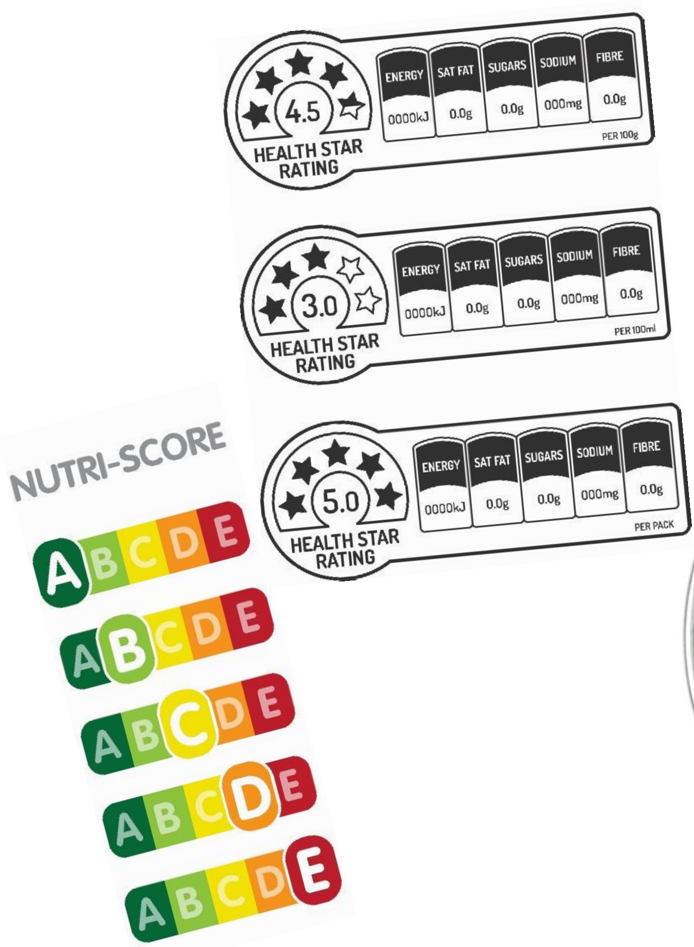
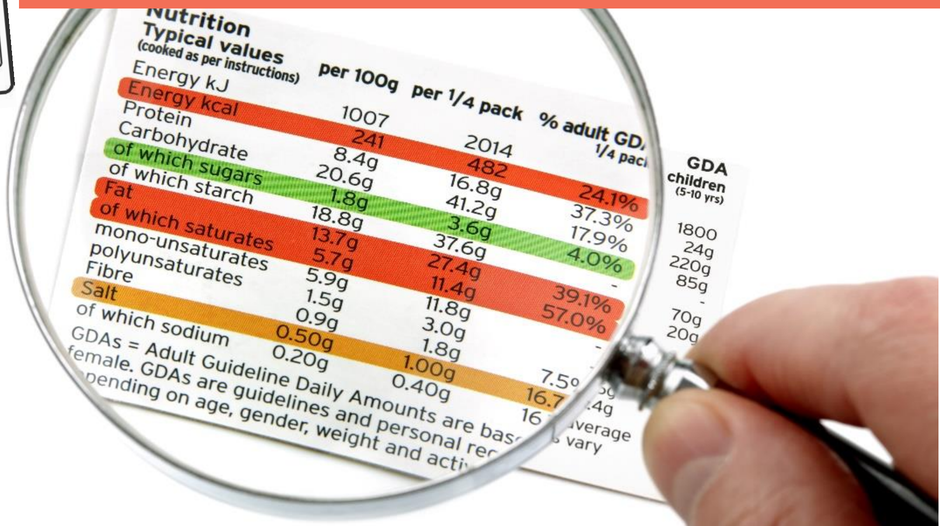
Methodology used to select the most potentially relevant nutrient profiling models for characterizing and monitoring the nutritional quality of the food supply in Québec and Canada – Part 1

February 2021





OBSERVATOIRE
de la qualité de l'offre alimentaire

UNIVERSITÉ LAVAL

AUTHORS
Vicky Leblanc, Dt.P., Ph.D. - Institute of Nutrition and Functional Foods (INAF), Université Laval
Mylène Turcotte, Dt.P., M.Sc. - Institute of Nutrition and Functional Foods (INAF), Université Laval
Marie-Eve Labonté, Dt.P., Ph.D. - Institute of Nutrition and Functional Foods (INAF), Université Laval

WITH THE COLLABORATION OF
Caroline Martin, M.Sc., Cand. PhD, Institute of Nutrition and Functional Foods (INAF), Université Laval

SCIENTIFIC REVISION
Sonia Pomerleau, Dt.P., M.Sc. - Institute of Nutrition and Functional Foods (INAF), Université Laval
Sylvie St-Pierre, Dt.P., Ph.D. - Office of Nutrition Policy and Promotion (ONPP), Health Canada
Véronique Provencher, Dt.P., Ph.D. Institute of Nutrition and Functional Foods (INAF), Université Laval

ACKNOWLEDGEMENTS
This project has been funded by a Fonds de recherche du Québec Santé (FRQS) Young Investigator Establishment Grant (FQ124280) awarded to Marie-Eve Labonté in conjunction with the FRQS Chercheurs-boursiers - Junior 1 Salary Award (FQ121840).

The authors would like to thank the members of the Food Quality Observatory Scientific committee for their involvement and advice.

Full version of this document is available in electronic format (PDF) on the Food Quality Observatory website at www.offrealimentaire.ca/en

Legal deposit - Bibliothèque et Archives nationales du Québec, 2021
ISBN : 978-2-924986-19-6

Table of contents

List of figures

1 Background

The food environment, which involves physical, economic, policy and sociocultural dimensions, strongly impacts individual food choices[1]. According to a nationally representative survey conducted in 2010, most Canadian consumers recognize the contribution of a healthy diet to the promotion of health and prevention of disease[2]. However, about 40% of respondents to this survey also reported having difficulty finding healthy and affordable processed foods on the market[2]. Public health interventions aimed at improving the food environment and supporting healthier food choices are among the most effective for improving a population's diet quality and health status[3]. Various levels of government across Canada are suggesting and implementing nutrition-related public health strategies, policies, and interventions targeted towards making healthier food choices easier for consumers. Health Canada launched its Healthy Eating Strategy in 2016[4], which aims at improving healthy eating information and the nutritional quality of foods, protecting vulnerable populations, and supporting increased access to, and availability, of nutritious foods. At the same time, the *Ministère de la Santé et des Services Sociaux du Québec (MSSS)* launched its *Politique gouvernementale de prévention en santé (PGPS)*[5], which includes the objective to improve the population's access to a healthy diet. One measure associated with this objective specifically consists of improving the nutritional quality of foods. However, a fundamental step to achieve improvement in the nutritional quality of foods goes through analyzing the nutritional quality of the food supply.

Nutrient profiling (NP) is defined by the World Health Organization (WHO) as the "science of classifying or ranking foods according to their nutritional composition for reasons related to preventing disease and promoting health"[6-8]. NP is promoted as a way to characterize the overall nutritional quality (i.e., healthfulness) of foods using objective and reproducible criteria. More precisely, NP models utilize algorithms to provide a comprehensive evaluation of a food's degree of healthfulness based on its content in multiple nutrients or food components[9, 10]. NP models can result in numerical scores (e.g., from 1 to 100, where 100 represents the highest nutritional quality) or more qualitative classifications such as traffic lights (e.g., green, amber, or red)[9]. Such models characterize specific foods and thus represent a way to support healthier dietary choices and to improve overall dietary patterns[7]. NP models have various applications in public health which include, but are not limited to, the underpinning of food labelling schemes (e.g., voluntary or mandatory front-of-pack [FOP] logos or symbols), the regulation of health and nutrition claims (e.g., to identify which food products are eligible to carry a specific claim), restrictions on the commercial marketing of unhealthy foods and beverages to children, and nutritional surveillance[11-14]. Current challenges around the use of NP models are related to their proliferation, with over 350 currently existing models developed by various types of organizations (e.g. governmental, academic, commercial) worldwide[11]. In this context, the WHO calls for a careful selection and adaptation, where relevant, of already existing models. Validation of NP models in their target jurisdictions is also lacking, particularly in Canada[9, 10].

The Food Quality Observatory[15] (hereafter named Observatory), hosted by the Institute of Nutrition and Functional Foods (INAF) at Université Laval, represents a large network of researchers, representatives from the provincial and federal governments, and representatives from non-governmental, parapublic and private organizations in Canada. The Observatory is dedicated to monitor the food supply, with the objective to generate knowledge and act collectively towards improving its quality and accessibility to the population[16]. In order to fulfill this mandate, the Observatory has defined different objectives in its 2017-2020 Scientific Program. One of them is about selecting the most potentially relevant NP models for characterizing and monitoring the nutritional quality of the food supply in Québec and Canada.

2 Objectives

Research Axis 1 of the Observatory's 2017-2020 Scientific Program aims at characterizing and monitoring the food supply's quality and accessibility (see **Appendix 1**). Key objectives of this Scientific Program, which are specifically related to the current project, consist of the following:

General objective 1.1: To characterize the dimensions related to the food supply's quality in Canada and to monitor quality using validated tools.

Specific objective 1.1.1b: To identify an indicator (i.e., NP model) that allows characterizing the nutritional dimension of the food supply's quality.

As explained earlier, given the proliferation of NP models worldwide, the Scientific Committee of the Observatory intended to select a pool of already existing NP models that will be submitted to robust validation processes using population-based data. Such an approach will allow fulfilling specific objective 1.1.1b, by determining which of the selected NP models would be the most reliable for evaluating the food supply in Québec and Canada. For the upcoming validation process, it was therefore decided **to select up to five score-based NP models**. The following sections describe the methodology and results of the NP models selection process.

3 Methodology

3.1 Identification of NP models potentially relevant for use by the Observatory

For building its list of potentially relevant NP models, the Observatory used data from a systematic review on NP models conducted by Labonté et al. (2018)[11].

Overview of the systematic review on NP models by Labonté et al. (2018)[11]

The systematic review on NP models by Labonté et al. 2018[11] represents the starting point in the achievement of the specified objectives. The primary outcome of this systematic review was to identify NP models existing worldwide for application specifically in government-led nutrition-related policies aimed at health promotion and noncommunicable diseases prevention. The systematic review was reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement[17]. The methods of the review were pre-established in a protocol that has been registered in PROSPERO (2015: CRD42015024750)[18]. The review was conducted following five main steps briefly described in the following paragraphs.

First, a draft catalog of existing NP models and its accompanying report built by Dr. Mike Rayner and colleagues[14] for the WHO was used as a starting point in the systematic review process by Labonté et al.[11]. This draft catalog was made available from Dr. Rayner himself (one of the co-authors of the systematic review).

Second, searches were carried out in PubMed, EMBASE, and Scopus to identify peer-reviewed publications relevant to the topic of nutrient profiling with the use of the following search terms: nutrient, nutritional, or nutrition, each preceding the truncated term profil∗. Searches were limited to articles published between January 2008 and May 2016. Results from the different databases were combined and duplicates were removed using EndNote, primarily based on the title, authors, and year of each publication. Two different authors independently conducted the screening (e.g., relevance assessment according to the title and abstract) of articles identified from the peer-reviewed literature. Given resource and time constraints, only one author performed the screening of publications identified from the grey literature.

The third step was the assessment of the integral text of all publications, to identify all potential NP models. An approach similar to the one used for the screening of the articles was adopted for assessing full text publications (e.g., through the presence of terms relevant to nutrient profiling), to ensure identification of all potential NP models. Authors captured the names of all potential NP models included in each publication evaluated in order to build a list of models. Possible duplicates in the model names were removed with help from the source references provided for each model. Authors also assessed whether each potential NP model corresponded to one of the 119 models previously identified in the draft catalog by Rayner et al.[14], or if it corresponded to a newly identified model.

Fourth, eligibility of all NP models identified was assessed by two different authors according to the inclusion and exclusion criteria (see **Appendix 2**). Models that met all inclusion criteria were included in the review and retained for data extraction. Models that were not eligible based on ≥1 of the exclusion criteria were kept in a list of excluded models. This list comprises the model number, the model name, the source reference(s), the date of last access, reason(s) for exclusion, details on reason(s) for exclusion, and additional information on the model (if relevant).

Fifth, characteristics of all NP models retained for inclusion were extracted independently by two different authors into a Microsoft Office Excel 2010 Workbook using fields based on and adapted from those used previously in the draft catalog[14]. Data extraction fields included the model number, model name, type and name of the organization(s) which developed the model, possible applications of the model, a list of food categories included, list of nutrients to limit or to encourage, reference amounts, outputs, and information on validation. Extracted data were then compared and discordances were resolved by consensus or by involving a third author.

For full details, see the following publication: Nutrient Profile Models with Applications in Government-Led Nutrition Policies Aimed at Health Promotion and Noncommunicable Disease Prevention: A Systematic Review | Advances in Nutrition | Oxford Academic (oup.com) doi: 10.1093/advances/nmy045

3.2 Eligibility assessment of NP models according to the Observatory's criteria

All NP models (i.e., both included and excluded models) originally identified in the systematic review by Labonté et al.[11] had to be assessed again for eligibility according to criteria specific to the Observatory's context.

Although similar, criteria established by the Observatory slightly differed from those used in the systematic review. A comparison of both sets of eligibility criteria is presented in **Appendix 2**. For example, criteria used by the Observatory stated that models from **both** academic and governmental organizations can be included, given that the Observatory is itself based in an academic organization, whereas only NP models from governmental or inter-governmental organizations were considered for inclusion in the systematic review. Moreover, as presented in **Appendix 2**, the **following criteria** were modified or added by the Observatory:
B) Only models which include **both nutrients to limit** (e. g., sodium, sugars) **and nutrients to encourage** (e.g., protein, fiber) are to be considered, to better capture the overall healthfulness of food products. Information on the nutrients must be readily available in Canada (e.g., on the Nutrition Facts table);

D) Only models that **generate scores** (i.e., continuous variables, either with or without accompanying classifications based on pre-determined thresholds) are considered for use, to allow for greater diversity in the interpretation of the results and to be able to monitor the nutritional quality of food products over time;
L) Models should ideally be **from different countries and/or organizations**, to allow for greater diversity in the types of models considered;
M) Models should ideally **each have a unique algorithm** (i.e., not deriving from one another), to allow for greater diversity in the results;
N) When available, models should consider **recommendations expressed by experts in the field of NP** as part of conferences, symposia, etc., as well as recommendations expressed by the **Observatory's Scientific Committee**.

The eligibility assessment of NP models according to the Observatory's criteria was done by two reviewers (M-ÈL and MT). Worth pointing out is that the details of the algorithm for the selected NP models had to be publicly available. The reason behind such a choice is that missing information on an algorithm (even partially missing) does not allow for the appropriate use of a model in a research or nutrition-related policy context.

3.3 Selection of the most potentially relevant NP models for the Observatory

All NP models identified as eligible according to the Observatory's criteria were presented to and discussed with the Scientific Committee. The final decision about the selected models was taken by paying special attention to criteria L, M and N detailed aboved and found in **Appendix 2**. The Committee agreed to select up to a total of five NP models to characterize the overall nutritional quality of the food supply.

4 Results

4.1 NP models selected from models <u>included</u> in the systematic review

As presented in the flowchart (see **Appendix 3**), the systematic review done by Labonté et al.[11] first identified 3865 publications from three different database searches on the scientific literature and 15 databases on the grey literature. Following the removal of duplicates, 2658 publications were screened based on their title and abstract/summary. Among these, 606 publications have been selected for full-text assessment. A total of 387 potential NP models were identified from the full-text assessment stage, of which 78 met all of the inclusion criteria. Most of the included models (73%) have been introduced in the 10 years preceding the systematic review, and 44% corresponded to models adapted from other existing models.

Based on the Observatory eligibility criteria, 70 out of the 78 NP models were first excluded because they did not generate a score (i.e., they only generated classifications, criterion D in **Appendix 2**). A total of **eight** NP models included in the systematic review have thus been identified as potentially relevant for the Observatory.

These models are:

1. Food Standards Agency-OFCOM nutrient profiling model (FSA-OFCOM model) (United Kingdom),
2. Food Standards Australia New Zealand Nutrient Profiling Scoring Criterion (FSANZ-NPSC) (Australia and New Zealand),
3. Nutri-Score (France),
4. Ireland model (Ireland),
5. Health Star Rating (HSR) System (Australia),
6. FSANZ-South Africa (South Africa),
7. Nutrient Value Score (United Nations World Food Program) and
8. SAIN-LIM model (France).
   (see Labonté et al. 2018[11] for full details on these models).

The potential NP models (n=8) have been discussed with the Scientific Committee and of these, **six** models (SAIN-LIM, FSANZ-NPSC, Ireland model, FSANZ-South Africa, FSA-OFCOM model, and Nutrient Value Score) have been discarded. The SAIN-LIM model, which was thought at first as providing a numerical score, ended up being discarded based on eligibility criterion D. Indeed, it was found that it only provides a categorization of foods within one out of four classes, similar to a healthy/less healthy classification, instead of an actual numerical score. The main reason for excluding the other models was based on the fact that most were derived from one another, i.e., they shared a common algorithm and thus, were not unique (criterion M). For instance, FSANZ-South Africa, Health Star Rating (HSR) System, FSANZ-NPSC, FSA-OFCOM model, the Ireland model, and Nutri-

Score are all based on a similar algorithm (see **Appendix 4**). Among these, it was decided to keep only the most up-to-date and improved models from different countries (criteria L). Therefore, **two NP models remained: the Health Star Rating (HSR) System (Australia) and the Nutri-Score (France)**. The next paragraphs present the key characteristics of these two NP models.

Health Star Rating (HSR) System (Australia)

The HSR System[19, 20] derives from the FSANZ-NPSC model[21]. The HSR is a FOP labelling system that rates the overall nutritional profile of packaged foods and assigns them a rating from half a star to five stars. It provides a quick way to compare similar packaged foods. According to this model, the more stars a food gets, the healthier the choice is. The number of stars is determined using a calculator designed to assess positive and negative components in food, leading to a score. The score is based on the amount of energy, saturated fat, total sugars, sodium, protein, fiber and percentage of fruits, vegetables, nuts and legumes in a given food product. Points gained for components to encourage are subtracted from points gained for components to limit, and the final numerical score falls between the possible limits of -40 and +96, where a lower score represents a higher overall nutritional quality (five stars) (see **Figure 1** below). The HSR system was developed by the Australian state and territory governments in collaboration with industry, public health and consumer groups.

Score = Energy + Sat fat + Sugars + Na - Protein - Fibre - FVNL*

**FVNL = % of fruits, vegetables, nuts and legumes*

-40 **96**

Table 7: HSR scores by category, with final Heath Star Rating

HSR rating	Cat. 1	Cat. 1D	Cat. 2	Cat. 2D	Cat. 3	Cat. 3D
5	Water	≤-2	Eligible fruits and vegetables ≤-11	≤-2	≤13	≤24
4.5	Unsweetened Flavoured water	-1	-10 – -7	-1 – 0	14 – 16	25 – 26
4	≤0	0	-6 – -2	1 – 2	17 – 20	27 – 28
3.5	1	1	-1 – 2	3	21 – 23	29 – 30
3	2 – 3	2	3 – 6	4 – 5	24 – 27	31
2.5	4 – 5	3	7 – 11	6 – 7	28 – 30	32 – 33
2	6 – 7	4	12 – 15	8	31 – 34	34 – 35
1.5	8 – 9	5	16 – 20	9 – 10	35 – 37	36 – 37
1	10 – 11	6	21 – 24	11 – 12	38 – 41	38 – 39
0.5	≥12	≥7	≥25	≥13	≥42	≥40

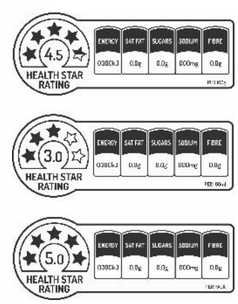


Figure 1. The Health Star Rating System
(Source: HSR system Calculator and Style Guide uploaded on 15 November 2020, p.24 http://healthstarrating.gov.au/internet/healthstarrating/publishing.nsf/Content/guide-for-industry)

Nutri-Score (France)

The Nutri-Score[22] derives from the FSA-OFCOM[23] model and shares similar characteristics with the FSANZ-NPSC[21] and the HSR[19, 20] models. The Nutri-Score is a five-level color scale with letters A to E applied in front of food packaging. A score represented by a letter is given to each product based on an algorithm. A product identified by the letter A on a green background indicates that this product scores well in terms of overall nutritional quality whereas a product identified with a red E should be consumed in moderation. This system allows to quickly identify recommended products and those which should be limited. The formula takes into account components to limit (energy, total sugars, saturated fats and sodium) and components to encourage (fiber, protein, percentage of fruits, vegetables, nuts and legumes). Similar to the HSR System, points gained for components to encourage are subtracted from points gained for components to limit, and the final numerical score falls between the possible limits of -15 and +40 (see **Figure 2** below). Similar to HSR, a lower score corresponds to a higher overall nutritional quality (letter A). The Nutri-Score has been developed by the National Public Health Agency *Santé Publique France*.

Score = Energy + Sat fat + Sugars + Na - Protein - Fibre - FVNL*

**FVNL = % of fruits, vegetables, nuts and legumes*

-15 ——————————————— **40**

Color assignments					
	NUTRI-SCORE A	NUTRI-SCORE B	NUTRI-SCORE C	NUTRI-SCORE D	NUTRI-SCORE E
Foods (points)	Min to -1	0 to 2	3 to 10	11 to 18	≥ 19
Beverages (points)	Water	≤ 1	2 to 5	6 to 9	≥ 10

Figure 2. The Nutri-Score
(Source: Santé Publique France (https://www.santepubliquefrance.fr/determinants-de-sante/nutrition-et-activite-physique/articles/nutri-score))

4.2 NP models selected from models <u>excluded</u> from the systematic review

In Labonté et al. (2018)[11], the 309 models that did not meet the inclusion criteria were primarily excluded because they were not developed or endorsed by a government body (n=164, 53%), because their details were not publicly available and/or not found (n=57, 18%) or because they were discontinued or never implemented (n=53, 17%) (see **Appendix 3)**. Of note, more than one possible reason for exclusion was applicable to 40% of the excluded models (n=123). Detailed reason(s) of exclusion, for each excluded model, are available as supplementary data (Supplemental Table 3) in the systematic review by Labonté et al. (2018)[11].

As eligibility criteria of the Observatory were slightly different from those of the systematic review by Labonté et al. (2018) (see **Appendix 2**), all of the 309 NP models excluded from the systematic review have been re-assessed according to the Observatory's criteria.

All models originally excluded from the systematic review, except the Nutrient-Rich Food Index (NRF)[24] version 6.3, were also excluded by the Observatory. First, 175 out of the 309 models that had been excluded in Labonté et al. (2018) due to reasons of exclusion A, B, C, D, H, I, J and K (see **Appendix 2**) remained excluded in the selection process by the Observatory. Second, the remaining 134 models that had been excluded in Labonté et al. (2018)[11] due to eligibility criteria E, F and G were retained for further analysis. They were first assessed independently by two authors (MT and M-ÈL), and then discussed with the Observatory's team. From these 134 models, the 38 models that had been excluded from the systematic review primarily for reason G (algorithm not found or not publicly available) remained excluded for that reason following their re-assessment. Also, the 10 models that had been excluded from the systematic review because of criteria F (models intended for use at the municipal level), ended up being excluded from the selection process by the Observatory due to criterion D (i.e., these models are generating classifications only, without any numerical score). Of the remaining 86 models, 40 remained excluded because they had been built by commercial organizations (criterion E). Of the remaining 46 models, 30 models were excluded primarily for criterion D (not a score/continuous variable) or B (not including both nutrients to limit and nutrients to encourage, or some nutrients not available on the Nutrition Facts table). It was also found that 16 models shared a common algorithm with at least one other model, meaning that a genealogy had to be established between those models before determining their eligibility. The genealogy and eligibility assessment of the last 16 models is detailed in **Appendix 5**. Of these, 15 models have been excluded, primarily due to reason B (not including both nutrients to limit and nutrients to encourage, or nutrients not available on the Nutrition Facts table). Therefore, **only the NRF version 6.3** ended up as meeting the Observatory's inclusion criteria.

The NRF version 6.3 was originally excluded from the systematic review by Labonté et al[11] because it was developed by academia, and not endorsed by any governmental or inter-governmental body. It is important to specify that the NRF version 6.3, as opposed to the widely used NRF version 9.3, has been retained by the Observatory because some nutrients included in version 9.3 are not readily available on the Canadian Nutrition Facts Table (e.g., potassium, magnesium and vitamin E) (criterion B). The next paragraphs present key characteristics of the NRF version 6.3 model.

Nutrient-Rich Food Index version 6.3 (NRF 6.3) (University of Washington, USA)

The Nutrient-Rich Food Index represents a family of NP models that derives from the Naturally Nutrient Rich Score[24]. Different iterations of the nutritional quality score exist and vary in the number of beneficial nutrients included in the model, ranging from 6 (NRF 6.3) to 15 (NRF 15.3). In the NRF 6.3, the nutritional quality score is presented as the sum of percent daily values from six nutrients to encourage (proteins, fiber, vitamin A, vitamin C, calcium, iron), subtracted from the sum of percent daily values from three nutrients to limit (saturated fatty acids, added or total sugars, and sodium) (see **Figure 3** below). The final score of the NRF 6.3 theoretically ranges between 0 and 600, a higher score representing a better overall nutritional quality. The score can be applied to individual foods as well as to overall dietary patterns. The Nutrient-Rich Food Index was developed by an academic organization, the University of Washington, Seattle, mainly for research purposes. This model is not endorsed *per se* by a government body.

TABLE 1 Nutrients to encourage and LIM in selected NRF nutrient profile models[1,2]

NRF models	Macronutrients	Vitamins	Minerals	LIM
LIM				Saturated fat, added sugar, Na
LIMt				Saturated fat, total sugar, Na
NRF6.3	Protein, fiber	A, C	Ca, Fe	Saturated fat, added sugar, Na
NRF9.3	Protein, fiber	A, C, E	Ca, Fe, Mg, K	Saturated fat, added sugar,[3] Na
NRF11.3	Protein, fiber	A, C, E, B-12	Ca, Fe, Mg, Zn, K	Saturated fat, added sugar, Na
NRF15.3	Protein, fiber, monounsaturated fat	A, C, D, E, thiamin, riboflavin, B-12, folate	Ca, Fe, Zn, K	Saturated fat, added sugar, Na

[1] As an example, NRF scores were calculated as the sum of the DV of nutrients to encourage and subtracting the DV for LIM: NRF9.3 = (protein g/50 g + fiber g/25 g + vitamin A IU/5000 IU + vitamin C mg/60 mg + vitamin E IU/30 IU + calcium mg/1000 mg + iron mg/18 mg + magnesium mg/400 mg + potassium mg/3500 mg – saturated fat g/20 g – added sugars g/50 g – sodium mg/2400 mg) × 100.
[2] Indices were calculated per RACC and per 100 kcal.
[3] A nutrient profile model based on NRF9.3 was assessed replacing total sugars for added sugars.

Figure 3. The Nutrient-Rich Food Index
Source : Fulgoni III et al. J Nutr. 2009;139:1549-54 (open access : Development and Validation of the Nutrient-Rich Foods Index: A Tool to Measure Nutritional Quality of Foods | The Journal of Nutrition | Oxford Academic (oup.com))

5 Discussion

The objective of this report was to describe the methodology and the results of the NP models selection process done for the Food Quality Observatory, in order to eventually characterize and monitor the overall nutritional quality (i.e. healthfulness) of the food supply in Québec and Canada using an appropriate summary indicator. The selection was done from the NP models identified in the systematic review by Labonté et al. (2018). As a result, three models were included based on the Observatory's criteria: the Health Star Rating System, Nutri-Score and Nutrient-Rich Food Index version 6.3. The next step will be to assess the validity of these three selected models, to identify the most reliable model in the context of the Observatory's work. Briefly, validity of the NP models will be evaluated by analyzing the nutritional quality of foods consumed by individuals in different cohorts and comparing it to: a) recognized diet quality scores, such as the Healthy Eating Index (convergent validity), and b) objective health status data, i.e. chronic disease risk factors, such as the lipid profile (criterion-related validity). To our knowledge, this is the first project that aims to test multiple robust forms of validity for several NP models simultaneously in Québec and in Canada, using population-based data. The validation processes will allow comparing results between NP models, to identify the one that shows the strongest associations with diet quality and health status.

5.1 Utility and impact

First, although NP models characterize specific foods instead of diets, they represent a way to support healthier dietary choices and to improve overall dietary patterns, through a variety of applications in public health[8]. Moreover, although many studies from different countries have already shown associations between **food consumption and benefits or risks regarding the development of some chronic diseases**, the validation of the NP models selected by the Observatory will have the potential to **corroborate some of these results within our country.**

Second, one of the most important impact of this project will be the **ability for the Observatory to evaluate and monitor,** using nutrient profiling, the overall **healthfulness of food categories** considered as a high-priority in the country (e.g., food categories widely consumed by the population). It will also be possible then to assess associations between the nutritional quality of foods, as measured using NP models, and several factors influencing food selection decisions by consumers, such as FOP label or price.

Third, future assessments of the food supply using NP models selected and validated by the Observatory will **provide useful information to knowledge users** (e.g., government, bio-food industry) about possible actions that could lead to improvements in the food supply's quality and, ultimately, that could contribute to improve health and prevent chronic diseases in the population of Québec and Canada. More specifically, within the industry context, collaboration between the Observatory and bio-food industries could contribute to improve the offer of healthy food products and facilitate consumer choices towards healthy foods.

Finally, an important **point of consideration** is that the systematic review by Labonté et al. (2018)[11] remains a complete catalog of NP models existing worldwide and of their main characteristics. This resource will be very useful for decision-makers, researchers and health professionals with interest in nutrient profiling, who might wish to compare the characteristics of different models in order to select the most relevant models according to their needs.

5.2 Strengths and limitations

The main strength of this project is the selection of NP models. It has been done following a rigorous process, using numerous practical eligibility criteria for the Observatory. Moreover, it has been based on a published systematic review in which the authors have searched for articles and documents in numerous databases of the scientific and grey literature. They have identified over 350 NP models worldwide.

In terms of weaknesses, as indicated in the systematic review by Labonté et al. (2018): *"nutrient profiling is a rapidly evolving field in which current NP models might be updated and new NP models might be proposed for use at almost any moment."*[11]. Thus, there is a possibility that other new NP models potentially relevant for use by the Observatory might not have been captured and selected at the moment. In this context, an update (2016-2020) of this systematic review in currently in progress. Given that the original idea was to identify up to five score-based NP models (see Objectives), and that only three score-based models have been selected up to now, the update of the systematic review may help to identify up to two other score-based NP models that will meet the Observatory's criteria.

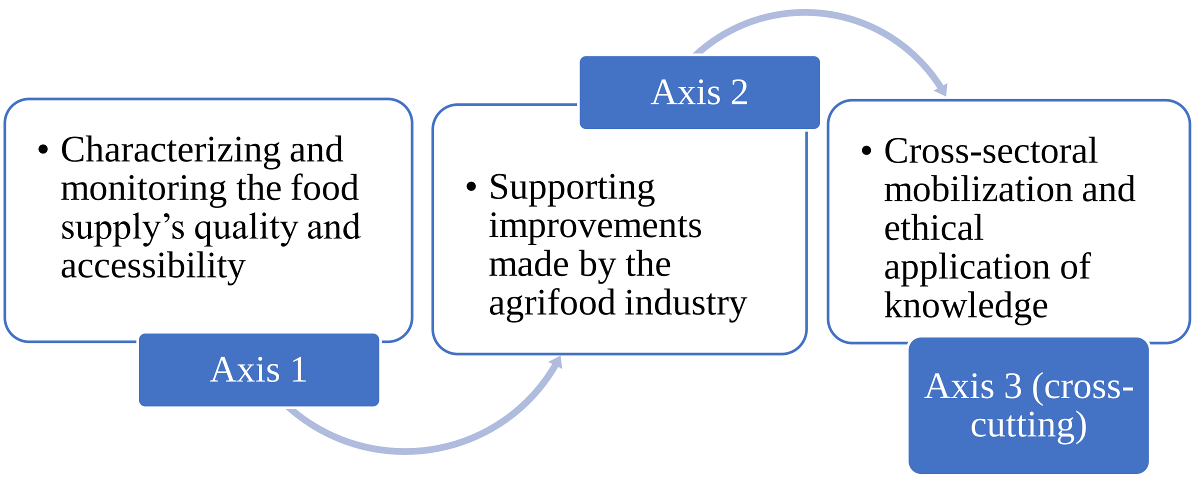
6 Conclusion

In conclusion, this document reports the methodology used to select relevant NP models for the Food Quality Observatory in order to eventually characterize and monitor the overall nutritional quality of the food supply in Québec and Canada. Based on specific criteria, three unique score-based NP models have been selected from those that had been included and excluded from a previous systematic review by Labonté et al. (2018)[11]. These NP models will be validated using population-based data to identify the most reliable model in the provincial and federal context. Up to two new models from the update of the systematic review by Labonté et al. (2018) could be added in a near future (article in preparation). Ultimately, the results of this project will ensure translational knowledge about the overall nutritional quality of foods available on the market, and will support future actions for improving the quality of dietary intakes and the health status of Canadians.

7 Appendices

Appendix 1. Research axes of the Food Quality Observatory

OBSERVATOIRE de la qualité de l'offre alimentaire



Appendix 2. Criteria for the eligibility assessment of all potential NP models identified in the systematic review by Labonté et al. (2018)[11] and comparison with criteria specifically relevant to the Observatory's work

	Criteria used in the systematic review by Labonté et al. (2018)[11]		Criteria specific to the Food Quality Observatory
	Inclusion criteria	Exclusion criteria	
A	Models allowing for the classification or categorization of individual foods.	Models only allowing for the classification or categorization of combinations of foods (i. e., meals or diets, such as the Healthy Eating Index).	Idem to Labonté et al. (2018), with the additional **inclusion** criterion: Models have to be applicable to foods eaten at any time of the day (i.e., not only foods eaten at breakfast, for example).
B	Models integrating data from more than one nutrient or food component to produce a single overall score or categorization, or, models with separate sets of criteria for multiple nutrients or food components (e. g., Traffic Light System in which the levels of each of the nutrients considered are interpreted separately).	Models in which only a single nutrient or food component is used, as focusing on only one aspect of the nutritional composition can mask the overall nutritional quality of a food product (e.g., nutrient content claim; reformulation targets for single nutrients such as sodium; Whole Grain Stamp).	Idem to Labonté et al. (2018), with the additional **inclusion** criteria: Only models which include both nutrients to limit (e. g., sodium, sugars) and nutrients to encourage (e. g., protein, fibre) are to be considered, to better capture the overall healthfulness of food products. Information on the nutrients must be available in the Canadian's Nutrition Facts table.
C	Models with a food focus that also use criteria based on nutrients and other food components.	Models with a food focus that do not use criteria based on the amounts of nutrients and other food components (e. g., a model which only states that soft soda cannot be advertised to children without considering the underlying nutritional composition of the products).	Idem to Labonté et al. (2018)
D	Models in which the output (score or classification) includes at least a modest interpretative element.	Models in which the output shows little or no interpretative element (e.g., models only repeating the amounts of some nutrients found in the Nutrition Facts table, or models showing a percentage of Guideline Daily Amonts (GDAs), a percentage of Daily Values (DVs) or the GDAs/DVs themselves).	Idem to Labonté et al. (2018), with the additional **inclusion** criterion: Only models that generate scores (i. e., continuous variables, either with or without accompanying classifications based on pre-determined thresholds) are considered for use, to allow for greater diversity in the interpretation of the results and to be able to monitor the nutritional quality of food products over time.
E	Models developed or endorsed by governmental or inter-governmental organizations and having applications in government-led nutrition policy and regulation, including, but not limited to: -Food certification schemes/front-of-pack labelling, -Standards for food advertising or marketing,	Models developed by different types of organizations (e. g., commercial; non-governmental; academic; etc.) that are not endorsed[2] by government bodies (e. g., models developed by the food industry for their own voluntary marketing restrictions; models developed by heart foundations for food-certification schemes).	As opposed to Labonté et al. (2018), **included models** can be those from: academic and non-governmental organizations, in addition to those from governmental or inter-governmental organizations. Models also have to be applicable overall to the general population, i.e., not only applicable to some specific subgroups of the population, such as pregnant women.

	-Regulation of health and nutrition claims, -Food procurement regulations/food quality standards for public institutions (e. g., schools, workplaces, hospitals, armed services, prisons, elderly care homes), -Food taxation, -Food subsidies, -Welfare support schemes, -Food fortification, -Nutritional surveillance.		Similar to Labonté et al. (2018), **excluded models** comprise those from: commercial organizations.
F	Models intended for national or international use, or for use in a jurisdiction with responsibility for the relevant food policy or regulation (e.g., models developed by states or provinces responsible for school food standards).	Models intended for use at a very specific / narrow level (e.g., municipal).	As opposed to Labonté et al. (2018), **included models** can be: intended for a very specific / narrow level of government (e.g., municipal). Also, models have to be from industrialized / developed countries.
G	Details of the model are publicly available in the peer-reviewed or grey literature (e.g., government documents/Websites, theses, etc.).	Details of the model are not known because they are not publicly or freely available, or they could not be found, therefore not allowing for the appropriate use or adaptation of a model or appropriate evaluation of its construct and components.	Idem to Labonté et al. (2018), except that models for which the details were not known when the systematic review was conducted might currently be available. A new eligibility assessment of such models is required.
H	Final versions of models which are currently in use or draft models that have been proposed for use within the last 3 to 5 years.	Discontinued models no longer in use, or proposed models that were never implemented.	Idem to Labonté et al. (2018), with the additional **exclusion** criterion: Models that were developed more than two decades ago are considered outdated and are therefore excluded.
I	Models that do not duplicate information included previously.	Models duplicating information from another model (e.g., an exact same model is described in multiple documents, but under slightly different names).	Idem to Labonté et al. (2018)
J	Full details of the model are available in English, French, or Spanish.	Full details available in another language than specified in the left column.	As opposed to Labonté et al. (2018), **excluded models** also comprise those with full details available only in Spanish.
K	N/A	"Not relevant": This represents the situation where it is found, during eligibility assessment, that a policy, regulation, standard, scheme, etc., initially considered as a potential NP model actually does not correspond to such a model (i.e., does not use any criteria to classify foods, either food-based or nutrient-based). For	Idem to Labonté et al. (2018)

		example, this could be a Code in which it is found, when reviewing the source document, that there is a total ban of the commercial advertising of any type of product to children, food or not. Therefore, this means that no NP model is used as part of this Code to determine which foods can or cannot be advertised to children.	
L	N/A	N/A	For the selection of the **final five models**: These models should ideally be from different countries and/or organizations (whenever possible), to allow for greater diversity in the types of models considered.
M	N/A	N/A	For the selection of the **final five models**: These models should ideally each have a unique algorithm (i.e. not deriving from one another), to allow for greater diversity in the results.
N	N/A	N/A	For the selection of the **final five models**: When available, recommendations expressed by experts in the field of NP as part of conferences, symposia, etc. should be considered, as well as recommendations expressed by the Observatory's Scientific Committee.

Appendix 3. Flowchart of the systematic review by Labonté et al. (2018)[11]

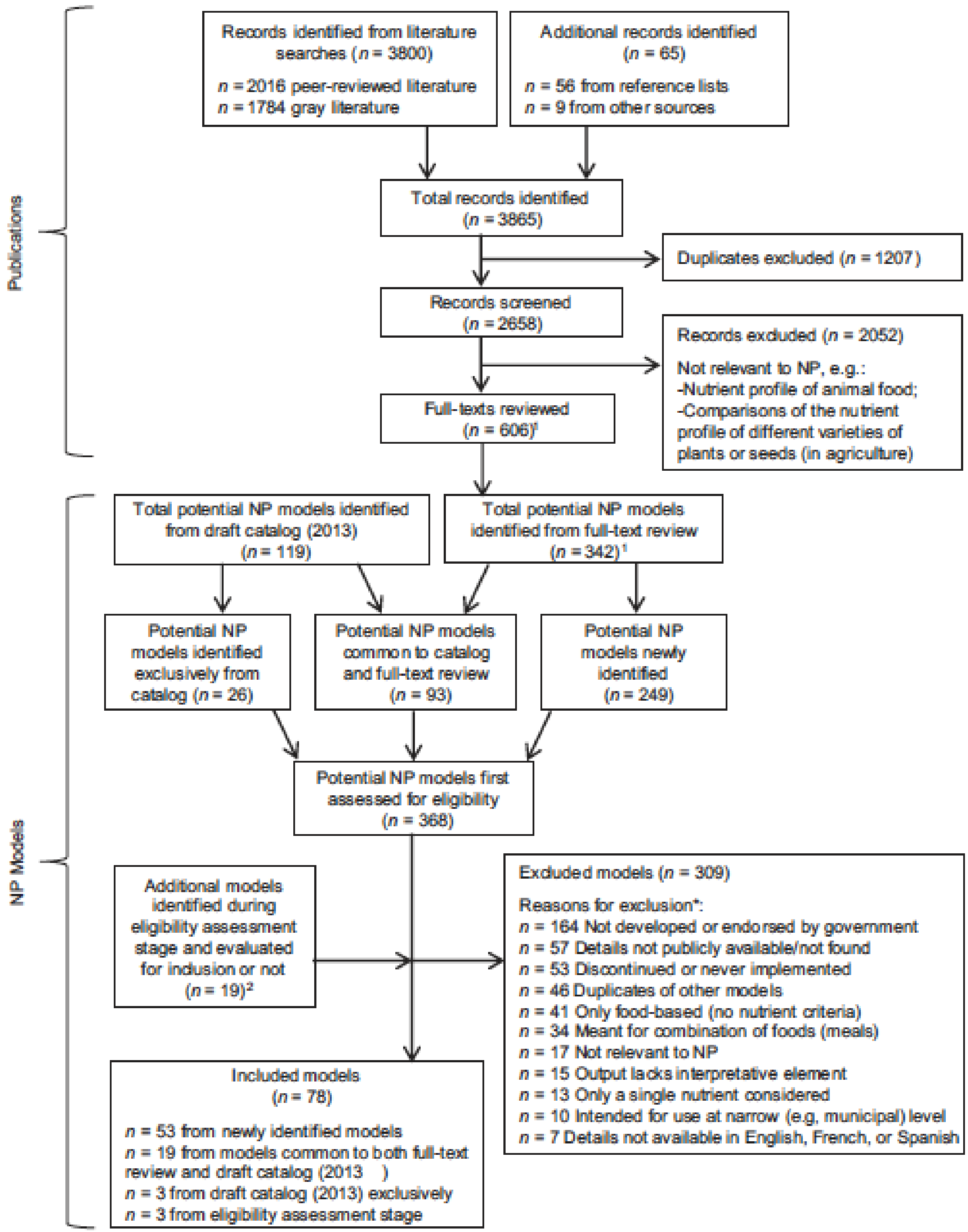
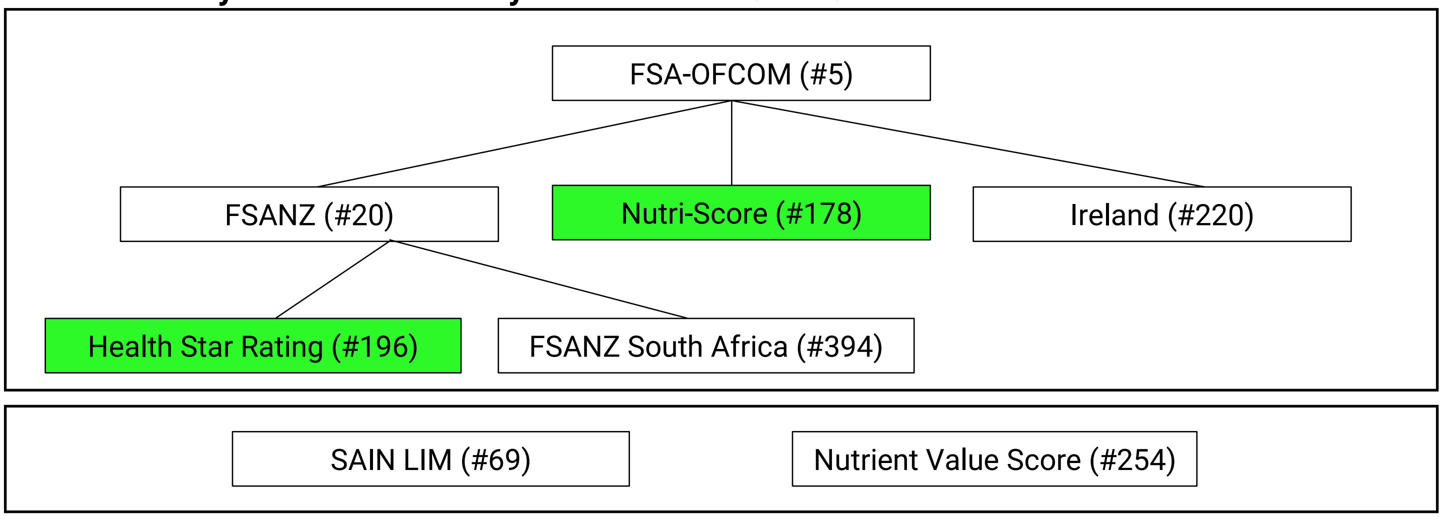


FIGURE 2 Flow diagram of the publications and NP models selection. Data are current as of 22 December 2016. [1]The number of publications included in the full-text assessment is independent of the number of potential models identified from these publications. [2]Of these 19 models, n = 15 were specifically identified as part of the process of assessing the eligibility of the first 368 potential models (e.g., through additional documentation reviewed) and n = 4 were identified from other sources (e.g., personal communication or e-mail newsletter received during the weeks that the eligibility assessment process occurred). *Note: Total is higher than 309 because n = 123 models are classified into ≥2 possible reasons for exclusion. NP, nutrient profile.

Appendix 4. A) Genealogy and decision regarding the inclusion or exclusion of eight NP models which were "included" in the systematic review by Labonté et al. (2018)[11]

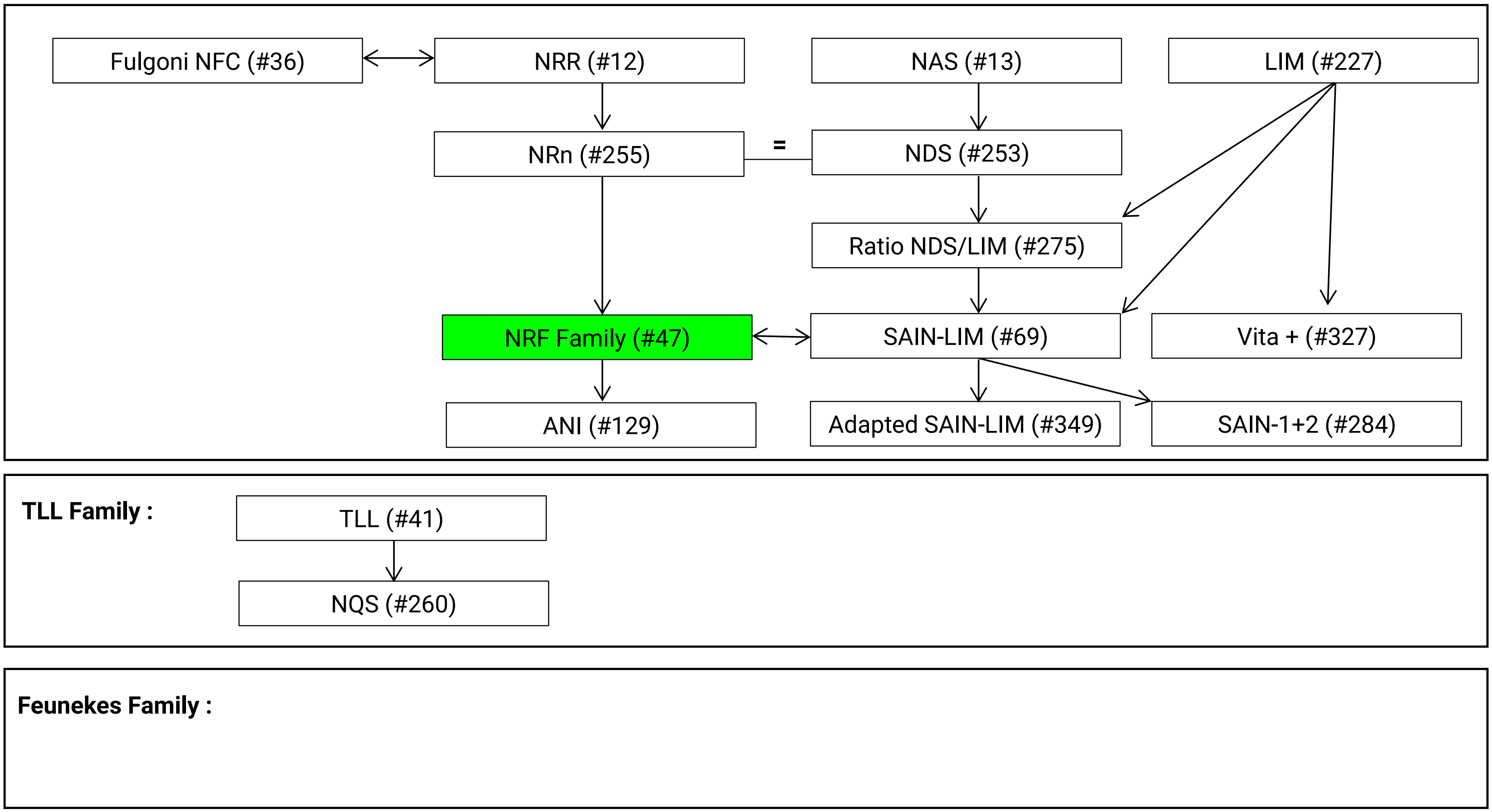


B) Eligibility assessment, according to the Observatory's criteria, of eight NP models "included" in the systematic review by Labonté et al. (2018)[11]

Model number in Labonté et al. (2018)	Model name	Organization	Country	Year	Applications	Decision and reasons (corresponding letter of the criteria)
5	FSA-OFCOM (Ofcom model for regulating the marketing of food to children, final version (WXYfm)	Ofcom (Broadcast regulator) and Department of Health (Food Standards Agency)	UK	2004-2005	Restriction of the promotion of foods to children (TV advertising)	Excluded: Represents the oldest NP model in the genealogy (M)
20	FSANZ (Food Standards Australia New Zealand - Nutrient Profiling Scoring Criterion (FSANZ-NPSC)	Food Standards Australia New Zealand	Australia and New Zealand	2007	Claims (health claims)	Excluded: Does not represent the newest version in the genealogy (M)
394	FSANZ-South Africa	Centre of Excellence for Nutrition North-West University South Africa,	South Africa	2013	Claims (health and nutrient claims)	Excluded: Based on a former (older) version of FSANZ; not as up-to-date as HSR (M)

	(South Africa NP model (FSANZ validated in South Africa))	Food Standards Australia New Zealand (Model developed by FSANZ and validated by North-West University South Africa)				
196	Health Star Rating System	Australian state and territory governments and New Zealand government in collaboration with industry, public health and consumer groups	Australia and New Zealand	2014	Food certification scheme for food labelling (front-of-pack label for packaged foods)	Included: Most recent and updated version of the FSANZ family of models (see genealogy).
178	Nutri-Score (formerly Five-Colour Nutrition Label; 5-CNL)	National Nutrition and Health Program (Programme National Nutrition Santé; PNNS) of the Agence nationale de sécurité sanitaire de l'alimentation, de l'environnement et du travail (ANSES)	France	2013	1. Food certification scheme for food labelling (on the front-of-pack, store shelves, or in advertising related to food products), 2. Reformulation (innovation)	Included: Represents a newer and updated version of the OFCOM model, therefore preferable to use, as also indicated by an expert in the field of NP, Dr. Mike Rayner, as part of a symposium held at an international conference in 2017 (N)
220	Ireland (Ireland - Broadcasting authority model for restricting the marketing of food and drink to children)	Broadcasting Authority of Ireland (BAI)	Ireland	2013	Restriction of the promotion of foods to children (restricting the marketing of unhealthy foods and beverages)	Excluded: Very similar to OFCOM, therefore the Nutri-Score represents a newer and updated version of the current model (M).
69	SAIN-LIM (The SAIN, LIM system)	French Food Safety Agency (Agence Française de Sécurité Sanitaire des Aliments)	France	2008	Claims (nutrition and health claims)	Excluded: Generates two scores that allow classifying a food into one out of 4 categories; therefore, does not generate an overall numerical score (D)
254	Nutrient Value Score (NVS)	United Nations World Food Programme	International	2013	1. Research/ general purpose (nutritional quality of food baskets), 2. Food assistance programs	Excluded: Only targets populations at high risk of undernutrition and micronutrient deficiencies (F)

Appendix 5. A) Genealogy and decision regarding the inclusion or exclusion of 16 NP models which were "excluded" in the systematic review by Labonté et al. (2018)[11], and which shared a common origin with at least one other model.



Health Protection Factor (Feunekes GI) #345	Healthier Choice Tick (Feunekes GI) #346	Stars (Feunekes GI) #348

N.B. SAIN-LIM (#69) and TLL (#41) were both "included" in the systematic review by Labonté et al. (2018)[11]. Therefore, these models are not counted in the 16 models which were "excluded" from the systematic review, and which shared a common origin with at least one other model.

B) Eligibility assessment, according to the Observatory's criteria, of 16 NP models which were "excluded" from the systematic review by Labonté et al. (2018)[11], and which shared a common origin with at least one other model

Model no. in Labonté et al. (2018)	Model name	References	Application	Decision and reasons (corresponding letter of the criteria)
36	Fulgoni's Nutrient for Calorie Index (NFC)	Drewnowski A, Fulgoni V, 3rd. Nutrient profiling of foods: creating a nutrient-rich food index. Nutr Rev 2008;66(1):23-39. doi: 10.1111/j.1753-4887.2007.00003.x	Model developed by an academic organization (University of Tennessee, Knoxville) for research/ general purposes	Excluded: Model with very similar calculations to the Naturally Nutrient Rich Score (NNR; model #12) (M); It only includes nutrients to encourage (B); Original reference of the model is also not available (G)
12	Naturally Nutrient Rich Score (NNR)	Drewnowski A, Maillot M, Darmon N. Testing nutrient profile models in relation to energy density and energy cost. Eur J Clin Nutr 2009;63(5):674-83. doi: 10.1038/ejcn.2008.16.	Model developed by an academic organization (University of Washington) primarily for research purposes, but also for consumer education in the context of dietary guidelines	Excluded: This model is a former version of the "nutrient-rich food" family of models (model #47), as indicated in Drewnowski et al. (2009) (M); It only includes nutrients to encourage (B); Also, some of the included nutrients are not available on the Nutrition Facts table (B)
255	Nutrient-rich subscores based on a variable number of beneficial nutrients (NRn)	Drewnowski A, Fulgoni VL, 3rd. Nutrient density: principles and evaluation tools. Am J Clin Nutr 2014;99(5 Suppl):1223S-8S. doi: 10.3945/ajcn.113.073395.	Model initially developed for research purposes	Excluded: The NRn is a sub-component and former version of the NRF family of indexes (model #47), as indicated in the source reference (M); It only includes nutrients to encourage (B)
47	Nutrient Rich Foods Index (NRF) (family of models)	Drewnowski A, Maillot M, Darmon N. Testing nutrient profile models in relation to energy density and energy cost. Eur J Clin Nutr 2009;63(5):674-83. doi: 10.1038/ejcn.2008.16.	Model developed by an academic organization (University of Washington, Seattle) for research/ general purposes	Included (version 6.3): Model generating an overall score; A widely used version is NRF 9.3 (9 nutrients to encourage, 3 nutrients to limit), but some of the nutrients to encourage are not available on the Nutrition Facts table (i.e. potassium, magnesium, vitamin E) (B). However, version 6.3 is included, as it fits the Observatory's inclusion criteria.

129	Affordable Nutrition Index (ANI)	Drewnowski A, Rehm CD. Vegetable cost metrics show that potatoes and beans provide most nutrients per penny. PLoS One 2013;8(5):e63277. doi: 10.1371/journal.pone.0063277; Drewnowski A. New metrics of affordable nutrition: which vegetables provide most nutrients for least cost? J Acad Nutr Diet 2013;113(9):1182-7. doi: 10.1016/j.jand.2013.03.015.	Model developed by an academic organization for research/ general purposes	Excluded: Modified version of # 47 (NRF Family) in which cost is simply added, and therefore adds nothing in terms of specifically evaluating nutritional quality (M): The ANI is described as the "ratio of the Nutrient Rich Foods [Foods] index per standard portion and the cost per standard portion, with higher values reflecting greater nutrient density per cost".
13	Nutrient Adequacy Score (NAS)	Drewnowski A, Maillot M, Darmon N. Testing nutrient profile models in relation to energy density and energy cost. Eur J Clin Nutr 2009;63(5):674-83. doi: 10.1038/ejcn.2008.16.	Model developed by academic organizations for research purposes	Excluded: This model served as the basis for (and is therefore a former version of) other models such as the nutrient density score (NDS) (model #253), as described in Drewnowski et al. (2009) (M); It only includes nutrients to encourage (B)
253	Nutrient Density Score (NDS)	Drewnowski A, Maillot M, Darmon N. Testing nutrient profile models in relation to energy density and energy cost. Eur J Clin Nutr 2009;63(5):674-83. doi: 10.1038/ejcn.2008.16.	Model initially developed by Maillot et al. (2007) for research purposes (for the purpose of their study)	Excluded: It only includes nutrients to encourage (B)
275	Ratio NDS:LIM (Maillot 2008)	Maillot M, Ferguson EL, Drewnowski A, Darmon N. Nutrient profiling can help identify foods of good nutritional quality for their price: a validation study with linear programming. J Nutr 2008;138(6):1107-13.	The Ratio NDS:LIM was developed by Maillot et al. (2008) for research purposes (for the purpose of their study)	Excluded: Many nutrients to encourage included in this model are not available on the Nutrition Facts table (B)
227	Limited Nutrient Score (LIM)	Maillot M, Darmon N, Darmon M, Lafay L, Drewnowski A. Nutrient-dense food groups have high energy costs: an econometric approach to nutrient profiling. J Nutr 2007;137(7):1815-20.	Model initially developed by Maillot et al. (2007) for research purposes (for the purpose of their study).	Excluded: It only includes nutrients to limit (B)
327	Vita+ choice logo	Gaigi H, Raffin S, Maillot M, Adrover L, Ruffieux B, Darmon N. Experimenting with nutritional signposting in two Marseille supermarkets "the Vita+ choice". [French] Experimentation dun flechage nutritionnel dans deux supermarches a Marseille Le choix Vita+. Cahiers de Nutrition et de Dietetique 2015;50(1):16-24. doi: http://dx.doi.org/10.1016/j.cnd.2014.12.005.	Logo created for research purposes	Excluded: It only includes nutrients to limit (B)

284	Score of nutritional adequacy of individual foods (SAIN) 1 and 2 (Lesturgeon A)	Lesturgeon A, Vieux F, George S, Rouveyrol C, Amiot M, Darmon N. Taking into account the nutritional specificities of food categories in an across-theboard nutrient profile system. Annals of Nutrition and Metabolism 2011;58:107	Two alternatives of the original SAIN score, i.e. SAIN scores 1 and 2, were created here by Lesturgeon et al. (2011) for research purposes	Excluded: It only includes nutrients to encourage (B)
349	Adapted SAIN, LIM (Lluch A)	Lluch A, Clerfeuille E, Demaretz L, Drewnowski A, Darmon N. Construct validity assessment of an adapted version of the sain, lim nutrient profiling system. Annals of Nutrition and Metabolism, 2013:923-4.	Model built by Lluch et al. (2013) for research purposes (conference abstract)	Excluded: Represents only a slightly modified/adapted version of the SAIN,LIM model (#69), which ended up being excluded by the Observatory, as it does not generate an overall numerical score (D)
260	Overall nutritional quality score (Faulkner GP)	Faulkner GP, Livingstone MB, McCaffrey TA, Kerr MA. Supermarket own brand foods: lower in energy cost but similar in nutritional quality to their market brand alternatives. J Hum Nutr Diet 2014;27(6):617-25	Model developed by Faulkner et al. (2014) for research purposes (i.e. for the purpose of the study)	Excluded: The model is a composite score based on the Traffic Light Labelling system (model #41), which only includes nutrients to limit (B)
345	Health Protection Factor (Feunekes GI)	Feunekes GI, Gortemaker IA, Willems AA, Lion R, van den Kommer M. Front-of-pack nutrition labelling: testing effectiveness of different nutrition labelling formats front-of-pack in four European countries. Appetite 2008;50(1):57-70.	Model built by Feunekes et al. (2008) for research purposes, based on the system used on sunscreen lotions	Excluded: The source reference does not provide details on how the numbers were determined (i.e. the algorithm underlying systems #345 and #348 is unknown) (G)
346	Healthier Choice Tick (Feunekes GI)	Feunekes GI, Gortemaker IA, Willems AA, Lion R, van den Kommer M. Front-of-pack nutrition labelling: testing effectiveness of different nutrition labelling formats front-of-pack in four European countries. Appetite 2008;50(1):57-70.	Model built by Feunekes et al. (2008) for research purposes	Excluded: The healthier variant of each pair within a same food category was determined based on the Unilever Nutrition Enhancement Programme Score (i.e. a model by a commercial organization) (E)
348	Stars (Feunekes GI)	Feunekes GI, Gortemaker IA, Willems AA, Lion R, van den Kommer M. Front-of-pack nutrition labelling: testing effectiveness of different nutrition labelling formats front-of-pack in four European countries. Appetite 2008;50(1):57-70.	Model built by Feunekes et al. (2008) for research purposes	Excluded: The source reference does not provide details on how the numbers were determined (i.e. the algorithm underlying systems #345 and #348 is unknown) (G)

8 References

1. Swinburn B SG, Vandevijvere S, Kumanyika S, Lobstein T, Neal B, Barquera S, Friel S, Hawkes C, Kelly B et al.: **INFORMAS (International Network for Food and Obesity/non-communicable diseases Research, Monitoring and Action Support): overview and key principles**. *Obes Rev* 2013, **14** (Suppl 1):1-12.
2. Schermel A MJ, Henson S, Dukeshire S, Pasut L, Emrich TE, Lou W, Qi Y, L'Abbe M R. : **Canadians' perceptions of food, diet, and health--a national survey**. *PLoS One* 2014, **9**:e86000.
3. Frieden TR: **A framework for public health action: the health impact pyramid**. *Am J Public Health* 2010, **100**(4):590-595.
4. **Healthy Eating Strategy** [https://www.canada.ca/content/dam/canada/health-canada/migration/publications/eating-nutrition/healthy-eating-strategy-canada-strategie-saine-alimentation/alt/pub-eng.pdf]
5. **Politique gouvernementale de prévention en santé** [http://publications.msss.gouv.qc.ca/msss/document-001753/]
6. **Nutrient Profiling** [http://www.who.int/nutrition/topics/profiling/en/]
7. Organization WH: **Guiding principles and framework manual for the development or adaptation of nutrient profile models**. *Geneva: World Health Organization* 2011.
8. **Nutrient Profiling: report of a WHO/IASO technical meeting** [Internet: http://www.who.int/nutrition/publications/profiling/WHO_IASO_report2010/en/]
9. Scarborough P, Rayner M, Stockley L: **Developing nutrient profile models: a systematic approach**. *Public Health Nutr* 2007, **10**(4):330-336.
10. Scarborough P, Rayner M: **When nutrient profiling can (and cannot) be useful**. *Public Health Nutr* 2014, **17**(12):2637-2640.
11. Labonte ME, Poon T, Gladanac B, Ahmed M, Franco-Arellano B, Rayner M, L'Abbe MR: **Nutrient Profile Models with Applications in Government-Led Nutrition Policies Aimed at Health Promotion and Noncommunicable Disease Prevention: A Systematic Review**. *Adv Nutr* 2018, **9**(6):741-788.
12. Lobstein T DS: **Defining and labelling 'healthy' and 'unhealthy' food**. *Public Health Nutr* 2009, **12**:331-340.
13. Sacks G, Rayner M, Stockley L, Scarborough P, Snowdon W, Swinburn B: **Applications of nutrient profiling: potential role in diet-related chronic disease prevention and the feasibility of a core nutrient-profiling system**. *Eur J Clin Nutr* 2011, **65**(3):298-306.
14. Rayner M, Scarborough P, Kaur A: **Nutrient profiling and the regulation of marketing to children. Possibilities and pitfalls**. *Appetite* 2013, **62**:232-235.
15. **Food Quality Observatory** [https://offrealimentaire.ca/en/]
16. **Food Quality Observatory - mission** [https://offrealimentaire.ca/en/about]

17. Moher D, Liberati A, Tetzlaff J, Altman DG, Group P: **Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement**. *J Clin Epidemiol* 2009, **62**(10):1006-1012.
18. Labonté ME PT, Gladanac B, Ahmed M, Franco-Arellano B, Rayner M, L'Abbe MR **Systematic review of nutrient profile models developed for nutrition-related policies and regulations aimed at noncommunicable disease prevention**. In.: PROSPERO #CRD42015024750 [Internet] [cited 2017 Sep 18]. .
19. **Health Star Rating System [Internet]** [http://healthstarrating.gov.au/internet/healthstarrating/publishing.nsf/content/home]
20. **Guide for industry to the Health Star Rating Calculator (HSRC). Version 5 [Internet]** [http://www.healthstarrating.gov.au/internet/healthstarrating/publishing.nsf/Content/guide-for-industry-document]
21. **Australia New Zealand Food Standards Code– Standard 1.2.7–Nutrition, health and related claims—F2016C00161 [Internet]** [https://www.legislation.gov.au/Details/F2016C00161]
22. **Propositions pour un nouvel élan de la politique nutritionnelle française de santé publique dans le cadre de la Stratégie Nationale de Santé. 1ère Partie: Mesures concernant la Prévention nutritionnelle [Internet]** [http://www.ladocumentationfrancaise.fr/var/storage/rapports-publics/144000068.pdf]
23. **Television Advertising of Food and Drink Products to Children** [https://www.ofcom.org.uk/consultations-and-statements/category-2/foodads_new/statement]
24. Fulgoni VL, 3rd, Keast DR, Drewnowski A: **Development and validation of the nutrient-rich foods index: a tool to measure nutritional quality of foods**. *J Nutr* 2009, **139**(8):1549-1554.

OBSERVATOIRE

de la qualité de l'offre alimentaire