CARDIOVASCULAR HEALTH

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NUTRIENT PROFILE MODELS

A critical tool to enable nutrition policy interventions

What is this document?

- Nutrient profile models **underpin key nutrition policy interventions.**
- There are many existing nutrient profile models that can be adapted for new uses.
- This document includes:
  - Background information on nutrient profile models including their **applications, impact** and an overview of their **development;**
  - **Five key steps to adapting an existing model** for use in a new context; and
  - **Examples** and **resources** to guide the process.

What is a nutrient profile model?

- Nutrient profile models classify or rank foods based on their nutritional composition for reasons related to preventing disease and promoting health
- They provide the scientific foundation for regulatory initiatives

WHAT ARE THE APPLICATIONS OF NUTRIENT PROFILE MODELS?

- Front-of-pack labels
- Regulation of health and nutrition claims
- Marketing restrictions of unhealthy foods and beverages
- Food procurement regulations for public institutions
- Food taxes and subsides
- Nutritional surveillance

WHAT DO THE APPLICATIONS OF NUTRIENT PROFILE MODELS ENABLE?

- **Identification of products** not allowed to be marketed to children, served or sold by public institutions, and / or are taxed or subsidized
- Informative **front-of-package labels** that provide accessible nutrition information for consumers
- **Industry reformulation of existing products** to improve healthfulness

Sources: World Health Organization. Fiscal policies for diet and prevention of noncommunicable diseases. 2015.; Labonté M-È., et al. Nutrient profile models with applications in government-led nutrition policies aimed at health promotion and Noncommunicable Disease Prevention: A Systematic Review. Advances in Nutrition. 2018;9(6):741–88.

DEVELOPMENT

WHEN DOES A COUNTRY NEED A NUTRIENT PROFILE MODEL?

- Countries need nutrient profile models when they are considering implementing a policy or educational program and need to classify foods according to their nutrient qualities

WHO TYPICALLY DEVELOPS NUTRIENT PROFILE MODELS?

- Organizations that are unbiased (independent of industry), transparent, and scientifically credible do so most successfully
- Often, governments convene experts

WHAT ELSE DOES IT TAKE TO DEVELOP A NUTRIENT PROFILE MODEL?

- Clear understanding of national objectives and priorities related to nutrition
- Standardized, mandatory nutrition information for all packaged foods
- Lab capacity to monitor accuracy of nutrient information

How does a country implement a nutrient profile model?

- After identifying an appropriate nutrient profile model (*see pages 3-11 for more detail)*, countries implement it by incorporating it into related policies
- For example, Chile introduced its nutrient profile model as a part of its labeling and advertising law. It made cutoffs stricter over the course of three phases from 2016-2019 (as depicted in the timeline below). While phased implementation is not necessarily recommended, it was what was feasible in this context for industry to comply and monitoring and evaluation mechanisms to be established.

Timeline of Chile Nutrient Profile Model Development and Application

PLANNING			PHASED APPLICATION		
2012	**2013**	**2015**	**2016**	**2018**	**2019**
Law 20 606 of food labeling & advertising	First proposed decree with regulation details (including nutrient profile model)	Final decree	Implementation began – with initial nutrient profile model cutoffs	Stricter cutoffs applied	Strictest cutoffs applied

Sources: Corvalán C, et al. Structural responses to the obesity and non-communicable diseases epidemic: Update on the Chilean Law of Food Labelling and advertising. Obesity Reviews. 2018;20(3):367–74.

Principles to guide model development

The process to develop a nutrient profile model for a country or context should be

- **Transparent:** Documentation of and a clear line of sight into who developed the nutrient profile model and how it was created
- **Evidence-based:** Draw on published nutrition standards, existing nutrient profile models, relevant food databases and expert input
- **Inclusive and representative:** Maintain an approach that considers the full target population, including any implications (e.g., whether the model consistently flags less expensive products)

Approaches

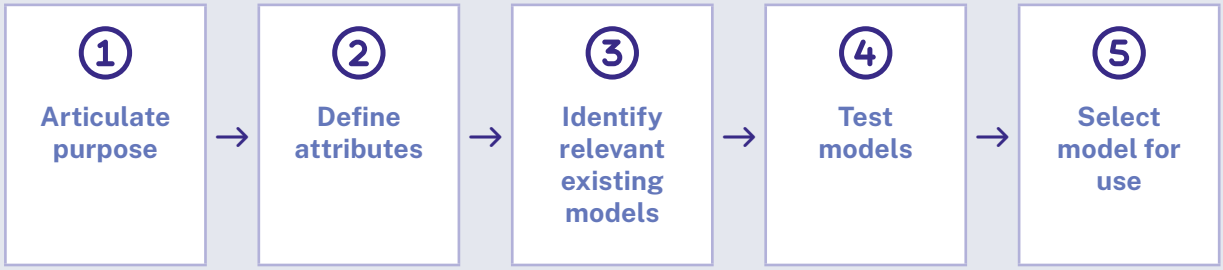
OPTION 1: START FROM SCRATCH

- Extensive effort and significant resources required
- Needs cohort study to validate relationship of potential cutoffs and health outcomes

OR

OPTION 2: ADAPT AND EXISTING MODEL

- Practical; less time and resource intensive
- Avoids duplication
- Reduces confusion
- Decreases likelihood of loss of credibility of NPMs broadly



This document focuses on adapting an existing model since it is more feasible and efficient, and few existing materials focus on this approach.

Sources: World Cancer Research Fund International. Building momentum: lessons on implementing a robust front-of-pack food label. 2019.; Labonté M-È., et al. Nutrient profile models with applications in government-led nutrition policies aimed at health promotion and Noncommunicable Disease Prevention: A Systematic Review. Advances in Nutrition. 2018;9(6):741–88.

ADAPT AN EXISTING MODEL

① ARTICULATE PURPOSE

At the outset, define the following to be clear on **the goals and uses of the nutrient profile model (NPM)**, and thereby increase its relevance and utility:

What to Define	Examples
Uses of the NPM What the NPM is intended to inform?	• Front-of-package warning labels • Packaged food sodium reduction targets • Fiscal policies • Several policies simultaneously
Target population Who will be impacted?	• All citizens • Children or children in schools
Eligible products What products will be covered by the NPM?	• Foods sold at fast food outlets • Food with anything added to its raw form (e.g., flavored yogurt but not plain yogurt) • Processed and ultra-processed foods • All foods with exceptions (e.g., food for specialized medical treatment)

② DEFINE ATTRIBUTES

Then, decide on the key attributes of the nutrient profile model:

Ⓐ **Categorization type** Whether it uses cutoffs for scoring to categorize products	Ⓑ **Food category delineation** Whether cutoffs are food category-specific or if a single cutoff is used per ingredient
Ⓒ **Ingredients covered** Whether it includes cutoffs for unfavorable and/or favorable ingredients	Ⓓ **Reference amount** The reference amount used to compare the quality of an ingredient (e.g., per 100g)

Pages 5-8 detail the options for these attributes along with their pros and cons

Sources: Scarborough, P., et al. (2007). Developing nutrient profile models: a systematic approach. Public Health Nutr., 10(4), 330-336.; Verhagen H, van den Berg H. A simple visual model to compare existing nutrient profiling schemes. Food & Nutr. Research. 2008;52(1):1649.; World Health Organization (2011). Nutrient profiling: report of a WHO/IASO technical meeting. https://apps.who.int/iris/bitstream/handle/10665/336447/9789241502207-eng.pdf?sequence=1&isAllowed=y

Decide on the desired **key attributes of the nutrient profile model**:

Ⓐ Categorization type

OPTION	Dichotomous thresholds Cutoffs to indicate whether an ingredient in the product meets a healthy/unhealthy level	Summary indicator Aggregate score that summarizes multiple ingredients to indicate a product's overall healthfulness
PROS	• Straightforward to understand, apply and enforce	• Consideration of the entire profile • Facilitates tiered taxation
CONS	• Some products may only need to reformulate minimally to achieve a category switch from unhealthy to healthy	• Less impactful at discouraging unhealthy food purchases • Often limited scientific backing for meaning of a score • Can be manipulated by industry if favorable ingredients are included in the score (e.g., adding fiber to improve score)
IDEAL FOR	**Front-of-package labeling** dichotomous thresholds make implementation and monitoring more feasible (i.e., warning labels)	

EXAMPLE

Chilean octagonal warning labels which rely on the Chilean nutrient profile model — flag products high in unfavorable ingredients including sugar, saturated fat, sodium and calories

Attributes:

a. **Categorization type** Dichotomous thresholds

b. **Food category delineation** Across-the-board

c. **Ingredients covered** Unfavorable

d. **Reference amount** Per 100g / 100mL

Sources: Corvalán C, et al. Structural responses to the Obesity and non-communicable diseases epidemic: The Chilean Law of food labeling and advertising. Obesity Reviews. 2013;14:79–87.

B Food category delineation

OPTION	Food categories Separate cutoffs for each food category	Across-the-board A single cutoff is used for each ingredient for all products
PROS	• Accounts for differences in food categories • Can drive more reformulation	• Straightforward to apply and enforce • Easy for consumers to understand
CONS	• More difficult to apply and enforce • Categories cannot be easily compared to each other	• Some categories may incidentally be penalized based on their natural composition (e.g., nuts and seeds) • Reduces reformulation potential for some categories
IDEAL FOR	**Reformulation targets** using specific food categories can help drive more change within a category	**Front-of-package labeling and marketing restrictions** across the board cutoffs using make implementation and monitoring and evaluation more feasible

INDUSTRY PUSHES BACK AGAINST THESE MODELS

Industry has used several approaches to weaken nutrient profile models:

- Industry pushes for less strict cutoffs overall, but also advocates for *more and more categories* – so the cutoffs are made for, and comparison is made to, very similar products. This can result in less change in the healthfulness of products, and also be more complicated to communicate and apply.
- Industry also proposes *adding healthful ingredients* (e.g., fiber) to improve a nutrient profile model summary score, without decreasing the amount of unhealthy ingredients in their product.
- Industry *manipulates serving size* to avoid being flagged as unhealthy by nutrient profile models.

Sources: Corvalán C, et al. Structural responses to the Obesity and non-communicable diseases epidemic: The Chilean Law of food labeling and advertising. Obesity Reviews. 2013;14:79–87.

© Ingredients covered		
OPTION	**Only unfavorable ingredients** Ingredients that consumers should avoid (e.g., sodium, sugar, saturated fat)	**Favorable and unfavorable ingredients** Ingredients ones should be increased (e.g., vitamin A, iron, fiber) in addition to unfavorable ingredients
PROS	• Not as easily manipulated by industry • Clear guidance for consumers	• Can support a comprehensive, balanced diet
CONS		• Can be manipulated by industry
IDEAL FOR	**Front-of-package labeling** Warning labels for unfavorable ingredients can clearly and concisely caution the customer of high levels of ingredients that should be avoided	**Public food procurement** Covering favorable and unfavorable ingredients can promote a healthy diet holistically (e.g., in schools)

EXAMPLE

Nutri-score is front-of-package label which relies on the nutrient profile model developed by the United Kingdom Food Standards Agency and is used by France. It summarizes the healthfulness of a product (both favorable and unfavorable ingredients) by assigning a letter score.

ATTRIBUTES:

E. **Categorization type** Summary indicator

F. **Food category delineation** Food categories

G. **Ingredients covered** Favorable and unfavorable

H. **Reference amount** Per 100g / 100mL

Sources: Corvalán C, et al. Structural responses to the Obesity and non-communicable diseases epidemic: The Chilean Law of food labeling and advertising. Obesity Reviews. 2013;14:79–87.

Reference amount			
OPTION	**Per 100g/100mL** compared to product weight	**Per 100 kcal/kJ** compared to calories within a product	**Per serving** compared to product serving size
PROS	• Straightforward to apply and enforce • Widely used, allows for model comparison • Aligns with *Codex Alimentarius*	• Comparable to WHO recommended daily intake • Better accounts for different calorie intake between women / men and adults / children	• May more accurately capture actual consumption
CONS	• Without volume corrections, can penalize calorie-dense foods with across-the-board cutoffs (e.g., nuts but not sugary beverages)	• More difficult to implement and enforce (need to know calorie content)	• Difficult to apply and enforce (serving sizes rarely defined) • Can be manipulated by industry (e.g., smaller servings)
IDEAL FOR	**Front-of-package labeling** Allows for direct comparison of products and is readily implementable		**Public food procurement** For interventions in restaurants or cafeterias, serving size is particularly relevant

NPMs FOR FISCAL POLICIES

Fiscal policies (e.g., taxes, subsidies) for unhealthy foods are gaining traction. A nutrient profile model may be used as the basis for a fiscal policy that promotes consumption of healthier foods. There are several nutrient profile model approaches to explore further:

- Use a model already in place for an existing policy (e.g., front-of-package labeling)
- Adapt or develop a model to inform fiscal policies

Sources: Corvalán C, et al. Structural responses to the Obesity and non-communicable diseases epidemic: The Chilean Law of food labeling and advertising. Obesity Reviews. 2013;14:79–87.

③ IDENTIFY RELEVANT EXISTING MODELS

Identify relevant existing models that could be used or adapted:

Ⓐ Find nutrient profile model(s) that serves the purpose with desired attributes

- Review existing models in the literature and assess their potential fit—including the relevant regional model developed by WHO *(see page 13)*
- The systematic review by Labonté et al. is a helpful starting place for a longlist of models, since it includes the 78 nutrient profile models considered for nutrition policy published in the literature as of 2018.

Nutrient Profile Models with Applications in Government-Led Nutrition Policies Aimed at Health Promotion and Noncommunicable Disease Prevention: A Systematic Review

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- Additional resources to find and review existing models are included on page 13

Questions to ask to assess potential models

- Was it created for the same purpose? Who is the target population? What products does it cover?
- Does it have the desired delineation, ingredients covered, reference and categorization type?
- Would it be feasible to apply? Is it regionally / culturally relevant?
- What context-specific changes would be required? Are they major or minor?

Ⓑ Review development and validation

- Assess which potential models have the validity, credibility and evidence-base to stand up to challenges and criticism by industry and other partners—noting a model may need slight adaptations for the context.

If there is not a relevant and valid model that meets desired attributes after slight modifications for the context — revisit and refine Step 2.

Questions to ask to review model development and validation

- Did a credible organization develop it?
- Was it thoroughly validated (ideally using predictive validity methods)?

Sources: World Health Organization. Nutrient profiling: report of a WHO / IASO technical meeting. 2010.; Labonté M-È., et al. Nutrient profile models with applications in government-led nutrition policies aimed at health promotion and Noncommunicable Disease Prevention: A Systematic Review. Advances in Nutrition. 2018;9(6):741–88.

4 TEST MODELS

Then, **test how the potential nutrient profile model(s) perform in the context of the relevant food supply of the country,** compared to others under consideration, by doing the following[1]:

A Identify or develop a food database

- Needs to contain nutrition information on food (and beverages) available for purchase to the representative population
- Information like product name, brand, package size, nutrition information and list of ingredients are important

B Analyze the potential nutrient profile model(s)

- Exclude ineligible products
- Sort products according to the various nutrient profile model categorizations
- Calculate: (i) mean nutrient value within a category; (ii) proportion of products considered healthy / unhealthy for each nutrient profile model; (iii) percent of products within 10-20% of the threshold where you might expect reformulation
- Identify areas of agreement and disagreement (i.e., when products are categorized differently) between nutrient profile models
- Assess whether each nutrient profile model flags: (i) any important staple foods as unhealthy; (ii) healthy products that target nutrient deficiencies
- Can also assess correlations between the nutrient profile model(s) and nutrient density scores or other independent measures of diet quality

What makes for a useful food database for these analyses?

Useful food databases should:

- Contain photographs or detailed information on packaged food
- Ideally be open access
- Include products that are representative of what the target population can access, purchase and consume
- Be representative of the market for a product category, if a large exhaustive dataset is not available or feasible

Examples of existing databases include:

- SMILING database (covers Cambodia, Indonesia, Laos, Thailand, & Vietnam)
- USDA Food and Nutrient Database for Dietary Studies

1 Several studies have compared nutrient profile models to the performance of Chilean III or Pan American Health Organization nutrient profile model given use.

⑤ SELECT MODEL FOR USE

Finally, select the nutrient profile model that is the best fit:

What defines a useful nutrient profile model?

- Fits the application that you are using (e.g., a front of pack warning label needs a specific type of nutrient profile model)
- Likely flags a large proportion of ultra-processed products as unhealthy, but not all
- Flags products or nutrients of concerns consistently
- Does not flag products with needed fortification ingredients
- Is feasible to apply and is actionable

Successful examples of nutrient profile model adaptation and testing

This approach has been used several times:

In **India,** researchers compared the WHO South-East Asia Region Organization model to the Chilean food labeling and advertising law model using data from the Mintel Global New Products Database Asia-Pacific Island Region.

Jamaica, **Colombia** and **Brazil** all compared the Pan American Health Organization (PAHO) model to the Chilean food labeling and advertising law model using data collected from packaged foods in supermarkets and retail outlets representative of where people shop.

In **South Africa**, researchers compared a model based on Food Standards Australia/New Zealand's (a version focused on unfavorable ingredients and one that accounts for unfavorable and favorable ingredients) to both the PAHO model and Chilean food labeling and advertising law model using data collected from packaged foods in large supermarkets.

Sources: Pandav et al. The WHO south-East Asia region nutrient profile model is quite appropriate for India. Nutrients. 2021; Soares-Wynter et al. Applying nutrient profiling systems...in Jamaica. Foods. 2020; Mora-Plazas et al. Nutrition quality of packaged foods in...Colombia. Nutrients. 2019; Duran et al. Role of different nutrient profiling models... Brazil. Public Health Nutrition. 2020; Frank et al. A fit-for-purpose nutrient profiling model...in South Africa. Nutrients. 2021.

Additional examples

		PAHO[2]	WHO South-East Asia Region[3]
Purpose	Uses	• Marketing restrictions for children • Regulation of school food environments • FOP warning labels • Taxation policies • Agricultural subsidies • Foods provided by social programs	• Marketing restrictions for children
	Target population	• People living in the PAHO member states	• Children in South-East Asia
	Eligible products	• Processed and ultra-processed products	• All except special food supplements for specific disease conditions
Attributes	Categoriz-ation type	• Dichotomous thresholds	• Dichotomous thresholds
	Food category delineation	• Across-the-board	• Food categories
	Ingredients covered	• Unfavorable — Free sugars, sodium, saturated fat, total fat, trans fats	• Unfavorable —Total fat, saturated fat, total sugars, added sugars, sodium, calories
	Reference amount	• Per 100 kcal / kJ	• Per 100g / 100mL
How thresholds were developed		• An expert consultation group was commissioned by PAHO in December 2014 • The group reviewed and discussed relevant evidence including WHO guidelines on sugar and other nutrients to develop the model	• Adapted from WHO Western Pacific model, which was based on WHO European model • Thresholds based on principles in PAHO nutrient profile model • Pilot tested in five member states by examining its applicability to foods commonly consumed by children and engaging stakeholders in discussion • Regional workshop held to review and finalize the model

Illustrative cut-offs for classifi-cation		• Sodium: > 1 mg per 1 kcal
		• Free sugars: > 10% of total calories
		• Other sweeteners: Any amount
		• Total fat: > 30% of total calories
		• Saturated fat: > 10% of total calories
		• Trans fat: > 1% of total calories
			• Cutoffs for 18 food categories, e.g.,:
			• Cereals
			  • Total fat: > 12 g per 100 g
			  • Sodium: > 0.35 g per 100 g
			• Frozen dairy
			  • Total sugars: > 12 g per 100 g
			  • Calories: > 230 kcal per 100 g

2 Pan American Health Organization. Pan American Health Organization nutrient profile model. 2016.

3 World Health Organization. Nutrient profile model for South-east Asia Region. 2017.

Resources

Common nutrient profile models

- **World Health Organization.** WHO Regional Office for Europe nutrient profile model. 2015.
- **Labonté M-È., et al.** Nutrient profile models with applications in government-led nutrition policies aimed at health promotion and Noncommunicable Disease Prevention: A Systematic Review. Advances in Nutrition. 2018;9(6):741–88.---summarizes 78 existing nutrient profile models
- **Pan American Health Organization.** Pan American Health Organization nutrient profile model. 2016.
- **World Health Organization.** Nutrient profile model for the WHO African region: a tool for implementing WHO recommendations on the marketing of foods and non-alcoholic beverages to children. 2019.
- **World Health Organization.** WHO nutrient profile model for South-east Asia region. 2017.
- **World Health Organization.** WHO nutrient profile model for the Western Pacific region: a tool to protect children from food marketing. 2016.
- **World Health Organization.** WHO Regional Office for Europe nutrient profile model. 2015.

Guides and frameworks

- **Verhagen H, van den Berg H.** A simple visual model to compare existing nutrient profiling schemes. Food & Nutrition Research. 2008;52(1):1649.
- **World Cancer Research Fund International.** Building momentum: lessons on implementing a robust front-of-pack food label. 2019.--section on nutrient profile models
- **World Health Organization.** Guiding principles and framework manual for front-of-pack labeling for promoting healthy diets. 2019.—appendix 2
- **World Health Organization.** Nutrient profiling: report of a WHO/IASO technical meeting. 2010.

Examples of adapting an existing model

- **Duran et al.** Role of different nutrient profiling models in identifying targeted foods for front-of-package food labelling in Brazil. Public Health Nutrition. 2020;24(6):1514–25.
- **Frank et al.** A fit-for-purpose nutrient profiling model to underpin food and nutrition policies in South Africa. Nutrients. 2021;13(8):2584.
- **Mora-Plazas et al.** Nutrition quality of packaged foods in Bogotá, Colombia: A comparison of two nutrient profile models. Nutrients. 2019;11(5):1011.
- **Pandav et al.** The WHO south-East Asia region nutrient profile model is quite appropriate for India: An exploration of 31,516 food products. Nutrients. 2021;13(8):2799.
- **Soares-Wynter et al.** Applying nutrient profiling systems to packaged foods and drinks sold in Jamaica. Foods. 2020;9(1):65.