Reformulation of Foods for Consumer Appeal. Read about the Access to Nutrition Initiative (ATNI) pilot project, which explores a modified Health Star Rating (HSR) NP model incorporating a micronutrient component. Choices International take us through the critical role of advocacy regarding NP, particularly in addressing the triple burden of malnutrition.

Finally, colleagues from Codex will provide key insights into Codex's past and upcoming work on the procedural manual focusing on NP.

We very much hope you will enjoy this Special Report from *Sight and Life*, and trust that it will stimulate thoughtful discussions and solution-driven approaches on this topic.

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Glossary

Double burden of malnutrition

The double burden of malnutrition is characterized by the coexistence of undernutrition along with overweight, obesity, or diet-related noncommunicable diseases (NCDs), within individuals, households, and populations, and across the life course. This double burden of malnutrition can exist at the individual level (for example, obesity with deficiency of one or various vitamins and minerals, or overweight in an adult who was stunted during childhood), at the household level (when a mother may be overweight or anemic, and a child or grandparent is underweight), and at the population level (where there is a prevalence of both undernutrition and overweight in the same community, nation, or region).

Source: WHO. The double burden of malnutrition: policy brief. Geneva: WHO; 2017.

Double-duty actions

Double-duty actions include interventions, programs, and policies that have the potential to simultaneously reduce the risk or burden of both undernutrition (including wasting, stunting, and micronutrient deficiency or insufficiency) and overweight, obesity, or diet-related NCDs. Reflecting the shared drivers and platforms of contrasting forms of malnutrition, double duty can be achieved at three levels: through doing no harm with regard to existing actions on malnutrition; by retrofitting existing nutrition actions to address or improve new or other forms of malnutrition; and through the development of de novo, integrated actions aimed at the double burden of malnutrition.

Source: WHO. Double-duty actions for nutrition: policy brief. Geneva: WHO; 2017.

Front-of-pack labeling

Front-of-pack labeling (FOPL) refers to nutrition labeling systems that: are presented on the front of food packages (in the principal field of vision) and can be applied across the packaged retail food supply; comprise an underpinning nutrient profile model that considers the overall nutrition quality of the product or the nutrients of concern for NCDs (or both); and present simple, often graphic, information on the nutrient content or nutritional quality of products, to complement the more detailed nutrient declarations usually provided on the back of food packages.

Source: WHO. Guiding principles and framework manual for front-of-pack labelling for promoting healthy diets. Geneva: WHO; 2019. Internet: https://apps.who.int/nutrition/publications/policies/guidingprinciples-labelling-promoting-healthydiet/en/index.html

Nutrient profiling

Nutrient profiling is the science of classifying or ranking foods according to their nutritional composition for reasons related to preventing disease and promoting health. Nutrient profiling can be used for various applications, including marketing of foods to children, health and nutrition claims, product labeling logos or symbols, information and education, provision of food to public institutions, and the use of economic tools to orient food consumption.

Source: WHO. Nutrient Profiling: Report of a WHO/IASO Technical Meeting, London, United Kingdom 4–6 October 2010. Geneva: WHO; 2011. Internet: https://apps.who.int/iris/bitstream/handle/10665/336447/9789241502207-eng.pdf?sequence=1&isAllowed=y

Nutrition claims

Nutrition claim means any representation which states, suggests, or implies that a food has particular nutritional properties including but not limited to the energy value and to the content of protein, fat, and carbohydrates, as well as the content of vitamins and minerals. The following do not constitute nutrition claims: **(a)** the mention of substances in the list of ingredients; **(b)** the mention of nutrients as a mandatory part of nutrition labeling; **(c)** quantitative or qualitative declaration of certain nutrients or ingredients on the label if required by national legislation.

Source: Nutrition labels and health claims: the global regulatory environment. WHO by Corinna Hawkes; 2002.

Triple burden of malnutrition

The triple burden of malnutrition is a term that refers to the coexistence of overnutrition, undernutrition, and micronutrient deficiencies within individuals, households, and population.

Source: Pinstrup-Andersen P. Agricultural research and policy for better health and nutrition in developing countries: a food systems approach. Agricultural Economics. 2007;37(s1):187–98.

In Search of Advanced Technologies for Predicting Health and Disease Outcomes

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According to the Global Burden of Disease Study 2019, poor diets are responsible for an astounding 11 million deaths from noncommunicable diseases (NCDs) in adults annually.[1] This number represents more deaths than those caused by any other risk factors, including tobacco smoking. Just three dietary factors contribute to 50 percent of diet-related deaths: high consumption of sodium, low intakes of whole grains, and low intakes of fruits.

The lockdowns during the COVID-19 pandemic have massively encouraged the proliferation of unhealthy eating patterns, with increased consumption of highly processed 'empty' calories and a concomitant increase in weight gain among children and adults. In a recent article in *Nature Food*, Corinna Hawkes and Charlotte Gallagher Squires eloquently describe double-duty actions to address the double burden of malnutrition (DBM), and what is needed to build back better nutrition after the pandemic.[2] According to the *Lancet* Series on the Double Burden of Malnutrition, "double-duty actions aim to simultaneously prevent or reduce the risk of both nutritional deficiencies leading to underweight, wasting, stunting or micronutrient deficiencies, and obesity or diet-related NCDs, with the same intervention, programme, or policy."[3] It has taken me by surprise that the authors[2] do not consider nutrient profiling (NP) as a policy option for the post-COVID-19 era. They recommend social protection and school feeding programs, food system financing, and taxes and marketing restrictions. While these measures are of course important, I see NP as a robust policy option as part of a double-duty action. NP and front-of-pack (FOP) labeling could make a substantial contribution to building back better after the crisis, both in high-income countries (HIC) and in low- and middle-income countries (LMIC).

> **"NP and FOP labeling could make a substantial contribution to building back better after the COVID-19 crisis"**

The DBM in the Pacific Islands

Soon after taking over the helm at *Sight and Life* in 2005, I became interested in the DBM. I 'inherited' a project of the Island Food Community of Pohnpei run by the late Lois Englberger, aimed at the promotion of locally produced food among the indigenous population.[4] Then, as now, the Federated States of Micronesia (FSM) and other islands in the Pacific were experiencing an unparalleled nutrition and health crisis. In 2002, WHO surveyed NCD risk factors in Micronesia and found 73.1 percent of the adult population were overweight, 42.6 percent were obese, and 32.1 percent had type 2 diabetes. These numbers have continued to increase until the present time. For instance, the Global Nutrition Report revealed that 79.8 percent of women in the FSM were overweight and 51.5 percent were obese in 2016.[5]

In early 2006, I visited Pohnpei together with the photojournalist Ulla Lohmann and Thomas Breisach (now Professor of Health and Social Management at FOM University), to to produce a documentary on the DBM on that island. We defined the DBM at thattime as the simultaneous presence of micronutrient deficiencies and overweight/obesity. The DBM in Micronesia has resulted from the increased consumption of cheap, empty calories from imported foods (e.g., rice, spam, and turkey tails), the abandonment of traditional food systems, and the adoption of sedentary lifestyles.

A US Navy survey in Micronesia in the late 1940s observed virtually no overweight, hypertension, or diabetes in the population. Dietary patterns changed radically during the late 1960s and 1970s, however, this shift coinciding with the introduction of US subsidies and USDA school feeding programs (after WWII, Micronesia was administered by the USA until 1986, when the islands became independent).[6] The traditional food system included bananas, breadfruit, taro, yam, and pandanus, combined with fish

and other seafood. Besides their carbohydrate content, these indigenous staples also provide considerable amounts of minerals and vitamins.

The nutrionist Lois Englberger always traveled to international conferences with food samples from Micronesia in her suitcase. In an early form of crowdsourcing, Lois engaged colleagues from across the world to get the nutrients of these foods analyzed. This significantly contributed to the literature of indigenous food composition data for Micronesia. We had quite a number of samples analyzed in Switzerland and found, for instance, high provitamin A carotenoid levels in yellow- and orange-fleshed banana, taro, and breadfruit. Access to reliable local food composition data is required for meaningful NP, and this is frequently missing for indigenous foods from LMIC.

"The Pacific Islands are certainly an extreme example of broken food systems"

The Pacific Islands are certainly an extreme example of broken food systems resulting from flawed trade policies, subsidies, and incentives, compounded by the culture of the indigenous people themselves. I generally dislike using the term 'broken' to describe food systems, but in the case of the Pacific Islands, it is no exaggeration.

Sharing insights into nutrient profiling

This *Sight and Life* Special Report on NP aims to compile knowledge and share case studies about NP in the hope of helping consumers to make healthier food choices. Creating demand for nutritious, safe, and affordable products is at the heart of many of our projects at *Sight and Life*, and we know how difficult this is. Would NP and FOP labeling have helped to reduce the DBM epidemic among Micronesians? Probably not by itself alone, because labeling policies must be concordant with other policies across sectors, such as those relating to trade, education, and social safety nets, and must not be contradicted by them.

The first NP model was the nutrition banding scheme of the UK Coronary Prevention Group in 1986. According to WHO, NP is "the science of classifying or ranking foods according to their nutritional composition for reasons related to preventing disease and promoting health."[7] NP models have not yet been designed to address the special food environment and culture in LMIC. Nor have fortified foods (similar to dietary diversity scores, DDS) been taken into consideration yet. In my opinion, however, NP could become an important tool for the guidance of policy and consumer choice in favor of nutritious food in LMIC.

From the above, it should follow that without quality data on food composition and consumption, it will remain difficult to encourage the shift towards healthy and nutrient-adequate diets. We need data to objectively guide the production and consumption of food – fresh produce and processed foods, alike. Dietary assessment relies on self-reported data, can be cumbersome, and may not be precise. In a soon to be published three-country survey study assessing nutrient density as a dimension of dietary quality, energy intake was found not to differ between normal-weight and obese women. This indicates that self-reported data has to be treated with caution. Health-conscious people residing primarily in HIC are increasingly demanding means for rapidly assessing the composition of foods and meals. This is reflected in the proliferation of smartphone-based dietary assessment apps, which use pictures of food and meals processed by artificial intelligence and deep learning to calculate nutrient profiles. However, the technology also requires high-quality food composition data to determine reliable intake data.

"Without quality data, it will remain difficult to encourage the shift towards healthy and nutrient-adequate diets"

The potential of nutrimetabolomics

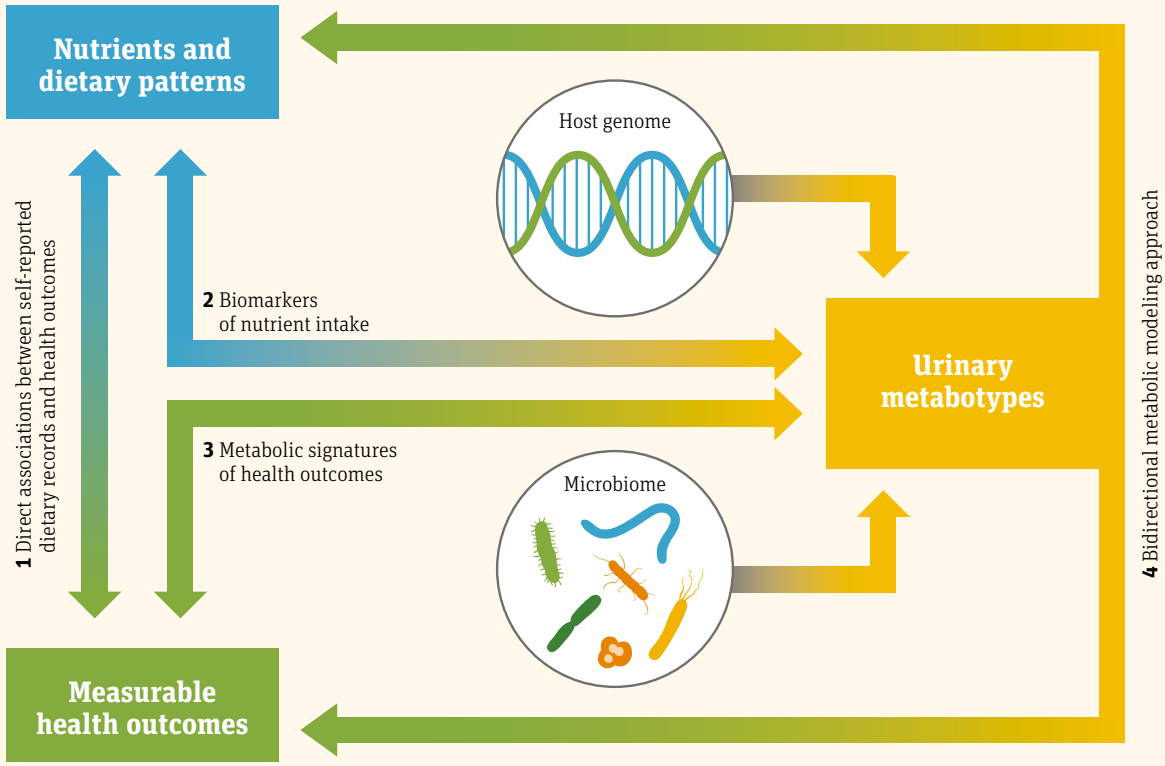
Foods contain not only macro- and micronutrients but also a plethora of biologically active plant compounds – phytochemicals such as flavonoids and carotenoids that have been connected with disease prevention. I see great potential in a new development, nutrimetabolomics, for assessing the effects of foods and diets on the metabolome in urine.

In a recent study, 46 metabolites predicted healthy and unhealthy dietary patterns in a US and UK cohort.[8] Nutrimetabolomics allows for the objective assessment of urinary biomarkers as a result of the interaction between the food consumed, the genome, and the gut microbiome of individuals. This results in metabolic signatures of health outcomes independent of subjective food consumption data (**Figure 1**).

This work may lead to the identification of functional nutritional phenotypes related to health and disease outcomes. At *Sight and Life*, we plan to deploy urinary nutrimetabolomics to objectively assess egg consumption among Malawian children exposed to social marketing campaigns that promote eggs. This will provide consumption data independent of subjective reporting on the part of mothers and will be related to child growth and development.

Omics technologies such as nutrimetabolomics could become the next generation of NP and help to identify what constitutes a healthy diet as well as NCD risk factors. Omics technologies may have a long way to go, but they may offer a 'leapfrog' technology in the context of LMIC – one not influenced by self-reported data

FIGURE 1: The use of metabolites to predict dietary patterns



Source: Posma et al. 2020;[8] reproduced and redrawn by kind permission of *Springer Nature*

and the lack of food composition data, and thus not leading to inaccurate assumptions about nutrition and health.

> **"Omics technologies such as nutrimetabolomics could become the next generation of NP"**

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Nutrient Profiling (NP): A 10-step road map for producing nutritious foods

DRIVERS

Double burden of malnutrition

Lack of food standards regulation(governing, for example, health claims)

Government and private-sector reformulation schemes

Development of government procurement guidelines for nutritious and healthy food

STEPS

TO DEVELOP AN NP MODEL

1. Decide on the **nutrient composition data**
2. Decide whether the model should be **across the board** (all foods) or **category specific** (‘best of class’)
3. Select nutrients **to limit**
4. Select nutrients **of public health concern**
5. Address **protein quality**
6. Select nutrient **standards**
7. Select the basis used for **calculation:** per 100 g, 100 kcal, or serving size
8. Decide whether the NP models should be **compensatory**
9. **Formulate** the NP algorithm
10. **Compare** with other NP models using the same database

OUTCOMES

Context-driven tool to support the production of nutritious food

Support engagement of small and medium-sized enterprises at country level to produce nutritious food

Increased availability of nutritious food

Informed food choices

Improved health and nutrition

Reference: Adam Drewnowski, Daniel Amanquah, Breda Gavin-Smith, Perspective: How to Develop Nutrient Profiling Models Intended for Global Use: A Manual, Advances in Nutrition, Volume 12, Issue 3, May 2021, Pages 609–620, https://doi.org/10.1093/advances/nmab018

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The Evidence Base

New Nutrient Profiling Methods for Global Public Health

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Is sparkling water a nutrient-dense beverage? It is, according to the 2020–2025 edition of the Dietary Guidelines for Americans.[1] In high-income countries, the concept of nutrient density has come to be defined as the absence in foods of calories, fat, sugar, and salt.[2] As a result, sparkling water is considered to be nutrient-dense, even though it contains no calories and no nutrients.[1] That particular concept would not apply to low- and middle-income countries (LMIC), where dietary inadequacies and hunger remain issues of pressing public health concern.[3,4] In those countries, nutrient-rich foods are viewed, correctly, as those that provide adequate dietary energy, high-quality protein, and a wide range of essential vitamins and minerals.[3,5]

Nutrient profiling (NP) aims to address and remedy a public health problem.[6,7] In high-income countries, that problem was obesity and noncommunicable diseases.[6,8] Nutrient density scores deliberately penalized excess calories, fat, sugar, and salt, providing a quasi-scientific rationale for any number of labeling, regulatory, and tax initiatives, all aimed at reducing the consumption of energy-dense foods[9,10] Favored were those foods and beverages that were free from calories, total or added sugars, and saturated fat.[8–10] This is why sparkling water qualified as nutrient-dense, whereas human breast milk laden with sugar and saturated fat probably would not.[1,11]

Regional nutrient profiling models

That different world regions face different public health problems has been noted by the World Health Organization.[6] To serve as public policy tools, NP models may need to become more territorial and context specific. The goal of regional NP models would be to acknowledge the continuing need for beneficial nutrients (protein, fiber, vitamins, and minerals) along with adequate energy intakes.[5] Rather than penalize dietary energy, nutrient density metrics for low-income countries ought to address potential protein undernutrition and likely micronutrient deficiencies, otherwise known as hidden hunger.[5] The relative nutritional value of different foods can be driven by regional nutrient needs. Regional NP models would also need to recognize the value of fortified processed foods that can provide nutrient density at an affordable cost.[12]

"Affordable nutrient density is key"

Measures of the nutritional value of foods ought to be related to food prices and to prevailing incomes. Affordable nutrient density depends on local food prices.[13,14] Lower-cost diets can provide dietary energy from grains, sugar, and fat, and yet can be deficient in high-quality protein, vitamin A, thiamine, vitamin B_{12}, calcium, iron, iodine, and zinc.[15] In high- and low-income countries alike, 'empty' calories cost less, whereas most nutrient-rich foods cost more.[16] As always, affordable nutrient density is key.[17]

Nutrient density metrics

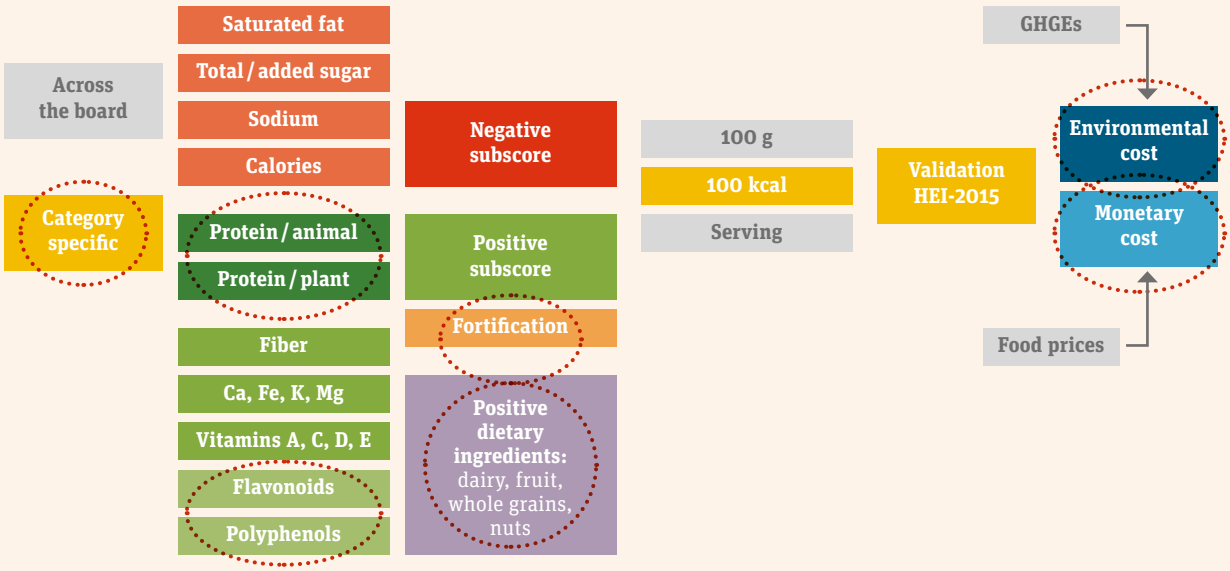
The development of nutrient density metrics requires data on both food composition and food prices.[18,19] In the USA, the USDA FoodData Central website provides the nutrient composition of all foods listed in the What We Eat in America studies, along with their ingredients.[20,21] For other countries, the FAO International Network of Food Data Systems (INFOODS) and the World Nutrient Databases for Dietary Studies (WNDDS) portal are useful resources.[22,23] The necessary nutrient standards for the development of NP models can be obtained from regional governments or international bodies. The Codex Alimentarius nutrient reference values are listed in the WHO/FAO Vitamin and Mineral Requirements in Human Nutrition.[24] These can be replaced by local standards when available.

The Nutrient Rich Foods (NRF) index, a nutrient density scoring tool, is based on two subscores: NR and LIM.[18,19] The positive NR subscore is the sum of percent daily values for a variable number of nutrients to encourage, expressed per 100 kcal and capped at 100 percent. The negative LIM subscore is based on three nutrients to limit: saturated fat, total or added sugar, and sodium. The final NRF algorithm is given by NRF = NR – LIM.

Uses of nutrient profiling

NP has found a variety of uses worldwide. Initially, NP ratings were intended to guide consumer choices in supermarkets and grocery stores.[8] NP models were also the basis for adjudicating nutrition and health claims, and for regulating marketing and advertising to children.[8] But the greatest impact of NP on global public health may come from the use of nutrient density metrics

FIGURE 1: A scheme for nutrient profiling of foods indicating areas of interest (ringed by dotted lines)



Source: Author

to guide product innovation and reformulation by the food industry.[25,26] Food reformulation is not limited to reducing the food's content of energy, fat, sugar, and salt. Rather, reformulation can include fortification with vitamins and minerals, and the addition to foods of desirable ingredients, such as whole grains, dairy, fruit, nuts, and seeds.[26] Technological innovations have also allowed the development of high-quality plant-based proteins.[27] These initiatives to improve the nutrient density of processed foods need to be captured by appropriate NP models.[28]

> **"The greatest impact of NP on global public health may come from the use of nutrient density metrics to guide product innovation and reformulation"**

There is also a new emphasis on protein quality.[28] Since most of the protein consumed in high-income countries is animal-source protein, protein quality was never an issue in NP models.[3] Adjusting the protein content of foods using the Protein Digestibility Corrected Amino Acid Score (PDCAAS) has implications for NP and nutrient density ratings.[28] Protein quality and amino acid balance depend on food source; whereas the PDCAAS value for milk and egg protein is 1.0, that number is sharply reduced for protein from nuts, wheat, or rice. Never a concern in high-income countries, protein quality is an issue for populations subsisting on diets of cassava or rice.[3,29,30]

NP methodology continues to evolve and innovate as new databases enter the public domain. The NRF swapped vitamin E for vitamin D when those data became available. The nutritional value of fruit was better captured using the new flavonoid database, and data on polyphenols will allow for better nutrient density assessment of other plant-based foods. Data on the iodine content of foods will also be useful but are not always readily available.

Category-specific models

The current trend is to develop category-specific models to identify 'best-in-class' items within a given food group[31] and so guide innovation and product (re)formulation. Another trend is to assess the relationship between a food's nutritional value and its cost,[32] using prices per 1,000 kcal or per nutrient. Studies have tested NP models with respect to energy density and price,[33,34] and identified lowest-cost sources of high-quality protein, vitamin A, calcium, iron, and zinc. The goal was to ensure that high-scoring foods were not simply those foods that were more expensive.[33,34]

Assuring affordable nutrient density

The initial goal of most NP models was to prevent obesity in high-income countries by penalizing energy-dense foods.[35–37] First, the pattern of nutrient deficiencies among LMIC may not be comparable with the excesses and deficits observed in wealthy societies.[38] Second, food sources of common nutrients can be very different, especially among those countries with the traditional diet of starchy staples.[39] Specific nutrient deficiencies in LMIC include but are not limited to vitamin A, vitamin B_2, vitamin D,

folate, iodine, calcium, iron, and zinc. Adequate protein quality (from animal or plant sources) is another emerging issue. New NP models intended for global use need to address the still-prevalent vitamin and mineral deficiencies.

"New NP models can help identify foods that are nutrient-rich, affordable, and appealing"

Assuring affordable nutrient density among LMIC can be a challenge.[40] The FAO report stressed that healthy diets may be, on average, five times more expensive than diets that only meet energy needs through a starchy staple.[28] To allow widespread adoption of healthier options, the cost of nutritious foods needs to come down. New NP models can help identify foods that are nutrient-rich, affordable, and appealing (**Figure 1**).

Disclosure

Adam Drewnowski is the developer of the Nutrient Rich Foods (NRF) index, a nutrient profiling model, and has received grants, contracts, and honoraria from entities, both public and private, with an interest in improving methods to assess the nutrient density of foods.

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Assessing the Micronutrient Quality of Foods Using a Modified Nutrient Profiling Model (NPM)

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Introduction

The COVID-19 crisis has highlighted the roles that both the public and private sector need to play to gain momentum in the fight to eradicate malnutrition and hunger worldwide.[1] The Access to Nutrition Initiative (ATNI) is dedicated to objectively assessing and driving change to improve the contributions of the private sector to tackle all forms of malnutrition. In 2018, ATNI published its first Product Profile, an independent assessment of the nutritional quality of companies' portfolios using the Health Star Rating (HSR) nutrient profiling model (NPM) developed by the Australian Government.[2] The components of NPMs that exist to date focus primarily on applications aimed at preventing or addressing malnutrition in the form of obesity, overweight, and diet-related noncommunicable diseases – for example, regulations on the marketing of foods and beverages to children. At the same time, it has become noticeable that NPMs can also be used by food manufacturers for the purposes of reformulation. A gap has been identified in current government-endorsed models whereby key micronutrients found in products are not successfully evaluated. Micronutrients are an essential part of a healthy diet, and micronutrient deficiencies, also known as 'hidden hunger,' are associated with critical public health challenges.[3]

> **"Micronutrient deficiencies are associated with critical public health challenges"**

In 2019, ATNI initiated a pilot project* to assess whether a new NPM that evaluates relevant micronutrients present in packaged foods can add value to its existing Product Profile. Such a model could help to provide a fuller picture of the nutritional quality of foods sold by manufacturers globally and locally, and ultimately stimulate them to improve their products and increase their contribution to public health. To achieve this, a model that could easily be adapted to include the most relevant micronutrients for public health challenges in specific markets/regions would be needed.

Current scope of nutrient profiling models: Opportunities and challenges

A literature review of 78 NPMs,[4] endorsed by governmental or intergovernmental organizations and carried out by Université Laval, found that existing NPMs have been fabricated primarily for school food standards or guidelines, front-of-pack food labeling, and restricting the marketing of foods and beverages to children. The outcome of this literature review was shared and discussed during an ATNI multistakeholder roundtable meeting. Participants confirmed that no existing NPM would be suitable to meet the project's goals.

The ATNI micronutrient-enhanced NPM Project

In phase 1, The George Institute for Global Health (TGI) was commissioned to explore whether a modified HSR (mHSR) model, which incorporates relevant micronutrients in the algorithm, could distinguish between healthy and less healthy products, given that the HSR has already been used by ATNI in its Product Profile. Two approaches were identified for the development of a new NPM that were pilot tested using data from Australia and India: (**1**) an mHSR system that incorporates micronutrients; and (**2**) a separate, simple micronutrient scoring system that can be used alongside the existing original HSR.

Information from the Australian FoodSwitch dataset was utilized to develop the new NPM, given the large availability of data points. A total of 73,406 foods were used to develop the initial test models. FoodSwitch presents an overall nutritional profile of foods according to the information obtained from the nutrition labeling on packaged foods. Both product nutrition labeling and imputed micronutrients values were used in the models. The Indian FoodSwitch dataset was used to further validate the new model.

India was selected as the pilot country to test the results from the Australian FoodSwitch dataset for two main reasons:

(1) The high incidence of double burden of malnutrition and micronutrient deficiencies and growing consumption of packaged foods. Iron, vitamin A, vitamin B_{12}, vitamin D, folic acid, and iodine were selected for this test, based on the attribut-

able disease burden[5] and India's Food Safety and Standards Authority (FSSAI) guidelines.[6]

(2) Data availability: ATNI and TGI had previously generated a dataset of the largest Indian food manufacturers in 2020 for its second India Spotlight Index.

Following the completion of this pilot study in India, the first approach – an mHSR system that incorporates micronutrients – was selected for phase 2 of the project. Performance criteria are summarized in **Box 1**. A simple scoring system was applied, with points assigned based on the percentage of the Nutrient Reference Value (NRV) present per 100 g or per 100 ml of product. The pilot assessed products as 'high' in micronutrient content according to the Codex definition of a high micronutrient level at 15 percent of NRV per 100 g (solids) or 7.5 percent of NRV per 100 ml (liquids).[7]

BOX 1: Performance criteria for mHSR models

Two criteria for the application of the new HSR model to packaged foods and beverages were initially established.

Performance criteria

1. Only a minimal number of unhealthy foods high in energy, salt, sugar, or saturated fat can improve their health star rating by adding or already containing micronutrients.
2. Moderately healthy foods containing micronutrients should see an improvement in health star rating with the inclusion of micronutrients in the algorithm.

Overall, five different mHSR models were tested, and the mHSR model incorporating micronutrient points instead of protein points was found to be the most effective at meeting both performance criteria. Therefore, this was the final model chosen for the second phase of the project. The original and modified models are summarized in **Box 2**.

In phase 2, ATNI invited companies participating in the Global Access to Nutrition Index 2021 to share, when available, micronutrient data for the products selected for the Product Profile assessment. Product information from five companies across three low- and middle-income countries (LMICs) – namely, India, Mexico, and South Africa – was used to test the modified nutrient profile. This validation study included 1,890 products in the final analysis and showed that the overall mean HSR improved when using the mHSR system. However, due to limitations in the availability of product data describing micronutrients, the analysis relied heavily on proxy values applied at the food category level, which may limit the capacity to discriminate between products. Further results from this study will be published during the second half of 2021.

BOX 2: Original HSR system and modified version accounting for micronutrients

Original Health Star Rating points

Baseline points – (V points) – (P points) – (F points)

Baseline points comprise the total points for energy, saturated fat, sugar, and sodium level in a product; V points comprise the points for fruits, nuts, vegetables, and legumes content in a product; P points comprise the points for protein levels in a product; and F points comprise the points for fiber levels in a product. Fewer points = more stars = a healthier choice.

New modified Health Star Rating points

Baseline points – (V points) – (F points) – (M points)

Protein points are excluded from this mHSR algorithm. This is because the inclusion of protein points as modifying points in the mHSR system was probably double counting, as protein in HSR is a marker for micronutrients. M points comprise the total points for micronutrient content in a product. V points and F points remain unchanged. Similar to the original HSR, fewer points = more stars = a healthier choice.

Conclusions

ATNI's project to develop a micronutrient-enhanced NPM has demonstrated that the explicit incorporation of micronutrient values into nutrient profiling is plausible and can be objectively evaluated. An mHSR model with micronutrient points instead of protein points worked well in elevating the scores of healthier products that contain micronutrients, without significantly boosting the scores of unhealthy products containing micronutrients.

"The explicit incorporation of micronutrient values into nutrient profiling is plausible and can be objectively evaluated"

In the coming months, the project team will continue to assess whether the model will help to discern between the nutrition quality of the product portfolios of different companies and explore its relevance, particularly for use in LMICs. To improve private-sector accountability, ATNI is confident that this research project will contribute to strengthening the assessments of the nutritional quality of packaged foods and beverages, taking micronutrients into consideration.

Acknowledgements

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- The George Institute for Global Health team comprising Maria Shahid, Liping Huang, Fraser Taylor, and Bruce Neal, who led the development of the mHSR systems.
- ATNI's Expert Group member Professor Mike Rayner, for his valuable inputs and advice on this project.

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1 ATNI has been tracking publicly available information on industry's response globally to the COVID-19 crisis, and reported on trends, best practices, and areas of concern in separate reports. Read more about how companies can positively contribute to addressing the global nutrition challenges in ATNI's COVID-19 Project: https://accesstonutrition.org/project/atni-covid-19-project/

2 The selection of HSR occurred after consensus with the ATNI Expert Group, and followed the following criteria: (1) developed with extensive, appropriate stakeholder consultation; (2) covers the majority of categories of foods and beverages available on the market; (3) designed to assess foods in the general market (i.e., not just school or hospital foods); (4) well validated with results published in peer-reviewed literature, demonstrating that the model produces internally consistent classification of 'healthy' and 'unhealthy' foods, consistent with general nutrition principles; (5) enables differentiation of nutritional quality within and between categories; and (6) algorithm is available in the public domain. Products are given an HSR of between 0.5 (low nutritional quality) and five (high nutritional quality). Further information is available here: http://healthstarrating.gov.au/internet/healthstarrating/publishing.nsf/content/home

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"This Is the Moment to Step Up"

Interview with Shawn Baker

Shawn Baker is Chief Nutritionist at USAID, the US Agency for International Development. He discusses the agency's response to the COVID-19 pandemic and the need for a joined-up, evidence-based, and adequately funded approach to the challenges it has created for nutrition, as well as context-specific flexibility in the application of nutrient profiling.

***Sight and Life* (SAL):** *Shawn, you joined USAID as Chief Nutritionist in February 2020. What attracted you to the role?*

Shawn Baker (SB): The compelling case for me to take on this role was that USAID is very much a country-facing organization in terms of financial resources, human resources, and decision-making, as well as being one of the world's major donors in three of the sectors that are most critical for good nutrition – health, agriculture and food systems, and humanitarian assistance. Our presence in these sectors, along with our dedication to looking at existing evidence, generating further evidence where necessary and using evidence to drive impact, working hand in hand with our partner governments and stakeholders, makes USAID a very powerful player in helping to drive the global nutrition agenda.

Of course, like many other organizations, we've had to ask ourselves how to put all the 'moving parts' of nutrition together in a coherent way. Over time, we've built the necessary architecture internally at USAID, through the creation of the Nutrition Technical Working Group, which draws on the expertise of the USAID 'pillar' bureaus serving these three big sectors and has elevated these capabilities to the management level through the Nutrition Leadership Council, which includes the regional bureaus, with their important role of overseeing our missions.

Part of my day job is to chair this council and ensure that we coordinate our efforts effectively – not just in technical terms but also at a managerial and 'voice' level, so that we elevate nutrition to the status of a huge priority for USAID internally and also use that voice externally to encourage our partners to take nutrition more seriously and put the necessary financial and political resources behind it. So that was the premise on which I joined the agency, and although I've been teleworking almost since the moment I joined, I can say that this approach has been delivering some very positive results, and I feel incredibly privileged to occupy this position.

SAL: *What has most surprised you since joining?*

SB: The pandemic, which hit us the moment after I'd joined! In all seriousness, the COVID-19 pandemic has been the biggest challenge to nutrition that I have witnessed in my past four decades in this sector. I think that USAID's response to the pandemic, and to the nutrition challenges it has brought with it, is proof that this joined-up approach really is working. We were able to put together agency guidance on nutrition in the context of COVID-19, first internally, and then to consult with our implementing partners across the world so as to be able to put out external guidance. When the Standing Together for Nutrition Consortium developed projections on the potential impacts of the pandemic on nutrition, we were able to socialize them across the agency very quickly, and use our voice externally to amplify these messages. Without having very strong coordination both on a technical level and on a 'voice' level, I think our response would have been more piecemeal rather than the all-agency response that we delivered.

"I've been inspired by the way that the foundations laid down over the course of decades have worked to deliver an effective response to this crisis"

Mother breastfeeding at nutrition training in Bugesera, Rwanda

So, to return to the question of what has surprised me most, I'd say that I've been surprised at how much of our work we've been able to carry on, but what has heartened me most is the degree of ingenuity, tenacity, and innovation that our implementing partners, partner governments, and mission staff have demonstrated in the face of this pandemic, which have allowed them to rapidly adapt to the new situation and keep nutrition on the agenda despite all the other topics competing for attention. In an 18-month period during which everyone has suffered in some way or another, I've been inspired by the way that the foundations laid down over the course of decades have worked to deliver an effective response to this crisis.

SAL: *Can you elaborate on USAID's immediate priorities now?*

SB: Yes, I've mentioned our three 'pillar' bureaus already. We recently organized a retreat to explore how these three bureaus can work together more closely. Our activities can be grouped into four programmatic areas and four technical or enabling areas, which cover our main priorities. I call it the '4 × 4'. On the programmatic side, we have – in no particular order – micronutrient deficiencies, maternal nutrition, children's diets, and wasting management. On the enabling side, we have positioning nutrition, financing nutrition, systematic reviews of capacity building, and metrics that matter. Our efforts are focused on these 4 × 4 thematic fields.

"Nutrition remains grossly under-resourced"

SAL: *What do you see as the challenges for the global nutrition community to achieving SDG 2, Zero Hunger, by 2030?*

SB: There's a short answer to this question and a long one. The short one is: political will. To give a more extended answer, we have a profound understanding of the problems that nutrition is facing, we have an ever-expanding set of tried and tested solutions, and we are also developing a much better picture of how to deliver these solutions at scale. However, nutrition remains grossly under-resourced. We need the political will to provide the necessary funding – and nutrition is still an astonishingly cost-effective investment in terms of the improvements it can bring to societies – and we need to hold people and organizations accountable for delivery. An already grave situation has been greatly intensified by the effects of the pandemic: only 17.3 percent of children in low- and middle-income countries receive a diet that meets the minimum nutritional requirements. In the face of the pandemic, a lot of people thought, "Well, nutrition can wait." But it can't wait. Damage is being done on a vast scale worldwide by

dietary insufficiencies and lack of access to nutrition services, and that damage is irreversible.

SAL: *What role does USAID as a leading donor organization strive to play in overcoming these challenges?*

SB: We have three essential types of asset to leverage: financial assets, technical and knowledge assets (through our partners in research and implementation), and convening assets (through our ability to bring key players together to focus on essential issues). We also place great emphasis on metrics that matter, which includes improving the quality and breadth of nutrition data collected through the Demographic and Health Surveys to fill in the many data gaps that still exist.

SAL: *Nutrient profile models have long been regarded as an important tool in supporting healthy consumer food choices, but this has largely been focused on the global north. Do you think such models could play a role in addressing malnutrition in low- and middle-income countries?*

SB: I'm not an expert in this area, although I of course have colleagues who are, but what I would certainly say is that context matters enormously when nutrient profiling is being considered. The concept of nutrient profiling might be universal, but I don't think that one standard can be expected to work in every situation. It requires contextual adaptation. And I don't think that nutrient profiling systems that have been developed in high-income, industrialized countries can be expected to be applicable to low- and middle-income countries. It's local food systems that need to be addressed here, and this involves gathering the necessary evidence so that you can shift the argument from an ideological to an evidence-based one. The role of data is key here, but also critical is close collaboration with all the relevant stakeholders – consumer associations, industry, and government, among others. I would say, though, that the Access to Nutrition Index already provides an excellent example of how to apply nutrient profiling to processed, packaged foods. We need a global food system that delivers safe, nutritious food, not nutrition-induced problems. The Food Systems Summit and the Nutrition for Growth Summit later this year are critical opportunities for us to deliver bold new commitments to this end. This is the moment to step up.

"We need a global food system that delivers nutritious food, not nutrition-induced problems"

SAL: *Thank you, Shawn, and let's hope those two big events will mark a real turning point for nutrition.*

SB: Thank you.

Shawn Baker was interviewed by Jonathan Steffen.

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Experience from the Field

The Chilean Labeling Law: Impact on the reformulation of foods

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Introduction

Chile is one of the countries with the highest prevalence of obesity worldwide (24.6 percent in school children aged 6–7 years, and 31.2 percent in the adult population › 15 years of age).[1] The prevalence of childhood obesity, which quadrupled between the 1980s and 1990s, is a cause for concern. Currently, more than 30 percent of Chilean children, and especially those in the most vulnerable socioeconomic groups, are obese. A diet that is high in saturated fats and sugars and a sedentary lifestyle are strong determinants of this trend in the child and adolescent population. It is worth noting that one-third of the energy consumed by Chileans comes from ultra-processed foods.[2] This fact led the country's health authorities in June 2016 to implement the Law of Food Labeling and Advertising. This legislation mandates that packaged foods and beverages containing amounts of added sugars, saturated fats, or sodium (salt) that are above established cutoff values for nutrients or energy must display up to four front-of-package (FOP) black warning labels (similar to a 'stop' traffic signal), with the words "high in [nutrient of concern]"[3,4] (**Figure 1**).

> **"One-third of the energy consumed by Chileans comes from ultra-processed foods"**

The cutoff values for critical nutrients were defined in accordance with the description of a Chilean Nutrition Profile (NP) system[1] based on the existing World Health Organization recommendations for the prevention of obesity and diet-related diseases.[5] They were applied only to processed foods.

This law seeks to create an adequate school environment, ensuring the sale of healthy foods in the kiosks and school cafeterias of Chile's educational establishments. Thus, products labeled with these black stamps as "high in" cannot be sold or distributed in the school food environment. In addition, there are general restrictions on food advertising, especially regarding adverts aimed at children under 14 years of age.[6]

FIGURE 1: Front-of-package (FOP) and advertising on packaged food labels*

* The four FOP labels are: high in sugars, high in saturated fats, high in sodium, and high in calories.
Source: Official newspaper of the Republic of Chile. 26 June 2015. Amends Supreme Decree No. 977 Republic of Chile. Food Sanitary Regulations, Decree 13.

With this strategy, the health authorities wanted to promote health awareness from an early age, encouraging children to avoid the bad eating habits that lead to a range of short- and long-term noncommunicable diseases. Moreover, the law forced food companies to reformulate their products according to the new NP. The law was implemented in three phases, with cutoffs becoming increasingly stricter at each of these stage gates (**Table 1**).

An exception was made regarding when the law came into force for small food producers; thus, the application of the labeling regulations only came into effect for them from 27 June 2019. In order to help these companies understand the regulations, the Ministry of Health (MINSAL), working through the regional ministerial secretariat (Seremi), implemented training workshops that were coordinated by the Chilean Agency for Food Safety and Quality (ACHIPIA).[7]

Impact on the reformulation of foods

A recent study by Reyes et al. (2020)[8] assessed the reformulation of foods and beverages during two periods: one before the implementation of the law (T0: January–February 2015 or 2016;

TABLE 1: Cutoff values for calories, fats, sugars, and sodium (salt) in processed foods[1]

Phase	June 2016*	June 2018	June 2019
Calories			
kcal/100 g	350	300	275
kcal/100 ml	100	80	70
Fats			
g/100 g	6	5	4
g/100 ml	3	3	3
Sugars			
g/100 g	22.5	15	10
g/100 ml	6	5	5
Sodium			
mg/100 g	800	500	400
mg/100 ml	100	100	100

*Date when the law came into force

n = 4,055 items), and the other during the first year after its implementation (T1: January–February 2017; *n* = 3,025 items).

For this work, they collected data in supermarkets in Santiago (where 30 percent of the population in Chile lives), and photographed all packaged foods and beverages available in these stores. Nutrient information declared on the food labels was compared between T0 and T1. The analytical sample included packaged foods and beverages with sales ≥ 1 percent of their specific food groups, according to Euromonitor International Database. A total of 26,748 products were photographed during the three data collection waves between 2015 and 2017. After each data collection wave, trained dietitians reviewed the photographs and entered general identifying information separately for each product, the ingredients list, and the amount of energy and nutrients per 100 g or 100 ml. The groups for this analysis were: beverages (sugar-sweetened, non-sugar-sweetened, and unsweetened); milks and milk-based drinks; yogurts; breakfast cereals (ready-to-eat and to be prepared); sweet baked products; desserts and ice creams; candies and sweet confectionery; sweet spreads; savory baked products; savory snacks; savory spreads; cheeses; ready-to-eat meals; sausages; non-sausage meat products; and soups (powder and ready-to-eat).

The results showed that the proportion of foods and beverages considered as unhealthy (i.e., "high in" energy, sugars, saturated fats, or sodium) decreased significantly, from 51 percent to 44 percent, and mostly in the food and beverage groups in which regulatory values were below the 75th percentile of the nutrient or energy distribution. The most frequent reductions were in the proportion of products "high in" sugar (beverages, milks and milk-based products, breakfast cereals, sweet baked products, and sweet and savory spreads) and products "high in" sodium (savory spreads, cheeses, ready-to-eat meals, sausages, and soups). Products "high in" saturated fats, by contrast, were reduced only in the case of some spreads (margarines, pâtés, and preparations of ground chicken, pork, or beef, or mixtures of these), and products "high in" energy only in the case of breakfast cereals and spreads. It remains to be seen how consumers react to these food composition changes, and whether this short-term reformulation will be sustained over time, especially following full implementation of the law.

> **"The most frequent reductions were in the proportion of products 'high in' sugar and sodium"**

How the food industry reacted to this law

First, it is pertinent to state that public policies related to health promotion are relevant for any societal development and that, from this point of view, the response of the food industry may be considered secondary to the main objective, which is to promote more healthy eating habits in the population as a whole.

In this regard, Corvalán et al. (2021)[9] have indicated that there is robust evidence showing the cost-effectiveness of the implementation of actions at the level of food environments in the prevention of obesity and associated diseases, in countries with a variety of political and economic contexts.

> **"Negative comments on the labeling law on the part of the food industry declined both before and after the law came into force"**

Having said that, a short summary of how the food industry reacted to this law compiled by Corvalán et al. (2021)[9] indicates that negative comments on the labeling law on the part of the food industry declined both before and after the law came into force. For example, claims that it was an economic threat declined from 32.5 percent to 9.7 percent, and claims that it was ambiguous for the industry declined from 8.0 percent to 1.7 percent. By contrast, positive comments increased: discourse on the industry's effort to cooperate with the law and the new standards rose from 25.5 percent to 29.6 percent, and observations highlighting that it was an incentive for innovation increased from 3.8 percent to 11.8 percent. An exception to this pattern was the discourse stating that the law was confusing for consumers, which climbed from 6.4 percent to 16.4 percent.[9*]

Conclusions

After the initial implementation of the Chilean Law of Food Labeling and Advertising, there was a significant decrease in the amounts of sugar and sodium in several groups of packaged foods and beverages. The labeling law can thus be seen as an appropriate and effective policy for encouraging nutrition in a healthier direction. In future, further studies should clarify how food reformulation will affect the quality of the population's diet and the concomitant impact on public health.

"The labeling law can be seen as an appropriate and effective policy for encouraging nutrition in a healthier direction"

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* Part of the present work was translated by the authors from this report. FAO is consequently not responsible for the content and the precision of the translation.

Nutritional Challenges in Ghana: How nutrient profiling (NP) can help shape nutrition choices

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Introduction

Although significant strides have been made in addressing poverty and malnutrition in Ghana, the latest national prevalence of stunting is 19 percent, with a higher prevalence of 33.1 percent in Northern Ghana. Similarly, anemia in women of reproductive age has remained stubbornly high at 42 percent.[1] Anemia is reported to be highest among adolescent girls, particularly those aged 15–19 years (47.7 percent).[2] Regrettably, in 2014, only 13 percent of children under 2 years of age met the requirement for the Minimum Acceptable Diet, indicating a persistent occurrence of malnutrition among this vulnerable group.[2] The consequences of chronic malnutrition in children include increased risk of noncommunicable diseases in their adult lives.[3]

The double burden of malnutrition in Ghana creates a need for tools to counter this trend. These tools include nutrient profiling (NP) models, food composition tables (FCTs), and food-based dietary guidelines (FBDGs). Like other low- and middle-income countries (LMICs), Ghana will need to integrate these tools with other health promotion policies in the fight to alleviate all forms of malnutrition.[4]

> **"The double burden of malnutrition in Ghana creates a need for tools to counter this trend"**

Nutrient profiling

Working with small and medium enterprises (SMEs) in Ghana, *Sight and Life* recognized the need for NP models that serve an LMIC context. NP models for LMICs can potentially capture the nutrient density of foods, especially fortified foods, as opposed to merely their energy density. *Sight and Life* initiated nutrient profile modeling using fortified OBAASIMA products as reference products.

OBAASIMA is a social business operating in partnership with private-sector food companies that seeks to improve the micronutrient intakes of women and families in Ghana. OBAASIMA uses a market-based model that requires food companies to develop, market, and sell nutritious foods that are low in salt, sugar, and fat, and are fortified with 18 vitamins and minerals available on the Ghanaian market. These packaged foods have the OBAASIMA logo, which signifies that they are fortified and nutritious. The OBAASIMA logo is a front-of-pack logo that is relatively new to the Ghanaian market. It serves as a differentiator that helps consumers to make quick, healthier, and informed purchasing decisions in a crowded market serving various fast-moving consumer goods product categories.

> **"The OBAASIMA logo helps consumers to make quick, healthier, and informed purchasing decisions"**

In the case of Ghana, developing an NP model included micronutrients to address the vitamin and mineral deficiencies still prevalent in the country, while also considering the inclusion of calories, fat, sugar, and salt.[5] This NP model can be utilized by other LMICs, with a specific focus on micronutrient levels.

The OBAASIMA Seal is a market-based approach aimed at addressing micronutrient deficiencies across the food chain, from production to demand creation

A study by Drewnowski et al.[5] assessed the nutrient density of selected foods sold in Ghana, paying special attention to fortified products. Apart from OBAASIMA products and some imported foods, nutrient composition data for vitamins, minerals, and trace elements were largely incomplete on the food labels. This underscores the importance of appropriate labeling and the need for updated nutrient composition/food composition databases to include packaged foods that are available in the Ghanaian market.

Tools needed to implement nutrient profiling in Ghana

Although Ghana has currently not adopted any NP model, some significant work has been done to determine what an acceptable nutritious diet might look like, coupled with efforts to complete the FCTs and FBDGs. The nature of NP models depends largely on the extent and quality of the available nutrient composition data.[5] Some of the tools necessary to develop NP models are explored below.

1) Food composition tables and food-based dietary guidelines

Ghana, like many LMICs, requires updated FCTs. The West African FCT that is currently being used was last updated 9 years ago,[6] and electronic access to this data is lacking. Food composition data has a wide variety of uses, including matching foods with nutrients from dietary assessment data to conduct analyses, nutrition labeling, policymaking, and the formulation of nutrition-sensitive agriculture policies.[7]

FBDGs are science-based recommendations in the form of guidelines for healthy eating.[8] Ghana currently lacks FBDGs; however, the development of country-level FCTs can provide consumers with evidence-based nutrition recommendations. Also, when combined with dietary consumption data, FBDGs can provide a picture of the types of foods available and consumed. In addition, nutritional data on food consumption can help policymakers make more informed decisions, tailored to the nutritional needs of a specific country.[9] The adoption of food composition data from other countries might not help policymakers understand the roots of national problems.

2) Food product labeling

A study by Laar et al.[10] in Ghana showed that the extent of enforcement regarding nutritional labeling is minimal. To date, the Government of Ghana has taken little action to establish either food composition standards for out-of-home meals, or a nutrition information system for consumer-oriented labeling on food packaging to enable consumers to make informed choices.[10]

How companies are reacting to the shifting focus to improved nutrition

Medium to large companies have become aware of food fortification, and are attempting to scale up efforts in voluntary food fortification. Ghana has a mandatory fortification scheme for salt, wheat flour, and vegetable cooking oil; however, it has limitations, as maize and cassava, two of the most consumed staples, are not considered under this scheme. Most SMEs have a reactionary approach to nutritious foods rather than being market leaders.

> **"Unless food fortification becomes mandatory, SMEs will face too many challenges in the voluntary production of nutritious foods"**

From experience on the ground, unless food fortification becomes mandatory, SMEs will face too many challenges in the voluntary production of nutritious foods.[11] Food companies in LMICs report that marketing and selling nutritious foods to consumers, especially bottom-of-the-pyramid consumers, is currently difficult. This is because of the high production and transportation costs involved, the lack of consumer demand, and the high cost of vitamin/mineral premixes. Demand-generation activities and an enabling environment can play a key role in increasing the availability of nutritious, desirable, and affordable foods to consumers who need them most.[12] Despite these challenges, the OBAASIMA social business has demonstrated that these issues can be overcome through a partnership approach with the right public and private mix, pooling capacity, resources, knowledge, and expertise.

When adapted by governments for nationwide application, NP models can be very useful for planning nutrition interventions, and can play a pivotal role for private-sector companies. They can consequently reinforce the marketing of nutritious foods and support more informed food purchasing decisions.

In conclusion, based on both academic and fieldwork experience, *Sight and Life* emphasizes the need for NP models that are appropriate for the nutritional needs of individual LMICs. This analysis work, undertaken in Ghana, can be applied to several LMICs to assist consumers in making nutritious food choices, and to create an enabling environment for companies producing nutritious foods.

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"It's about the Contribution We Make to Society as a Whole"

Interview with Samuel Kwame Ntim-Adu

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Samuel Kwame Ntim-Adu is Chief Executive Officer & Managing Director of Yedent Agro Group of Companies, which produces healthy and affordable cereal foods for Ghana, Africa, and beyond. The company's vision is to become a premiere multinational fortified food manufacturer. Samuel discusses the role of nutrient profiling in making nutritious and affordable foods more widely available to consumers in the region.

***Sight and Life* (SAL):** *Before we speak about what Yedent does, Samuel, can we talk about the company's name? What does 'Yedent' mean?*

Samuel Kwame Ntim-Adu (SKN-A): Many people ask that question! It's a synthesis of the names of my mother and one of my sisters. I had four sisters when I was growing up, and my first job after university was with Unilever. The day before I started in that first job, my sister died. My mother died of grief and physical complications not very long thereafter. And so when setting up a company of my own, I chose the name Yedent to honor them both – my mother, Yedua, who had been a very entrepreneurial woman, and my eldest sister, Denta. It was my way of thanking them both for everything they had given me.

SAL: *And what was the inspiration behind the company itself, Samuel?*

SKN-A: At Unilever I'd worked in the area of fortified salts to combat goiter, and this had given me important insights into the value of food fortification. I had read economics and business studies at university, and my job at Unilever had been in marketing, but I now see myself as a converted food scientist, nutritionist, and agriculturalist! I wanted to set up a company that could operate across the full nutrition value chain. Yedent was founded 14 years ago, and was one of the first companies in Ghana to engage in the voluntary fortification of corn soy blends.

Today, we employ about 80 people and deal with thousands of cereal smallholder farmers across the three Northern and Brong Ahafo Regions of Ghana. We produce custom cereal food products for schools, hospitals, and other sister companies, operating in collaboration with the Ghana Health Service. And we ensure that our products are affordable, as well as being nutritious and healthy: our products are approximately 50 percent lower in price than comparable products made by international companies.

SAL: *What nutrition challenges does the population of Ghana face today?*

SKN-A: The scientific literature and statistics are very clear on this. Ghana suffers from a lack of both macro- and micronutrients, and especially a lack of protein. Approximately 33 percent of Ghanaian children are stunted, and many women over the age of 14 suffer from iron deficiency. Incomes in general are low in the country, and animal protein is unaffordable for many people. Plant protein therefore has an important role to play in addressing the population's nutrition challenges.

> **"Plant protein has an important role in addressing Ghana's nutrition challenges"**

SAL: *And what sort of challenges do entrepreneurs in Ghana face when trying to set up businesses to address this need?*

SKN-A: Very many. It's extremely hard to raise money to set up a manufacturing facility when faced with interest rates of 30 percent. The Government's fiscal policy, with import taxes at 60–70 percent, is another barrier, as is the extremely strict national regulatory framework, which can be cumbersome and very frustrating. Above and beyond this, accessing routes to market is very difficult

in Ghana, and the many distribution challenges in the country mean that it can be extremely hard to get nutritious products to those who need them most.

SAL: *Significant bottlenecks, indeed. What about the opportunities?*

SKN-A: I look on Africa as the last frontier to be conquered economically. Africa feeds the rest of the world with raw materials. The continent is indeed challenged on many fronts, but there are also so many opportunities. Almost one-third of all arable land in the world is in Africa, and the continent also has the world's fastest-growing population, with the fastest rate of urbanization. In 15 years' time, almost half of all the youth in the world will be African. And with a growing middle class, there is a growing awareness of the importance of health, and specifically of good nutrition.

> **"Africa is challenged on many fronts, but there are also so many opportunities"**

SAL: *What, in your opinion, is the role of the OBAASIMA seal in encouraging nutritious food choices among the Ghanaian population?*

SKN-A: Thomas Edison once said that "The doctor of the future will give no medication but will interest his patients in the care of the human frame, diet and in the cause and prevention of disease." The OBAASIMA seal is designed to create awareness of good nutrition, but promotion of the seal is not enough in itself: the food products bearing the seal also need promotion. Consumers may be guided by the OBAASIMA seal, but they don't eat it. If it is to truly achieve its aims, OBAASIMA requires a significant investment and a much less bureaucratic structure. And producers of nutritious foods in Ghana require a significantly more supportive operating environment.

SAL: *Is Yedent currently using nutrient profiling in the development of its products?*

SKN-A: Nutrition profiling is a relatively new concept for us, so we're not actively using it at the moment. We will, however, be drawing on the support of *Sight and Life* to explore its potential benefits and applications.

SAL: *You have described the work of Yedent in terms of significant challenges as well as significant opportunities, Samuel. On the basis of your experience of the past 14 years, and looking at the public health picture in Ghana as a whole, would you advise other small and medium-sized enterprises in the country to get involved in the production and supply of nutritious foods?*

SKN-A: I absolutely would. It's not about the bottom line: it's about the contribution we make to society as a whole. If our children don't have nutritious food, they will have missed the boat, and we will have failed them. It's as simple as that.

SAL: *Thank you, Samuel, and the best of luck with your future endeavors.*

SKN-A: Thank you.

Samuel Kwame Ntim-Adu was interviewed by Jonathan Steffen.

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How Understanding Human Behavior Can Increase the Effectiveness of Nutrient Profiling

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Introduction

Malnutrition has been identified as the most dangerous single threat to global public health.[1] It is a universal issue and every country in the world is affected by one or more forms of malnutrition.[2] Many countries are currently undergoing a 'nutrition transition' and face a unique triple burden of malnutrition whereby food insecurity, undernutrition, and micronutrient deficiencies coexist alongside overweight and obesity.

> **"Nearly one in three people in the world suffers from at least one form of malnutrition"**

Among children under 5 years of age, 149 million are stunted, 49.5 million are wasted, and 40.1 million are overweight. There are also 677.6 million obese adults.[3] To put these figures into perspective, today nearly one in three people in the world suffers from at least one form of malnutrition, and one-quarter of children worldwide below the age of 5 years are stunted due to malnutrition. This burden is predicted to increase.[4]

These alarming figures leave us with the question: *Why are so many children eating too little of what they need, while an increasing number of children and adults are eating too much of what they do not need?*[5]

A focus on health education and promotion

Answering these key questions and subsequently achieving nutritional outcomes requires that individuals, communities, and organizations change their behaviors. Some of the most frequently used tools to change behavior are health education and media campaigns. These aim to increase knowledge and raise awareness of what a healthy diet should (and should not) include. Nutritional profiling has been used to support these initiatives, and adding profiling data to food packaging has been a way to better inform consumers and support changes in eating behaviors.

Nutrient profiling is the science of classifying or ranking foods according to their nutritional composition for reasons related to preventing disease and promoting health.[6] Instead of explicitly dictating what people should and should not eat, it aims to give individuals the necessary information about the overall nutritional quality of the food, then leave the choice to them.[7]

> **"Simplicity is key when it comes to presenting nutritional information"**

This is as relevant for the developing world as the developed, where the fast-food proliferation movement has effected a radical shift in eating patterns.[8] Simplicity is key when it comes to presenting nutritional information.[7] This evidence has led to the creation of many nutritional rating systems. Examples of these systems include NuVal and ANDI. NuVal attributes (based on the US Government's Code of Federal Regulations) guide American consumers to foods and beverages with specific properties (such as gluten-free, organic, and low sodium) that can help them have a healthier lifestyle.[9] The ANDI score, on the other hand, allows one to see which foods are the most nutrient-dense.[10] In addition, Epstein and colleagues developed the Traffic Light Diet in the 1970s. This is a structured eating plan that divides food according to the colors of traffic signals. Green is for low-calorie food (go) that can be eaten at any time; amber (caution) is for moderate-calorie food that can be eaten occasionally; and red (stop) is for high-calorie food that should be eaten rarely.

The traffic light system, or versions of it, have also been used in the USA as a quick and visual tool on the front of food packaging.[11,12] Other countries use different rating scales and symbols to communicate to consumers which foods are healthy. Developed

by the Australian Government and adopted in New Zealand, the Health Star Ratings is a front-of-pack labeling system that rates the overall nutrition profile of packaged foods and assigns them a star rating from half a star to five stars.[13]

With over 30 front-of-pack nutrition labeling regulations now endorsed by governments,[14] what impact has the nutrition profiling had on purchase behavior?

Past research studies have found that consumers favor nutrition labeling,[14,15] and countries where they have voluntary schemes have seen an increase in the number of companies adopting the labeling.[16] However, the actual reported impact on purchases is mixed and can vary based on product type, the way in which the nutritional profiling data is presented,[17,18] and whether shoppers view the nutritional data.[19]

Overall, this would suggest that the use of consumer-facing nutrition profiling labels is important, but not enough when it comes to achieving sustainable behavior change. *So, what else can be done to increase the impact on purchasing behaviors?* To answer this question, we need to have a greater understanding of human behavior.

> **"The reality is that people are less rational than policymakers and health professionals presume"**

Understanding human behavior

For the most part, current efforts around nutrition profiling are built on a 'rational' account of human behavior and on conscious and carefully considered decision-making. Health professionals and nutritionists often focus on people's beliefs, awareness, and attitudes as drivers of behavior. The common assumption here is that if people only knew of the damage their actions caused (awareness), or if they cared a little more (attitudes and values), they would change their behavior. However, the reality is that people are *less* rational than policymakers and health professionals presume.[20] As Ian Potter, past Director of the New Zealand Health Sponsorship Council, once remarked, *"It would be easy to give the public information and hope they change behavior, but we know that doesn't work very satisfactorily. [If it did] none of us would be obese, none of us would smoke and none of us would drive like lunatics."*[21]

Based on this understanding, if we want to have impact, we need to focus more on non-conscious decision-making processes, and on behavior, instead of developing interventions to increase awareness or change attitudes and intentions.

In a study conducted in a hospital's cafeteria, choice architecture was used with nutrient profiling data to increase the visibility and accessibility of healthier food and drink choices. Choice architecture is the design of different ways in which choices can be presented to consumers, and the impact of that presentation on consumer decision-making.[22] In the study, 'green' beverages and sandwiches were placed at eye level, whereas 'red' products were moved to lower shelves. They also positioned healthier items, such as salads, near less healthy ones (e.g., pizza), and made bottled water available throughout the cafeteria. The study analyzed the impact of the interventions after 2 years in order to answer whether the healthy choices made would persist over a longer period of time, or if patrons and employees would acclimatize to the interventions and revert to their previous behavior. Encouragingly, employees at the hospital purchased unhealthy beverages 39 percent less often than they did before the implementation of the interventions.[23]

> **"Environmental approaches may be a promising way to prompt healthy food choices"**

Conclusion

If we want to effectively address all forms of malnutrition, we need to move beyond information-giving, and draw upon the ever-evolving understanding of human behavior to develop more effective interventions. While nutrition profiling is an important and useful tool, it should be used in conjunction with other interventions to support long-term change. According to the ecological models of health behavior, intervention designs that make use of multilevel strategies – psychological, social, and environmental – are likely to be more effective in reaching and engaging individuals who are susceptible to unhealthy eating habits than interventions operating on a single level. Environmental approaches, such as choice architecture interventions, may be a promising way to prompt healthy food choices.[24]

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The Reformulation of Foods for Consumer Appeal

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Introduction

The triple burden of malnutrition is a growing challenge worldwide that hampers the health of populations. Virtually all countries in transition have to deal not only with undernutrition but simultaneously with alarming rates of overweight, obesity, and related noncommunicable diseases. A recent report highlights a dose–response relationship, including mortality, between higher BMI and severe COVID-19-associated illness.[1]

A healthy diet and physical activity are paramount for achieving a healthy weight. Most people, however, do not eat a healthy diet and are not physically active at the levels needed to maintain a healthy weight. One of the reasons is the food environment, which provides large supplies of rather inexpensive, highly palatable, energy-dense foods that are easily accessible, convenient to consume, and heavily marketed. This type of environment promotes excess caloric intake and eventually obesity.[2]

> **"Reformulation can also bring positive nutrients – the 'goodies' such as vitamins and minerals – into diets"**

Attempts to change consumer behavior

Attempts to change consumer behavior in favor of nutrient-dense foods rather than energy-dense foods using labeling, fiscal measures, and social media campaigns have had limited success and impact on obesity. Obesity and malnutrition persist because only a minority of the population is truly interested in healthy eating. Most others have different priorities concerning food, such as taste, price, convenience, family preferences, or simply other problems to deal with rather than healthy food choices. The latter was witnessed in a number of countries during the confinement period necessitated by the COVID-19 pandemic. Factors such as stress, work–life balance, health issues, and many more make healthy eating a secondary priority. More impactful ways to address malnutrition, obesity, and sustainability challenges are therefore needed, rather than reliance on attempts to change population behaviors.

Reformulation: A solution?

To reformulate existing and commonly consumed processed foods can be a highly realistic approach and opportunity to improve the health of people and at the same time the health of the planet, with a substantial estimated positive impact on obesity.[3]

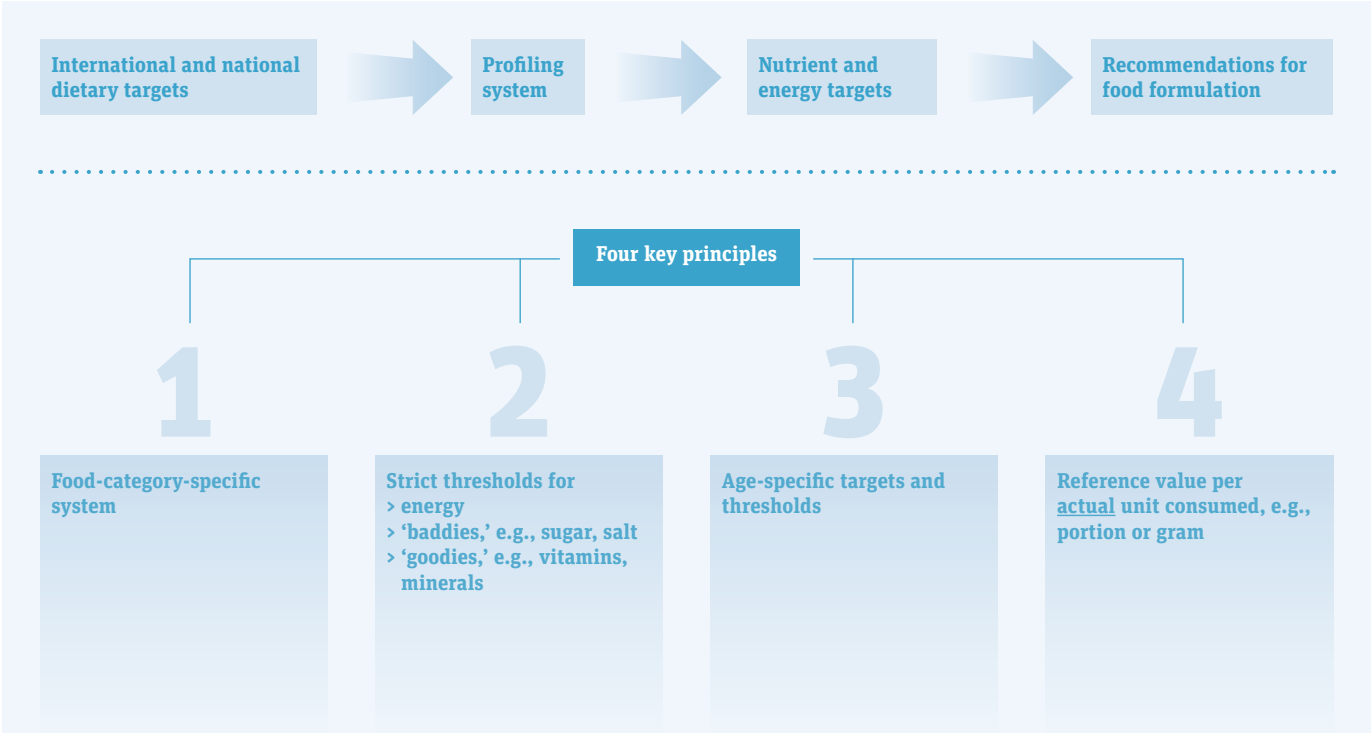
The reformulation of processed foods is defined as changing the content of such foods by reducing the proportion of negative ingredients such as sodium, saturated fats, and trans fats, and/or by increasing the content of beneficial nutrients such as dietary fiber, whole grains, fruits, vegetables, and micronutrients. Reformulation is appealing because it requires the least change in dietary behavior on the part of the consumer. Reformulating foods over time with gradual changes may minimize consumer perceptions and negative attitudes if both taste and palatability are preserved, thereby keeping food purchasing and consumption patterns unchanged.

The gradual reduction of ingredients that are considered 'baddies' (sugar, sodium, saturated and trans fats) would go unnoticed by the vast majority of consumers and could ultimately reduce individual intakes.[4,5] However, the nutritional quality of processed foods can be improved not just by decreasing the 'baddies'. Reformulation can also bring positive nutrients – the 'goodies' such as vitamins and minerals – into diets and can enable food fortification at low cost to increase nutrient density, which is the ultimate goal of the reformulation process. As needs and demands can vary greatly in accordance with specific regions of the world and the nutritional needs of their respective populations, nutritional profiling systems should ideally cater for these differences – for example, for the nutritional needs of populations in low- and middle-income countries.[6]

> **"Nutrient profiling is a tool to guide successful reformulation of foods"**

Nutrient profiling is described as the science of ranking or classifying foods based on their nutrient composition for the purpose of preventing disease and promoting health[7] (see **Figure 1**).

FIGURE 1: Nutrient profiling principles



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Jörg Spieldenner: "One pizza: is that really 2 to 4 portions, or will the customer calculate sodium content per 100 g multiplied by 3.8, as the pizza weighs 380 g?"

Some systems follow this approach, but nearly all struggle with the definition of meaningful reference values for the amount of a specific food consumed. Two examples illustrate this challenge. The serving size of breakfast cereals – between 25 g and 40 g – is defined by food producers in many countries. The true average serving size of breakfast cereals is, however, higher, leading to a higher intake of sugar than that mentioned on the label. A more striking example is prepackaged pizza, with most labels reporting 2–4 portions per one whole pizza in a carton package. *De facto*, the pizza (300–500 g) is mostly eaten entirely by one person, resulting in severalfold higher intakes of salt than the labeled intake per serving.

Several regulatory bodies across the globe have introduced a per 100 g reference value as a concise anchor. This may seem somewhat objective at first sight, but it does not take into consideration the reality of consumption as shown in these two examples: 100 g of cereals per serving is too much, whereas 100 g of pizza is by far too little, making this a complex calculation exercise for the consumer. This calls for clear, transparent, realistic, and binding targets for critical ingredients in critical food categories – in this case, sodium and sugar in foods that have a high impact on the diet, such as pizza and cereals. Such targets and standards, in combination with mandatory portion or serving sizes reflecting true consumption patterns, will make products easily comparable for the consumer and have the potential to subsequently drive reformulation efforts and improved food offerings.

> **"Reformulation has the potential to improve diets and thus address obesity and nutrition-related diseases"**

Conclusion: The context for a successful implementation

Reformulation has the potential to improve diets and thus address obesity and nutrition-related diseases, but only in combination with regulations (nutrient and composition targets) that are smart, encouraging food producers and retailers to increase nutrient density while nudging consumers to increase their purchasing of reformulated foods. Certainly, a mandatory 'tacit' improvement of processed foods through reformulation will create quite some noise from farmers through food manufacturers to retailers – yet it is a *sine qua non* for improved nutrition.

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"We Simply Have to Do This. We Can't Afford Not to"

Interview with Esi Foriwa Amoaful

© Esi Foriwa Amoafu

With its slogan "Your Health, Our Concern" and its headquarters in Accra, the Ghana Health Service is a Ghanaian Government body established in 1996 as part of the Health Sector Reform of Ghana. Esi Foriwa Amoaful, Team Lead for Nutrition within the Ghana Health Service, discusses the potential benefits of nutrient profiling for the country's people.

***Sight and Life* (SAL):** *Esi, can we start by discussing your own role within the Ghana Health Service? How long have you been with the GHS, and what are your key responsibilities?*

Esi Foriwa Amoaful (EFA): I've been with the Ghana Health Service for more than 25 years now. I'm a public health professional, and a nutritionist by training. As Team Lead for Nutrition, my responsibilities involve helping to formulate health and nutrition policies, designing nutrition-based public health interventions, developing staff capacity, providing technical guidance, and liaising with the relevant agencies.

SAL: *How would you characterize the nutritional status of the population of Ghana?*

EFA: Our country is currently going through the nutrition transition, like so many other countries in Africa. There's a problem of chronic undernutrition, with approximately 20 percent of Ghanaian children stunted at present, and wasting also is a significant problem, involving underlying micronutrient deficiencies. At the same time, there is a notable increase in overweight and obesity within the population. So Ghana is currently experiencing the double burden of malnutrition, with poor diet and micronutrient deficiencies driving an increase in dietary-related diseases, which in turn is increasing the overall disease burden in the country, and, with it, mortality rates as a whole.

SAL: *How has this situation come about?*

EFA: We've made some gains in addressing undernutrition in recent years, but overweight and obesity are on the increase. This is partly because an open-market policy is allowing many different types of processed food to be imported into Ghana. These are, of course, generally high in fat, sugar, and salt, and low in nutrients. The consumption of processed foods as a proportion of the overall diet of the Ghanaian population has increased, while the consumption of fruit and vegetables has declined. At the same time, improvements in the standard of living have led to an increase in portion sizes among those who can afford them. All these factors have combined to bring about the current situation.

> **"The consumption of processed foods has increased, while that of fruit and vegetables has declined"**

SAL: *Looking at the population of Ghana as a whole, what are the micronutrient deficiencies that require the most attention?*

EFA: We currently list iron deficiency anemia, vitamin A deficiency (especially among women of reproductive age and children), and iodine deficiency as being of public health concern. There are indications that the B vitamins are also reaching this status, and there is a need for research to explore this topic in greater detail.

SAL: *What role do you think that nutrient profiling might have to play within the Ghana Health Service's nutrition policy going forwards?*

EFA: We're currently faced with a changing nutrition environment, which is bringing about a detrimental change in the quality

of diets. Nutrient profiling has the potential to make the case for improving the quality of foods on the shelf. The Ghana Food and Drugs Authority and the Ghana Standards Authority need to work with industry to ensure that all foods purchased by consumers in Ghana conform to the guidelines established by the World Health Organization.

We also need to continue to educate the public on the importance of good nutrition, and we are in fact currently running a wellness initiative nationwide. Nutrient profiling can be an important tool in explaining the implications of a poor-quality diet for health and promoting healthy food choices. It's also essential to work with the relevant agencies to counter fallacious and misleading marketing claims about foods available to consumers, as these are harmful to the population.

This is very challenging, because the relevant agencies need to regulate so many individual commodities, and also because it's often the case that not all the contents of processed foods are declared on the packaging. So we have a problem about the control of imports coming into the country, which is compounded by the noncompliant activities of certain food producers in Ghana itself.

> **"It's often the case that not all the contents of processed foods are declared on the packaging"**

SAL: *Does the Ghana Health Service have hard data on the way consumption patterns in the country have changed in recent years?*

EFA: Not at present, although we're working with the Ghana Food and Drugs Authority and other agencies to compile this. Some data is available via the FAO, but we don't yet have a national dataset. We know, however, from assessments and anecdotal information that consumption patterns have changed tremendously in recent times, and one only has to go to the shops to observe this.

SAL: *Can you tell us something about the Four-Star Diet recommended by the Ghana Health Service?*

EFA: Yes, it's a diet that categorizes foods in terms of their nutritional value: staples, one star; legumes, two stars; vitamin-rich foods such as fruit and vegetables, three stars; and animal-source foods, four stars. It's a proxy description that we use in behavior change communications and nutrition counseling for women to try to encourage them to eat more nutritious foods. More complex systems of food categorization do exist, but not all of the population of Ghana is literate, and we therefore found it more effective to simplify it into a four-part system. We encourage people to eat foods from each of these four categories every day so as to encourage variety of diet and nutritional adequacy.

> **"We encourage people to eat foods from each of the four-star categories every day"**

SAL: *Do you think that a nationwide front-of-package labeling system based on nutrient profiling is feasible in Ghana?*

EFA: I do indeed. It will be difficult to achieve and will involve a great deal of advocacy as well as close collaboration between government and the private sector. It will also require the participation of the World Food Programme and the World Health Organization. We need to bring everyone to the table, including non-traditional actors. We simply have to do this. We can't afford not to.

SAL: *Do you have any other comments for our readers, Esi?*

EFA: I would say we should expect a great deal more from the food industry in Ghana. One can make good money by producing healthy food. Why don't we all demand that?

SAL: *Thank you, Esi, and good luck with the next steps!*

EFA: Thank you.

Esi Foriwa Amoaful was interviewed by Jonathan Steffen.

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"We Need to Create a Genuine National Picture of the Situation"

Interview with Maryse Umugwaneza

© Maryse Umugwaneza

Maryse Umugwaneza obtained her PhD from North-West University, South Africa, in 2017. Her thesis, on the development of food-based dietary guidelines (FBDGs) for Rwandan children aged 6–23 months, offers a solution to contribute to addressing stunting, a nutrition-related public health problem in Rwanda. Maryse discusses the potential of nutrient profiling in the context of the country.

***Sight and Life* (SAL):** *Maryse, can you tell us a little about your PhD, and also how you came to write it?*

Maryse Umugwaneza (MU): My career started in food engineering in France, after which I took a Master's in Public Health and Nutrition. I subsequently won a scholarship to pursue a doctorate degree in nutrition at North-West University in South Africa.

My thesis was on the development of food-based dietary guidelines, with a particular focus on the problem of undernutrition among children aged 6–23 months. Although the prevalence of stunting (height-for-age below –2 SD) among children under 5 years of age in Rwanda has recently been reduced from 38 percent, where it stood in 2015, to 33 percent, where it stood in 2020, this figure is still unacceptably high, and the phenomenon of stunting has been shown to increase sharply in infants aged from 6 to 23 months. I therefore wanted to study this age group specifically with a view to identifying what they are currently eating and what they should be eating in order to avoid the risk of stunting.

The solid foods traditionally used for weaning infants in Rwanda are not nutritionally adequate, and the fact that many infants live in impoverished conditions, often crawling on the ground where sanitary conditions are poor, makes them extremely vulnerable to the risk of stunting. Even in the context of a greatly improved diet, it's very hard to reverse the effects of stunting after 2 years. It's therefore essential to develop effective guidelines that will encourage the delivery of more nutritious diets to children in this age group.

> **"Even in the context of a greatly improved diet, it's very hard to reverse the effects of stunting after 2 years"**

SAL: *And is this the area in which you are still working?*

MU: I'm currently working, with FAO, on the development of FBDGs for the general population of Rwanda, but I'm also extremely interested in the potential of nutrient profiling. Nutrient profiling and dietary guidelines should go hand in hand in fact, because nutrient profiling identifies foods that are nutritionally dense, and guidelines indicate how these should be incorporated in the diet.

SAL: *Are dietary deficiencies widespread in the population of Rwanda at large today?*

MU: We don't have solid data on this, but we can assume a high prevalence of micronutrient deficiencies in all age groups, certainly in terms of iron, zinc, and calcium, because of the low nutrient intake seen in the diets of children and mothers.

We do have data on the prevalence of anemia and also overweight in women in Rwanda. Anemia is highly prevalent among both children and adults. The DHS 2019–20, a national survey, found that 37 percent of children under 5 years of age and 13 percent of women aged 15–49 are anemic. In the adult population, meanwhile, the proportion of overweight or obese women (BMI > 24.9 kg/m²) increased from 12 percent in 2005 to 16 percent in 2010 and 21 percent in 2014–15. Thinness among men is also a problem, affecting 10 percent of males in Rwanda.

A food market in Musanze, Rwanda, with a variety of fresh local food items on sale

SAL: *What kind of nutritional interventions does the population of Rwanda need then, in your view, Maryse?*

MU: There is food insecurity in certain regions of the country, but even in those regions not affected by food insecurity, there is stunting. Some parts of the country therefore require interventions specifically targeting food insecurity, whereas others are more in need of nutrition education – for example, advice about how to get the most nutritional value from the money available for food, why eggs are more nutritious than biscuits, and so forth.

SAL: *Is nutrient profiling currently being used by the authorities in Rwanda?*

MU: It's not currently being used at all in Rwanda, and in fact I first heard about it while studying in South Africa. WHO drew significant attention to the subject in 2010 when advocating the use of nutrient profiling as a tool to help curb the marketing of unhealthy foods to children, but it has many applications beyond that.

SAL: *Could it be effectively applied in the Rwandan context, do you think?*

MU: I think it would be helpful in a variety of contexts. These include the regulation of health claims made about food, the front-of-pack labeling of food products, and the formulation and delivery of nutrition education. Nutrient profiling could also be used as an economic tool to help guide the establishment of parameters for food taxes and subsidies. This would be extremely valuable, because there are more and more processed foods on the market in Rwanda.

> **"Nutrient profiling could be used as an economic tool to help guide the establishment of parameters for food taxes and subsidies"**

SAL: *What do you therefore see as the key priorities for nutritionists working in Rwanda?*

MU: We definitely need more dietary intake data, because the studies currently available focus on specific regions and subpopulations. We need to create a genuine national picture of the situation. We also need more data on the composition of foods. We've been using data from other African countries, with which Rwanda shares some commonalities, but this data is not specific to the situation on the ground here and it doesn't cover all the nutrients

associated with dietary-related noncommunicable diseases. Nor does it include fiber.

On top of this, the data currently available to us tends to focus on undernutrition, examining the levels of protein, lipids, and micronutrients in the diet, but not on obesity, examining the levels of sugars and trans fats. In addition to this, we need data on food pricing, so as to be able to provide practical advice on food choices that are both healthy and affordable. Nutrient profiling and food composition data are very resource-intensive to develop, but we need a full range of tools – one tool or framework is certainly not enough to address the country's needs.

SAL: *Thank you, Maryse. It sounds as if you have some challenging and also very rewarding projects ahead of you. The best of luck with them.*

MU: Thank you.

Maryse Umugwaneza was interviewed by Jonathan Steffen.

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The Road to Healthy India

Interview with Inoshi Sharma

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The Food Safety and Standards Authority of India (FSSAI) is an autonomous body established under the Ministry of Health and Family Welfare, Government of India. FSSAI is responsible for promoting public health through the regulation and supervision of food safety. Inoshi Sharma, Executive Director (SBCD, FFRC, and Regulatory Compliance) at FSSAI, discusses the role of dietary guidance in raising nutritional standards in the country.

***Sight and Life* (SAL):** *Inoshi, can you tell us something about FSSAI, and your role within the organization?*

Inoshi Sharma (IS): FSSAI was established in 2006 under the Food Safety and Standards Act, which is a consolidating statute covering food safety and regulation in India. Our work falls into six areas: globally benchmarked food standards, hassle-free food imports, globally benchmarked safe food practices, consistent and transparent enforcement, credible food testing, and capacity building and competition to raise the bar for food safety.

In 2017, FSSAI introduced a principle of 'One Nation, One Food Law' with the object of ensuring that every state-level food authority in India follows a standard practice for the implementation, compliance, and surveillance of food safety regulations. This in turn will ensure smoother operations for food companies.

Headquartered in New Delhi, FSSAI has six regional offices, located in Delhi, Guwahati, Mumbai, Kolkata, Cochin, and Chennai. I've been with FSSAI in New Delhi for 2 years, having joined in June 2019. I'm a civil servant on deputation from the Indian Revenue Service.

SAL: *Can you tell us something about the 'Eat Right' movement in India?*

IS: There's been an alarming increase in lifestyle diseases in India in recent years, partly driven by increased prosperity and associated changes in dietary habits. As per the WHO estimates, a total of six out of every ten deaths globally are related to noncommunicable diseases. Further, India suffers from the triple burden of malnutrition. Over half of women and children suffer from anemia. Each year we lose over US$12 billion to vitamin and mineral deficiencies. Noncommunicable diseases such as diabetes, heart disease, and hypertension account for more than 60 percent of deaths in our country, which is almost similar to the global estimates.

FSSAI actively responded to tackle these alarming issues with the creation of the 'Eat Right India' movement. Launched in July 2018, the movement aims to engage, excite, and enable citizens to improve their health and wellbeing. Eat Right India is based on three key themes: eat safe, eat healthy, and eat sustainably.

- **Eat Safe:** Ensuring personal and surrounding hygiene, hygienic and sanitary practices through the food supply chain, combating adulteration, reducing toxins and contaminants in food, and controlling food hazards in processing and manufacturing processes.

- **Eat Healthy:** Promoting diet diversity and balanced diets, eliminating toxic industrial trans fats from food, reducing consumption of salt, sugar, and saturated fats, and promoting large-scale fortification of staples to address micronutrient deficiencies.

- **Eat Sustainably:** Promote local and seasonal foods, prevent food loss and food waste, conserve water in food value chains, reduce use of chemicals in food production and presentation, and promote the use of safe and sustainable packaging.

Eat Right India encompasses a bouquet of initiatives to promote the demand for, and supply of, safe and healthy food in a sustainable way. While the supply-side interventions are aimed at building the capacities of food businesses to promote self-compliance, the demand-side initiatives work towards motivating consumers to demand safe and healthy food.

In 2019, the Government of India commemorated the 150th anniversary of the birth of Mahatma Gandhi, Father of the Na-

Swasth Bharat Yatra: display of mass mobilization efforts with people

Eat Right Mela (street food festival): display of trained and certified places of worship under the Blissful Hygienic Offering to God (BHOG) project

tion, by organizing a pan-India cycle rally called *Swasth Bharat Yatra* as part of the campaign. A *Yatra* in Hindi is a procession or pilgrimage, especially one with a religious purpose, and *Swasth Bharat* means "Healthy India." The name draws its inspiration from Gandhi's Salt March, which was an important step in India's march to freedom from British colonial rule. By analogy, the Eat Right movement aims to help our nation achieve freedom from dietary-induced lifestyle diseases.

SAL: *What problems is India currently facing on this front?*

IS: Like so many other countries, we're confronted with the double burden of malnutrition. The Comprehensive National Nutritional Survey conducted in 2019 ascertained that 34.7 percent of Indian children under the age of 5 are stunted (height-for-age), while 13.2 percent are severely stunted. Among adolescents aged 10–19 years, 28.4 percent were found to be suffering from anemia and 21.5 percent from low serum ferritin. The figures for deficiency in folate, vitamin B_{12}, serum 25-hydroxy vitamin D, and zinc were 36.7, 30.9, 23.9, and 31.7 percent, respectively. These are just a few figures of many indicating the seriousness of the situation and the need for urgent and concerted action.

SAL: *And what kind of dietary guidance does the Eat Right movement offer?*

IS: Under the Eat Right India movement, a wide variety of foods are being promoted, considering the vast diversity in the diet, culture, and customs, etc. in our country regarding wholesome nutrition. Further, citizens are nudged to make the right food choices to ensure a balanced diet with all essential vitamins, minerals, proteins, carbohydrates, fats and oils, as well as essential micronutrients. Nutritive value and options for various vegetarian and nonvegetarian food items are disseminated to the public so that they can make informed food choices.

In association with the Voluntary Health Association of India (VHAI) and the National Health Systems Resource Centre (NHSRC), FSSAI developed an 'Eat Right' toolkit, which incorporates key messages on food safety and nutrition, with a focus on preventive healthcare. This toolkit has been developed as an interactive tool for frontline health workers and mid-level health providers to offer holistic learning on 'Eating Right', and is extremely useful in reaching out to people at the grassroots level.

The toolkit is built on two broad components: 'Eat Healthy' and 'Eat Safe'. It offers clear and simple messages on foods to eat, covering subjects such as a balanced diet, fortified foods, and nutrition during the first 1,000 days. It also indicates foods to avoid – those high in fat, sugar, and salt – and explains the importance of eliminating trans fats from our diets. This dietary guidance is complemented by guidance on how to eat safely, covering the topics of hygiene, sanitation, food safety, and combating food adulteration.

FSSAI has also produced the 'Eat Right India Handbook', which is a guide for various stakeholders to implement Eat Right initiatives at the ground level and scale up the Eat Right India movement. It outlines the background and inspiration for Eat Right India and

Training of ASHA (Accredited Social Health Activist) workers on the Eat Right toolkit for health and wellness centers

© FSSAI

Training of street food vendors on food safety and hygiene practices

also provides all the required information on initiatives such as the movement's key objectives, steps for implementation along with the role of each stakeholder, resource materials, partners, contact information, and success stories for inspiration.

SAL: *What role does food fortification play in helping to address dietary deficiencies in India?*

IS: Food fortification in India dates back to the 1950s, when fortification with vitamin A was introduced. Iodization of salt for human consumption was a landmark step in 2005, since which time widely consumed food staples such as wheat, oil, milk, and rice have also been fortified. Approximately 45 percent of milk sold in India is now fortified, for example, and approximately 70 percent of oil. We also have double-fortified salt (DFS) – something that is specific to India. DFS contains iron as well as iodine, and has been developed to reduce iron deficiency anemia. A wide range of breakfast cereals, breads, buns, and fruit juices on the Indian market are also fortified.

In 2018, FSSAI introduced the Food Safety and Standards (Fortification of Foods) Regulations, 2018, to regulate the provisions regarding fortified food. These regulations prescribe the standards for the addition of micronutrients to foods for the purpose of food fortification. Manufacturers of fortified foods have to provide a quality assurance undertaking, and packaging and labeling have to state the food fortificant added and include the +F logo and the tagline *"Sampoorna Poshan Swasth Jeevan"* ("Complete Nutrition, Healthy Life"). The +F logo and the accompanying standards were launched at a national summit in New Delhi in 2016.

SAL: *Finally, Inoshi, is India already using front-of-pack labeling to specify the nutritional profile of foods?*

IS: At FSSAI we're currently considering implementing symbol-based front-of-pack nutrition labeling, with the ultimate intention of making this mandatory. This is still a work in progress.

SAL: *Thank you very much. The best of luck to you and your colleagues at FSSAI with this important initiative.*

IS: Thank you.

Inoshi Sharma was interviewed by Jonathan Steffen.

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The Good Food Logo: The first of its kind in Africa

Interview with Mirriam Chipilu and Miyanda Kapepe

© SHAIS Foods

Mirriam Chipilu with examples from SHAIS Foods' product range

SHAIS Foods is a homegrown agro-processing company in Zambia that adds value to locally grown grains and crops to produce meals and highly nutritious cereals that are a good source of vitamin A and dietary fiber. Mirriam Chipilu, Chief Executive Officer of SHAIS Foods, and Miyanda Kapepe, Programmes Policy Officer – Business Engagement from the World Food Programme (WFP), discuss the collaboration behind the introduction of the Good Food Logo, a joint initiative of the Government of Zambia and the SUN Business Network (SBN).

***Sight and Life* (SAL):** *Mirriam, let's start with SHAIS Foods itself. What's the history of SHAIS Foods, and what does the name mean?*

Mirriam Chipilu (MC): The name itself was suggested by my husband. It means "It's coming" in Bantu. I set up SHAIS Foods in 2015, working as a sole trader. The company was incorporated in 2017. We now employ about 15 people, including myself, and we're based in Lusaka. We're a member of the SUN Business Network, which is how our collaboration with WFP came about.

SAL: *And what sort of foods go into SHAIS products?*

MC: Locally grown millet, sorghum, and soya beans, as well as maize bio-fortified with vitamin A. The millet, sorghum, and soya we use are not fortified, but they all contain a lot of important naturally occurring nutrients. The soya beans have the additional function of increasing the protein content of the foods to which they are added.

SAL: *Miyanda, can you tell us a little about WFP's involvement here?*

Miyanda Kapepe (MK): We have two main areas of focus in this context. One is how to increase the affordability and accessibility of nutritious food. The other is how to encourage the uptake of healthy food, which we're promoting via part of the 'Healthy Diets Campaign,' an initiative of the SBN.

SAL: *And how does the Good Food Logo fit in?*

MK: The Good Food Logo is a joint initiative of the Zambia Bureau of Standards, the National Food and Nutrition Commission, the SUN Business Network, and the private sector. Its purpose is to help consumers identify nutritious food products in the Zambian market. The logo is a front-of-pack pack certification mark that appears on eligible products that meet criteria jointly defined by technical experts from Zambia's Government, nutritionists, and academics. Its aim is to contribute to the reduction in overweight and obesity, noncommunicable diseases, and micronutrient deficiencies in Zambia, to help consumers make better food choices, and to encourage manufacturers to produce more nutritious foods.

"The logo's aim is to contribute to the reduction in overweight and obesity, noncommunicable diseases, and micronutrient deficiencies in Zambia"

SAL: *When was the Good Food Logo launched?*

MC: In 2018. It's the first logo of its kind to have been launched in Africa with the aim of reducing micronutrient deficiencies and preventing overweight, obesity, and associated noncommunicable diseases.

SAL: *What benefits does the use of the Good Food Logo offer small and medium-sized enterprises (SMEs) such as SHAIS Foods, Mirriam?*

MC: There are many: positive exposure, networking opportunities with other member organizations committed to delivering healthy nutrition, and increased consumer demand for nutritious foods in Zambia. To have the Good Food Logo means a lot to SHAIS Foods, because we're known for the nutritional quality of our products. Consumers rarely read, hence the need to have a logo to help them make healthier choices when shopping. And even if they can't read the labels, they can recognize the Good Food Logo and know what it stands for.

> **"Consumers rarely read, hence the need to have a logo to help them make healthier choices when shopping"**

MK: Yes, and the SUN Business Network is really committed to the logo, and to increasing its use. We're also asking retailers in Zambia to give products with the Good Food Logo priority, so as to increase consumer access to them, and we're continuing our social behavior change communication activities to support the Healthy Diets Campaign. Three SMEs have packed products with the logo, while the others are waiting to change into new packaging incorporating the logo. Adoption has been slowed by the effects of the COVID-19 pandemic, however. Implementation is being done jointly by WFP and the Zambia Bureau of Standards (ZABS), so it will be for ZABS to sustain the rollout by getting more products and companies certified with the Good Food Logo.

SAL: *And what is the nutritional status of the Zambian population at present?*

MK: According to the 2020 Global Nutrition Report,[1] 33.7 percent of women aged 15 to 49 years in Zambia are now affected by anemia, while 34.6 percent of children under 5 years of age are affected by stunting, a figure that is higher than the average for the Africa region, which is 20.1 percent. So, looking just at these two statistics, you can see that there's plenty of work to be done to raise nutritional standards in the country overall. On a more positive note, Zambia's obesity prevalence is lower than the regional average (18.4 percent for women and 7.8 percent for men), with an estimated 12.4 percent of adult (aged 18 years and over) women in Zambia and 3.6 percent of adult men living with obesity. The engagement of the SUN Business Network is at present planned for rollout out into six Districts (Choma, Monze, Mongu, Kaoma, Chipata, and Lundazi).

SAL: *From your perspective, Mirriam, what needs to be done now to encourage Zambian consumers to opt for healthier foods in the shops?*

MC: I would say that more communication support is required, and also better packaging. Most important of all, however, is to give our Zambian products more space on the shelves. Given the opportunity, Zambian consumers will buy Zambian products – but it's they who should decide, and not the shopkeepers.

SAL: *Mirriam and Miyanda, thank you very much and good luck with the continuation of these efforts.*

MC & MK: Thank you.

Mirriam Chipilu and Miyanda Kapepe were interviewed by Jonathan Steffen.

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Resources for Scale-up

How Nutrient Profiling Can Help Governments Address Malnutrition in All Its Forms

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Malnutrition in all its forms – i.e., undernutrition, overweight/obesity, and micronutrient deficiencies – exists in many countries and sometimes in the same families and individuals, and is commonly referred to as the 'double burden of malnutrition' or 'triple burden of malnutrition.'[1] Despite the need for a broader approach to address malnutrition, many low- and middle-income countries are using their limited resources to exclusively address food security and undernutrition.

A different approach, inspired by a broader perspective on malnutrition, would have a stronger impact on public health. However, major obstacles such as lack of capacity on the part of many governments, strong opposition from powerful interest groups, and a lack of demand for more strategic health policies from the general public cause an overall state of policy inertia.[2] In addition, from our experience of working with various countries, the Choices International Foundation believes that an unclear road map for a coherent implementation of evidence-based policy recommendations is another obstacle. Double-duty actions to tackle both undernutrition and obesity represent a powerful way to facilitate the transition from food security to policies with a broader impact on malnutrition in all its forms.

> **"Double-duty actions represent a powerful way to facilitate the transition from food security to policies with a broader impact"**

Double-duty actions

A recent review by Hawkes and colleagues prioritized 10 double-duty profiling.[3] We analyzed these and concluded that a nutrient profiling system (NPS) – i.e., criteria to classify the healthiness

FIGURE 1: Examples of double-duty actions as prioritized by Hawkes et al.[3] and how nutrient profiling systems could support these

Double-duty actions delivered through	Examples of double-duty actions	Double-duty actions are linked with nutrient profiling systems (NPSs)
Health services	Redesign guidance for complementary feeding practices and related indicators	NPS specifically for young children
Social safety nets	Redesign cash and food transfers, subsidies, and vouchers	NPS identifies products eligible for vouchers / subsidies
Educational settings	Redesign school feeding programs and devise new nutritional guidelines for food in and around educational institutions	NPS provides guidelines for school feeding programs and foods allowed in and around schools
Agriculture, food systems, and food environments	Implement policies to improve food environments from the perspective of malnutrition in all its forms	NPS provides guidance to: • front-of-pack labeling • marketing restrictions • nutrition and health claims • financial (dis)incentives • reformulation and fortification

Source: Authors' analysis

FIGURE 2: Recommended use of Choices' multilevel criteria in relation to various policies for basic food groups

Choices levels	1	2	3	4	5
Positive FOPL	Positive Logo				
Graded 5-level FOPL	A	B	C	D	E
Graded 3-level FOPL	Green		Amber	Red	
Negative FOPL				Negative Logo	
Reformulation	% Green / A	% Green / B	% Amber / C	% Red / D, E	
Marketing to children				Not allowed	
Subsidies	Possible	Possible			
Taxation				Possible	Possible
School meals			Not allowed	Not allowed	
School environments	Min % Green / A	Min % Green / B		Not allowed	
Fortification	Possible	Possible	Not allowed	Not allowed	
Health / nutrition claims	Possible	Possible	Not allowed	Not allowed	

of food products based on their nutrient content – would facilitate the implementation of these actions (see **Figure 1**). NPSs have been developed by governments, NGOs (particularly heart foundations), UN organizations, academia, and the food industry. Their applications include school food standards, front-of-pack labeling (FOPL), marketing restrictions, financial (dis)incentives, reformulation, and regulation of health and nutrition claims.[4]

The application of different NPSs is highly fragmented. Although many of these NPSs share the same purpose (e.g., to tackle noncommunicable diseases), most of them support only one application.[4] Moreover, criteria for healthy food products often focus on nutrients whose intakes are connected to overnutrition, such as salt, sugar, and saturated fat, without considering undernutrition.

To facilitate the implementation of coherent and reinforcing policies by governments, there is a need for:

- a clear road map to overcome the current policy inertia;
- a unique global, independent, and science-based NPS to classify food products based on their nutrient profile that is able to support multiple applications promoting the consumption of healthier foods and demoting the consumption of less healthy foods; and
- the ability to adapt such an NPS to a local or regional context, recognizing differences in food cultures, nutritional issues, and the availability of products on the market.

Front-of-pack labeling

In 2006, the Choices International Foundation developed an NPS to identify 'best-in-class' food products in each food group and rewarded them with a positive FOPL. This system focused on nutrients whose intakes are strongly related to an increased risk of chronic disease (sugar, sodium, saturated and trans-fatty acids, and energy) or a reduced risk of the same (fiber). An independent international scientific committee is the custodian of these criteria and is responsible for their revision every 4 years.

Choices collaborates with 19 countries in Europe, Asia, and Africa through the Choices program, providing the international criteria as a reference and road map for how to adapt them to a national context and implement an FOPL system.[5,6] Choices supports national scientific committees that adapt the international criteria to country-specific situations in terms of noncommunicable diseases, obesity, and undernutrition prevalence. Some countries, such as Malaysia and Zambia, have included micronutrients in their national criteria based on their nutritional situation.[7,8] Choices therefore started with a food-system approach that made the healthier choice easier. However, so far we have not been able to support applications to demote the consumption of less healthy foods.

> **"We started with a food-system approach that made the healthier choice easier"**

To this end, Choices asked the international scientific committee to extend the logo criteria to a five-level system of criteria that would classify food products into five levels of healthiness that are suitable to support multiple applications such as FOPL in combination with reformulation, school food standards, marketing restrictions, and financial (dis)incentives.

FIGURE 3: Recommended use of Choices' multilevel criteria in relation to various policies for non-basic food groups

Choices levels	1	2	3	4	5
Positive FOPL	Not allowed				
Graded 5-level FOPL	C		D	E	
Graded 3-level FOPL	Amber		Red		
Negative FOPL			Negative Logo		
Reformulation	% Amber / C		% Red / D, E		
Marketing to children	Not allowed				
Subsidies	Not allowed				
Taxation			Possible	Possible	
School meals	By exception		Not allowed		
School environments			Not allowed		
Fortification	By exception		Not allowed		
Health / nutrition claims	By exception		Not allowed		

Choices has chosen to work with five levels to support a five-level graded FOPL system (as used by, for example, Nutri-Score[9]), but the criteria can also support a three-level graded FOPL system. How Choices' criteria may support various policies coherently with an FOPL system is illustrated in **Figures 2** and **3**. These multilevel criteria are work in progress, and Choices expects to publish them during 2021. They will be defined by four thresholds for each of the nutrients mentioned above (sodium, sugar, etc.) and are consistent with the previous FOPL criteria, with which they will coexist until the next cycle of revision in 2023.

> **"Choices believes it is essential to work with all food product categories"**

Application of multilevel criteria

Choices believes it is essential to work with all food product categories. Choices' criteria distinguish between food groups included in official dietary recommendations (i.e., basic food groups) (**Figure 2**) and discretionary (or non-basic) food groups (**Figure 3**). For the former, thresholds are defined both for nutrients to limit and for nutrients to encourage, whereas for the latter, only nutrients to limit are considered. Note that Choices clearly distinguishes between basic and non-basic food groups.

Choices does not favor a purely 'worst-in-class' approach, which would not encourage front-runners of the food industry to implement innovations to make healthier products more available and affordable. Contrary to other existing NPSs, Choices' multilevel criteria can be adapted to a local context and used to combine positive and restrictive applications and make different applications coherent with one another, which is expected to be a more effective approach than using single measures alone. A properly designed NPS can also effectively stimulate food product reformulation, and different food companies use the Choices' criteria as an external benchmark for this. Choices' multilevel criteria reward each step in the progressive reformulation of all food products.

> **"Our multilevel criteria reward each step in the progressive reformulation of all food products"**

Future challenges

The development and governance of NPSs is a constant work in progress. Choices' multilevel criteria will still mostly focus on 'negative' nutrients, with the exception of fiber. In the near future, Choices' ambition is to provide further guidance to countries on how to include 'positive' nutrients, such as micronutrients, into their national criteria, based on the experiences of developing or adapting national standards in Ghana, Zambia, and Malaysia.

Whether Choices' approach (i.e., international scientific criteria adapted by national scientific committees) will promote long-lasting partnerships between scientists, food policymakers, governments, and the food industry will remain an open issue. Ultimately, will this approach have a bigger impact on improving diets than the fragmented approaches mentioned earlier? Choices' experience has shown that its approach has helped many countries to establish fruitful collaborations between stakeholders, resulting in the implementation of positive logo programs.

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Developing and Validating a Food-Based Global Diet Quality Score

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Characterizing the collective contribution of foods to health

In contrast to nutrient profiling models that evaluate the overall nutritional value of individual foods, food-based diet quality metrics attempt to characterize the collective contribution of foods to health. The two approaches are complementary means of providing a quantitative basis upon which to develop programmatic guidance for improving population diets. Below we describe a novel food-based metric of diet quality for global use, and key takeaways of our research to develop and evaluate this metric.

From 2018 to 2020, an international team led by researchers in the Department of Nutrition at Harvard T H Chan School of Public Health, Instituto Nacional de Salud Pública de México, and *Intake* – Center for Dietary Assessment at FHI Solutions set out to develop and validate a global standard metric of diet quality: the Global Diet Quality Score (GDQS). This was done using secondary analyses of data from multiple world regions.

In this research, we aimed to address several prominent gaps in global nutritional surveillance[1,2] – particularly in low- and middle-income countries (LMICs) – by creating a metric that would be simple to collect and analyze, and that would validly describe population diet quality in terms of both nutrient adequacy and diet-related risk of noncommunicable disease (NCD). This metric would allow for robust population-based assessments, comparisons among populations, and tracking of diet quality over time.

> **"This metric would allow robust population-based assessments, comparisons among populations, and tracking of diet quality over time"**

How does the GDQS work?

- The GDQS is a score ranging from 0 to 49 that is assigned to individuals based on their consumption of 25 food groups identified as globally important contributors to nutrient adequacy or risk of NCDs based on current nutrition science and epidemiological literature[3,4] (**Table 1**). Point values are assigned to each food group based on three or four categories of amount of consumption defined in *grams per day*.
- The GDQS includes 16 'healthy' food groups that receive increasing points for *higher* amounts of consumption, seven 'unhealthy' foods that receive increasing points for *lower* consumption, and two food groups – red meat and high-fat dairy – that receive increasing points up until specific consumed amounts, after which no points are given (the scoring approach for red meat and high-fat dairy reflects that these food groups are important contributors to nutrient adequacy in LMICs, while also recognizing that high consumption of these foods is associated with NCD risk).
- GDQS scores ≥ 23 are associated with a low risk of both nutrient inadequacy and NCD risk, scores ≥ 15 and < 23 indicate moderate risk, and scores < 15 indicate high risk.
- The GDQS serves as a summary measure of overall diet quality with respect to both nutrient adequacy and diet-related NCD risk, while two GDQS sub-metrics – the GDQS+, composed of only the 16 healthy GDQS food groups, and the GDQS–, composed of the 9 GDQS food groups classified as unhealthy or unhealthy in excessive amounts – are useful for quantifying the contributions of healthy and unhealthy foods to overall diet quality in a given population.
- While the GDQS is assigned at the level of individuals, these sub-metrics are intended to be used to describe and compare diet quality at the group level.

What is the basis for the GDQS scoring approach?

We identified gram per day cutoffs for scoring the 25 GDQS food groups based primarily on their ability to produce a reason-

ably even distribution of trichotomous categories of consumed amounts in quantitative 24-hour recall and food-frequency questionnaire data from nonpregnant, nonlactating women in 10 sub-Saharan African countries, China, India, Mexico, and the USA. For high-fat dairy, we added a fourth scoring range to target very high consumption equivalent to roughly 3+ servings per day.

Variation in point values assigned to different consumption amounts was informed by the literature on contributions of different food groups to health, as well as secondary analysis in which we evaluated and statistically compared the performance of 32 metric variants in predicting outcomes related to nutrient adequacy and NCD risk in cross-sectional and cohort data from sub-Saharan Africa, China, India, Mexico, and the USA, and incrementally improved metric performance based on this analysis. In this analysis, we found that using three or four scoring categories per GDQS food group provided a predictive advantage over using two, so we adopted this approach despite the added burden for data collection that it implies.

Further details on design and operationalization of the GDQS are available online.[6]

"A single food-based metric can capture outcomes related to both nutrient adequacy and NCD risk in diverse settings"

Key takeaways from design and evaluation of the GDQS[5]

1. *A single food-based metric can capture outcomes related to both nutrient adequacy and NCD risk in diverse settings, with performance comparable to that of existing metrics intended to capture only one of those domains.*

The GDQS' expanded list of food groups in comparison with those of other food-based metrics (such as the Minimum Dietary Diversity – Women [MDD-W],[7] which includes 10 food groups) captures a broader range of dietary contributors to both nutrient adequacy and NCD risk, and compensates for the predictive advantage that might otherwise be had by including nutrient components in the metric design (as in the Alternative Healthy Eating Index – 2010 [AHEI-2010],[8] which is based on six food groups and five nutrient components).

As part of our secondary analysis evaluating metric performance in different regions, we found the GDQS performed comparably with the MDD-W in predicting anthropometric and biochemical indicators of undernutrition (including underweight, anemia, and serum folate deficiency); and comparably or better than the AHEI-2010 in capturing NCD-related outcomes (including metabolic syndrome, change in weight and waist circumference, and incident type 2 diabetes).

2. *Including both healthy-scoring and unhealthy-scoring food groups improved metric performance in predicting outcomes reflective of **both** nutrient adequacy and NCD risk.*

This finding is explained by the fact that consumption of healthy, nutrient-dense foods has been associated with better metabolic health in epidemiological studies (either directly, or by replacing unhealthy foods in the diet), while lower consumption of unhealthy food groups is also associated with better nutrition status. Consequentially, the GDQS does not differentiate food groups or point values when targeting either category of outcome (use of a single metric design also makes the GDQS simpler to use).

Unlike in the MDD-W, unhealthy foods receive increasing points for *lower* consumption in the GDQS. This somewhat reduces correlations between the GDQS and nutrient intakes because unhealthy foods contain some nutrients. However, inclusion of these foods did not compromise associations with anthropometric and biochemical indicators of undernutrition in the analysis of data from sub-Saharan Africa and India.

"A key feature of the GDQS is that it is entirely food-based, which facilitates use of the metric in limited-resource settings"

Advantages of a food-based approach to measuring diet quality

A key feature of the GDQS is that it is entirely food-based. This facilitates use of the metric in limited-resource settings where data needed to calculate nutrient intakes (including local food composition data, recipes, and food preparation methods) are often inadequate or outdated. The GDQS' food-based design is therefore highly conducive to cross-country comparisons of diet quality.

The GDQS' ease of collection and analysis also allows rapid assessment of population diet quality, for obtaining time-relevant results. Furthermore, because the GDQS describes diet quality in terms of the contributions of healthy and unhealthy food groups, it provides simple and actionable data for improving population diet quality.

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TABLE 1: GDQS and GDQS sub-metric food groups and scoring[5]

Inclusion in metrics	Scoring classification	Food group	Categories of consumed amounts (g/day)			
			Low	Middle	High	Very high
GDQS and GDQS +	Healthy	Citrus fruits	< 24	24–69	> 69	–
		Deep-orange fruits	< 25	25–123	> 123	–
		Other fruits	< 27	27–107	> 107	–
		Dark-green leafy vegetables	< 13	13–37	> 37	–
		Cruciferous vegetables	< 13	13–36	> 36	–
		Deep-orange vegetables	< 9	9–45	> 45	–
		Other vegetables	< 23	23–114	> 114	–
		Legumes	< 9	9–42	> 42	–
		Deep-orange tubers	< 12	12–63	> 63	–
		Nuts and seeds	< 7	7–13	> 13	–
		Whole grains	< 8	8–13	> 13	–
		Liquid oils	< 2	2–7.5	> 7.5	–
		Fish and shellfish	< 14	14–71	> 71	–
		Poultry and game meat	< 16	16–44	> 44	–
		Low-fat dairy	< 33	33–132	> 132	–
		Eggs	< 6	6–32	> 32	–
GDQS and GDQS –	Unhealthy in excessive amounts	High-fat dairy* (in milk equivalents)	< 35	35–142	> 142–734	> 734
		Red meat	< 9	9–46	> 46	–
		Processed meat	< 9	9–30	> 30	–
		Refined grains and baked goods	< 7	7–33	> 33	–
		Sweets and ice cream	< 13	13–37	> 37	–
		Sugar-sweetened beverages	< 57	57–180	> 180	–
		Juice	< 36	36–144	> 144	–
		White roots and tubers	< 27	27–107	> 107	–
		Purchased deep-fried foods	< 9	9–45	> 45	–

Source: Table adapted from Table 3 in Bromage S, Batis C, Bhupathiraju SN, Fawzi WW, Fung TT, Li Y, et al. Development and validation of a novel food-based Global Diet Quality Score. Manuscript submitted in February 2021 for publication consideration in a Journal of Nutrition Supplement: 'The Global Diet Quality Score (GDQS): A New Method to Collect and Analyze Population-Based Data on Diet Quality.'

The naming of food group categories as 'healthy,' 'unhealthy,' and 'unhealthy when consumed in excessive amounts' provides a simple method for communicating how the foods in each food group contribute to an overall healthy diet, as reflected in the epidemiological literature and operationalized by the GDQS.

* Hard cheese should be converted to milk equivalents using a conversion factor of 6.1 when calculating total consumption of high-fat dairy for the purpose of assigning a GDQS consumption category. See[6] for details on how to apply this conversion factor appropriately, according to the method used to collect the data.

As a simple metric of diet quality, the GDQS does not intend to capture information related to the consumption of fortified foods. Fortified foods should be classified in the food groups that correspond to the unfortified versions of those foods (e.g., orange juice fortified with calcium should be classified in the juice category; liquid oil fortified with vitamin A should be classified in the liquid oil category).

Points assigned			
Low	**Middle**	**High**	**Very high**
0	1	2	–
0	1	2	–
0	1	2	–
0	2	4	–
0	0.25	0.5	–
0	0.25	0.5	–
0	0.25	0.5	–
0	2	4	–
0	0.25	0.5	–
0	2	4	–
0	1	2	–
0	1	2	–
0	1	2	–
0	1	2	–
0	1	2	–
0	1	2	–
0	1	2	0
0	1	0	
2	1	0	–
2	1	0	–
2	1	0	–
2	1	0	–
2	1	0	–
2	1	0	–
2	1	0	–

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Nutrient Profile Guidelines for Codex Alimentarius

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Introduction

Nutrient profiling (NP) has several applications in regulatory guidance and policy development as well as in public health interventions aimed at improving diets, such as regulating the advertising of foods to children and the provision of nutrition labeling, including front-of-pack nutrition labeling (FOPNL).[1,2] Currently, there is a lack of global guidance to address the definition and criteria for nutrient profiles for food labeling. The establishment of international guidance on NP for labeling purposes is necessary in order to create a harmonized reference and promote an international understanding of how nutrient profile models (NPMs) are constructed and how they function. This article outlines current uses of nutrient profiles for regulatory purposes and presents efforts to establish Codex Global Guidelines for the development of nutrient profiles for FOPNL.

> **"The establishment of international guidance on NP for labeling purposes is necessary in order to create a harmonized reference"**

Background

The development of guidance on NP can contribute to the evidence-informed guidance on nutrition and healthy diets provided by the Food and Agriculture Organization of the United Nations (FAO) and the World Health Organization (WHO), and can support the realization of the Sustainable Development Goals (SDGs) and the United Nations Decade of Action on Nutrition, 2016–2025 (Nutrition Decade),[3] which was proclaimed by the UN General Assembly as a follow-up to the Second International Conference on Nutrition (ICN2) held in 2014. More specifically, such guidance will complement existing initiatives, including the Global Action Network on Nutrition Labeling[4] that was formed in 2019, under the umbrella of the Nutrition Decade, to accelerate implementation of effective nutrition labeling policies.

WHO initiated work in NP in 2009, which resulted in a joint technical meeting with the International Association for the Study of Obesity (IASO) and a joint publication of a manual outlining guiding principles and a framework that WHO Member States and Regions could adapt when developing and implementing the NP of foods for various uses.[2]

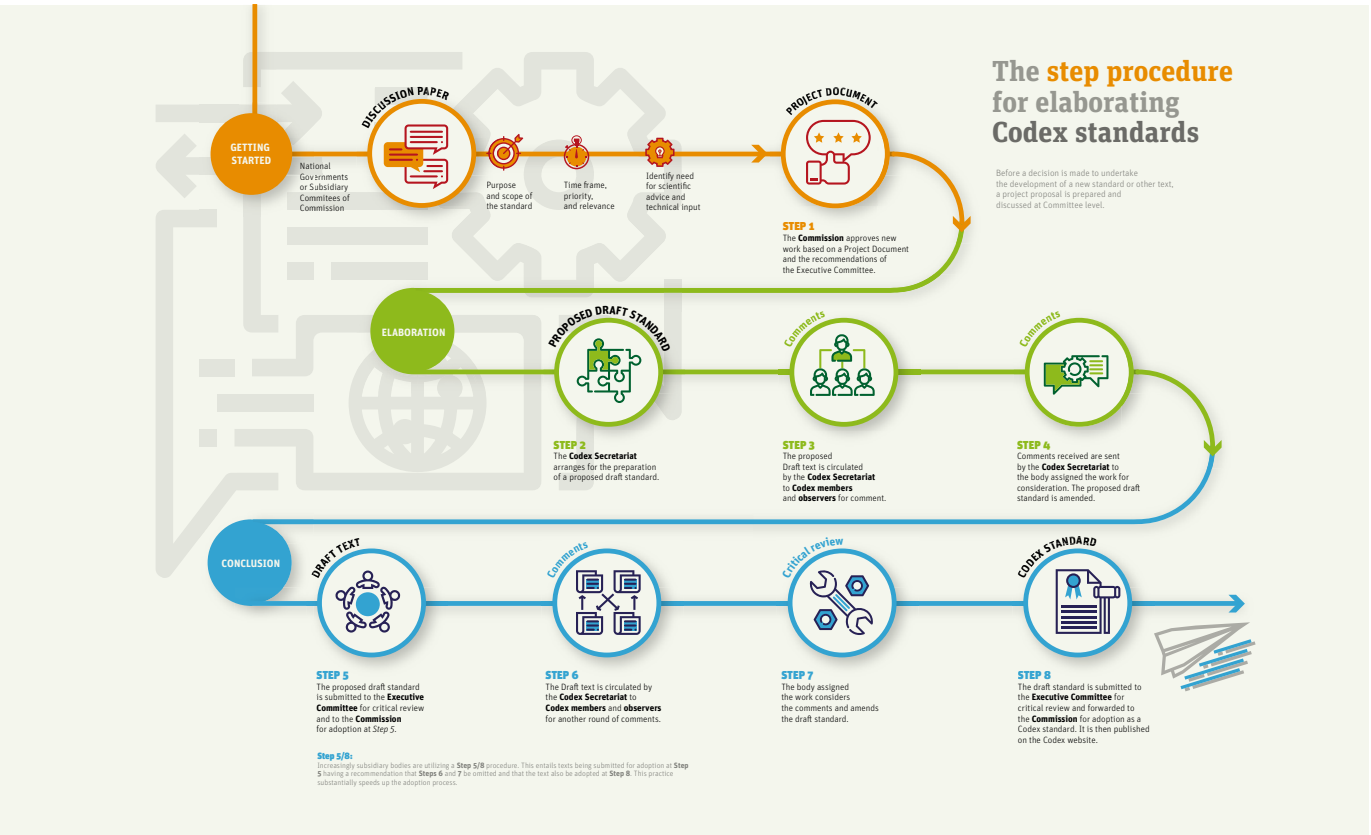
Many different NPMs have now been developed in several countries for regulatory purposes.[1] These include the UK FSA/Ofcom model, published by the United Kingdom's Food Standards Agency (FSA) and Ofcom,[5] the independent regulator and competition authority for UK communications industries, and the WHO-Euro model, published by WHO's European Regional Office (WHO-EURO).[6] Both of these models were developed by public bodies to help regulate the marketing of food to children. The UK FSA/Ofcom model has been adapted by bodies around the world for other regulatory purposes besides the advertising of foods to children, such as food labeling (in FOPNL) in Australia and New Zealand,[7,8] and the Nutri-Score FOPNL system in France.[9] The WHO-Euro model has also been adapted by WHO regional offices of the Eastern Mediterranean Region[10] and the Western Pacific Region.[11] Finally, the Pan American Health Organization (WHO/PAHO) model published in 2016 was developed for multiple applications, including the regulation of marketing, front-of-pack labeling, and fiscal policies related to foods and beverages with a high energy content and poor nutritional values.[12]

In view of the different NPMs being developed and used in a range of countries, concern is growing as to how this will impact international food trade, which is where the Codex Alimentarius Commission and its work can play a role.

Codex Alimentarius Commission: Procedural guidance for guideline development

The Codex Alimentarius is a collection of standards, guidelines, and codes of practice adopted by the Codex Alimentarius Commission (the Commission). The Commission is the central part of the Joint FAO/WHO Food Standards Programme, and was established by FAO and WHO to protect consumer health and promote fair practices in food trade.[13] The core Codex texts apply to all products and product categories, and typically deal with several areas including labeling and nutrition.

FIGURE 1: The eight-step procedure used by the Commission for elaborating Codex standards[15]



> **"The core Codex texts apply to all products and product categories"**

The Procedural Manual of the Commission[14] describes the legal foundations and practical functioning of the Commission and its subsidiary bodies. It also outlines extensive guidance on the eight-step process for developing a standard, as summarized in **Figure 1**. This uniform process enables Codex to meet its core values of collaboration, inclusiveness, consensus building, and transparency. Standards can take several years to develop. Once adopted by the Commission, a Codex standard is added to the Codex Alimentarius and published on the Codex Alimentarius website.[15]

Codex Alimentarius general guidelines on nutrient profiling

The Codex Alimentarius Commission defines nutrition labeling as "a description intended to inform the consumer of nutritional properties of a food." The Commission provides guidance on the procedures for implementing nutrition labels, such as how to implement nutrient declarations, which nutrients are to be declared, what reference values are to be used, or how to present nutrition labels.[16]

In 2017, the Codex Committee on Food Labeling (CCFL)[17] recognized the need to develop guidelines on FOPNL. This was done to provide global consistency in facilitating consumer understanding of the nutritional value of foods, while reducing the risk of impediments to trade that may arise from the proliferation of different systems. The Codex Alimentarius Commission subsequently agreed to start new work on developing guidelines for FOPNL.

> **"The Codex Alimentarius Commission agreed to start new work on developing guidelines for FOPNL"**

In 2019, the 41st session[18] of the Codex Committee on Nutrition and Foods for Special Dietary Uses (CCNFSDU) considered a discussion paper for devising general guidelines to assist governments (or other stakeholders) in the development and application of nutrient profiles to be used on front-of-pack labeling systems. Such guidance would support the guidance on FOPNL that was under development.

In developing the discussion paper,[19] an inventory of NPMs was undertaken. This outlined 39 NPMs that had been developed for

FOPNL. Using the WHO approach to test the validity of NPMs, the degree to which each model manages to correctly categorize the different foods was assessed.[20] This exercise highlighted gaps in the existing validation methodology, particularly due to the lack of definition of healthy food. It also justified the need to harmonize the scientific criteria of nutrient profiles applicable to food labeling.

CCNFSDU will consider a further paper to define the scope for developing general guidelines for the establishment of nutrient profiles for use in FOPNL (the intent of such proposed work is not to establish a single harmonized NPM for FOPNL). Provided CCNFSDU agrees to start new work, then such a proposal could be submitted to the Codex Alimentarius Commission in 2022 for approval. If approved, it is expected that such work could be finalized by 2025. The proposed work is in line with the mandate of the Commission for the development of international standards, guidelines and other recommendations to protect consumer health and ensure fair practices in food trade, and in line with the need to address current, emerging, and critical issues in a timely manner (Goal 1 of the Codex Alimentarius Commission Strategic Plan 2019–2025).[21]

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Germany Introduces Nutri-Score Front-of-Package Labeling

Interview with Christoph Meyer

© Christoph Meyer

Christoph Meyer is Head of Department 215 at the German Federal Ministry of Food and Agriculture in Berlin. He describes the process of introducing the Nutri-Score system to Germany, and considers its wider benefits – for food and beverage producers as well as consumers.

***Sight and Life* (SAL):** *Christoph, how would you describe the nutritional status of the German population as a whole today?*

Christoph Meyer (CM): According to the German Nutrition Society (Deutsche Gesellschaft für Ernährung), contemporary German diets are too high in animal-source foods as well as in salt, fat, and sugar, and too low in plant-source foods and dietary fiber. Micronutrient levels are generally adequate, but there are deficiencies in iodine and folate within the population. Approximately half of all men and women in Germany are now either overweight or obese, while 15 percent of children are overweight and 6 percent obese.

> **"Approximately half of all men and women in Germany are now either overweight or obese"**

SAL: *Are there particular trends in the population's nutritional status, whether positive or negative?*

CM: Current figures indicate that overweight and obesity are on the increase in adults, but are stable in children at present. However, these figures don't take into account the effects of the COVID-19 pandemic, which has led to a general reduction in levels of physical activity and also had a widely negative impact on diets. We shall have to see what the updated picture shows when it becomes available.

SAL: *When and why was Nutri-Score front-of-pack (FOP) labeling introduced in Germany?*

CM: It was introduced on 6 November 2020, under the German Food and Agriculture Minister, Julia Klöckner. The topic had been under discussion for the foregoing 10 or 12 years, and fitted well into the policy framework of the Federal Ministry of Food and Agriculture. It was decided to introduce some form of FOP labeling, but the ruling parties did not specify which. Germany did not have an FOP labeling system of its own, so the requirement was to study systems that had been developed by other countries and decide which would be most suitable for application in Germany. The Federal Ministry of Food and Agriculture reviewed 15 systems from different countries. This was the basis for in-depth stakeholder consultations and consumer research, which resulted in the identification of Nutri-Score as the most suitable system.

SAL: *What informed the selection of this system rather than another?*

CM: Our objective was simple: to make it easier for consumers to identify and purchase nutritionally favorable foods. Consumer and health associations as well as some companies tended to favor some form of color-coded system, whereas parts of the industry favored a purely descriptive system. Minister Klöckner therefore initiated an analysis, which examined the strengths and weaknesses of all the systems under review and also involved all the relevant stakeholders. Independent and representative consumer research resulted in a clear recommendation for Nutri-Score, which is a color-coded system with five categories, from A (dark green, nutritionally favorable) to E (red). Nutri-Score was originally developed in France, which was the first country to adopt it, and has since been rolled out to a number of European countries, including Belgium, Switzerland, and Luxembourg, as well as Germany.

The launch of Nutri-Score in Germany. Left to right: the President of the Food Federation, Minister Klöckner, and the Executive Director of the Federation of the German Consumer Organizations.

SAL: *Why did Germany opt for a voluntary approach to front-of-pack labeling?*

CM: The EU Food Information to Consumers (FIC) regulation permits FOP on a voluntary basis only, and so it was on this basis that Nutri-Score had to be introduced in Germany. However, the EU Commission has announced the tabling of a legislative proposal for a mandatory FOP labeling system by the end of 2022.

> **"The EU Commission has plans to introduce a mandatory FOP labeling system"**

SAL: *To what types of product and packaging is Nutri-Score applied?*

CM: The Nutri-Score label applies to all foods that have to bear a nutrition declaration under the FIC regulation. FIC covers all foods, but nutrition declaration under FIC is in general mandatory for all prepackaged foods and beverages.

SAL: *How does the Nutri-Score system work?*

CM: Nutri-Score is a nutrition label. It converts the nutritional value of products into a simple code consisting of five letters, each with its own color. Each product is awarded a score based on a scientific algorithm that was originally developed by the UK Food Standards Agency and then modified by French scientists. The formula takes into account those nutrients whose intake should be limited (especially the energy value and the amount of sugars, saturated fats, and salt) and those that support a healthy diet (e.g., content of fiber, protein, fruit, vegetables, nuts, and vegetable oils). The calculated score allows the consumer to see at a glance which foods of the same category are favorable in terms of their nutritional value. Thus Nutri-Score facilitates the choice between different yogurts or cereals, for example.

SAL: *What communication and education initiatives have been launched to support the introduction of Nutri-Score?*

CM: We ran a communication campaign targeting two groups: consumers on the one hand, and food and beverage producers and retailers on the other. We wanted to promote the use of Nu-

tri-Score and to explain to the industry that Nutri-Score might be a means for them to communicate their reformulation efforts. We also assisted companies with the registration process, which has to be completed in French or English rather than German. In terms of outreach to consumers, we ran a social media campaign, a print media campaign, and also a series of adverts on televisions in doctors' waiting rooms.

"The response from enterprises exceeded our expectations"

SAL: *How has Nutri-Score been received to date?*

CM: The response from enterprises exceeded our expectations: some 160 German firms, most of them producers, had registered within 5 months of the launch of Nutri-Score in Germany. Retailers have also embraced it, and some of them are even using it in their marketing. We're currently conducting an evaluation of our consumer information campaign, which will give us a detailed picture of consumer reactions across Germany.

SAL: *How is the impact of the Nutri-Score system being measured? Are there any early findings to report?*

CM: To answer that question, it's important to reiterate that Nutri-Score was introduced only at the end of last year and to explain that food and beverage producers as well as retailers who sign up for it have at least 24 months, and in some cases a maximum of 36 months, to change their labels. This means that we can't have any meaningful metrics at this stage, although we can, of course, note positive trends.

SAL: *On the basis of your experience to date, would you recommend the Nutri-Score system to other countries?*

CM: Indeed, but this should be seen in the context of the EU overall. The European Commission's farm-to-fork strategy proposes a mandatory FOP system for all EU countries. This would offer transparency to consumers, but would also offer advantages to food and beverage producers and retailers who sell in multiple markets. It was in fact during Germany's presidency of the EU that member states agreed on the introduction of a uniform system.

SAL: *If you were to launch Nutri-Score all over again in Germany, is there anything you would do differently the second time around?*

CM: I'd say that the process went more smoothly than anticipated, because it was extremely transparent and also because it involved all the relevant stakeholders.

SAL: *Thank you, Christoph, and let's hope that the use of Nutri-Score really does help consumers to make healthier food choices.*

CM: Yes, indeed. Thank you.

Christoph Meyer was interviewed by Jonathan Steffen.

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The Nutrient Profile behind Mexico's Warning Labels

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Responding to an epidemiological emergency

An epidemiological emergency was declared in Mexico in 2016 due to alarming rates of obesity and noncommunicable diseases (NCDs). At the time, 71.3 percent of the Mexican adult population was overweight or obese and 9.4 percent had diabetes;[1] by 2018, these figures had increased to 75.2 percent and 10.3 percent,[2] respectively. Despite this, the country has made strides towards comprehensive public health measures to modify the population's consumption habits and improve the food environment. Its most recent achievement is the adoption of front-of-pack (FOP) warning labels (WLs),[3] which were implemented in October 2020. The labels consist of black octagons that signal excessive amounts of calories, sugar, saturated fat, trans fat, and sodium (**Figure 1**). They also include two warning 'captions' for children on products containing non-caloric sweeteners and caffeine. Food and beverage manufacturers must place labels and captions on packaged products that exceed the cutoff points. For small packages, a seal with a number indicating how many labels apply to that product can be used (see example in **Figure 1**). Exemptions exist for culinary ingredients and products intended for young children (aged 3 years and under), which are regulated by a different law.

> **"The narrative created by the food industry that 'there are no good foods or bad foods' cannot be sustained"**

The nutrient profile (NP) behind Mexico's WLs is based on the Pan American Health Organization's (PAHO) model,[4] which was

FIGURE 1: The Mexican warning label system

From top to bottom: Mexico's five black octagonal warning labels; two warning captions for identifying products that are unsuitable for children because they contain sweeteners and caffeine; and five seals for use on small packages to indicate the number of warning labels that apply to the product.

TABLE 1: The Pan American Health Organization's nutrient profile

Total fat	Saturated fat	Trans fat	Free sugars	Other sweeteners	Sodium
≥ 30% of total energy comes from total fat	≥ 10% of total energy comes from saturated fat	≥ 1% of total energy comes from trans fat	≥ 10% of total energy comes from free sugars	Any amount of other sweeteners	≥ 1 mg of sodium per 1 kcal

TABLE 2: The nutrient profile used to design warning labels in Mexico

	Energy	Free sugars	Saturated fat	Trans fat	Sodium
Solids, per 100 g	≥ 275 total kcal	≥ 10% of total energy comes from free sugars	≥ 10% of total energy comes from saturated fat	≥ 1% of total energy comes from trans fat	≥ 1 mg of sodium per 1 kcal or ≥ 300 mg
Liquids, per 100 ml	≥ 70 total kcal or ≥ 8 kcal of free sugars				≥ 45 mg of sodium in non-caloric beverages

created by an international group of nutrition experts. It provides a measure of acceptable amounts of critical nutrients that can be applied to obesity and NCD prevention strategies. This NP goes against the narrative created by the food industry that "there are no good foods or bad foods," which cannot be sustained considering that ultra-processed products (UPP) contain high amounts of calories, sodium, fat, and sugar and are harmful to health. In fact, years of research has demonstrated an association between NCDs and the consumption of UPP.[5,6] For this reason, PAHO's model exclusively evaluates processed products and UPP, aligning with food-based dietary guidelines in most countries. The critical nutrients included in the NP are based on population nutrient intake goals developed by the World Health Organization (WHO).[7] The criteria used by PAHO to determine if a product has excessive levels are shown in **Table 1**. Artificial sweeteners are also included on the basis that they may encourage the consumption of sweet foods and beverages, particularly in individuals who are exposed to them early in life. Comparisons with other NPs show that PAHO's is stricter and less permissive than other commonly used models.[8,9]

Context-specific nutrient profiling

Of the six cut-points in the PAHO profile, Mexican WLs use those for free sugars, saturated fat, trans fat, and sodium, also expressing nutrient content relative to total weight or volume (per 100 g/ml). In addition, national experts adopted the criterion for calories in solid foods that were used to develop WLs in Chile. It deems products excessive in calories if they contain ≥ 275 kcal per 100 g. Finally, the Mexican NP has unique cut-points for calories and sodium in liquids. Beverages have excess calories if they contain ≥ 70 total kcal or ≥ 8 kcal of free sugars per 100 ml. This was done to fairly evaluate drinks whose source of calories is exclusively from sugar. For sodium, ≥ 300 mg per 100 g was added as an alternative parameter to ≥ 1 mg per kcal, which is recommended by PAHO as an "absolute ceiling,"[10] considering that it is the maximum amount a food could have in its natural state. Lastly, a specification of ≥ 45 mg of sodium covers non-caloric beverages. Combining these different elements allowed researchers to create a context-specific NP on which to base the labels in Mexico (see **Table 2**). However, the regulation itself not only labels foods; it also prohibits the use of claims and characters, including cartoon

FIGURE 2: Natural cereal compared with processed breakfast cereals in Mexico, with varying numbers of warning labels

FIGURE 3: An example of how products are displayed on shelves with the back side (shown on the left) facing forward to hide the front-of-pack warning labels

and licensed characters, celebrities, athletes, and influencers, on products with WLs. This applies to all media through which products are advertised: stores, television, the internet, billboards, and so on. An example of varying numbers of WLs on popular breakfast cereals in Mexico is shown in **Figure 2**.

Challenges to the effectiveness of warning labels

Despite successful implementation of the labels, challenges to their effectiveness still exist. Numerous efforts by the food industry to undermine this policy have been documented. For example: printing characters on the product itself as opposed to the package; displaying products on shelves with the back of the packet facing forward to hide the labels (see **Figure 3**); utilizing sweeteners that are not classified as non-caloric sweeteners to avoid warning captions; using messages with incorrect interpretations of WLs; and recruiting researchers with conflicts of interest to distort public narrative, among others. Similar strategies have been observed in other countries with WL systems.

> **"Numerous efforts by the food industry to undermine this policy have been documented"**

The benefits of warning labels

Despite strong opposition from the food industry, the obstacles are worthwhile as extensive research has documented the benefits of WLs, which meet the criteria for an effective FOP labeling system.[10,11] Specifically, it adapts to the short time frame in which consumers make purchasing decisions, allowing them to quickly and easily identify unhealthy products without much effort.[12] Studies comparing WLs with color-coded and Guideline Daily Amount (GDA) labels have shown that WLs capture consumers' attention more rapidly and improve their understanding of critical nutrients more successfully.[13,14] What distinguishes them most from other systems is that they promote healthier food choices and reduce consumers' intent to purchase products with labels in diverse populations.[10,15–17] In Mexico, validation exercises have shown that WLs are well understood and accepted by low- and middle-income populations, as well as by Mexicans living in the USA.[18,19]

> **"Validation exercises have shown that WLs are well understood and accepted by low- and middle-income populations"**

Furthermore, promising evidence has recently surfaced in Chile, where WLs were implemented in 2016. An evaluation of sugary beverage purchases from 2015 to 2017 showed a 23.7 percent reduction compared with the pre-regulation period. At the same time, purchases of sweetened beverages without labels increased by 4.8 percent.[15] Another pre and post evaluation showed a decrease in the percentage of breakfast cereals that used child-directed marketing strategies, from 36 percent to 21 percent.[20] Moreover, no impact has been observed on employment or wages in the food and beverage sector.[21]

A resource for consumers and health providers

In conclusion, NPs are a tool to differentiate basic, healthy foods from non-basic and UPP, whose consumption should be reduced to minimize health effects. Mexico and other Latin-American countries have been able to harness this tool to design comprehensive FOP labeling regulations. Forming part of overarching obesity and NCD prevention strategies, WLs serve as a resource for Mexicans who wish to make healthier choices, and for health providers seeking practical ways to make dietary recommendations to patients who are at risk of developing NCDs and those who are already struggling with them.[3] The next step will be to generate sustainable dietary guidelines on the basis of regional nutrition problems, food consumption patterns, cultural practices, and the country's indigenous crops, among other factors.

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