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Food product classification: comparison of methods
in different regions

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Food product classification

Internship Report

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Healthy choices: food and
drink classification guide
A system for classifying foods and drinks



PRODUCT CRITERIA FOR BELGIUM



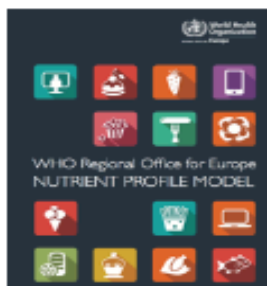
CHOICES INTERNATIONAL
FOUNDATION

A publication of the
Singapore Food Agency (SFA)



ZAMBIA GOOD FOOD LOGO

Criteria



NUTRIENT PROFILE
MODEL
FOR THE WHO AFRICAN REGION



Nutrition Criteria
White Paper



Manual for Food and
Nutrition in Regulated
Child Care Settings



Preface and Acknowledgement

For 5 months from March till August 2020, I did an internship at Choices International Foundation, a global organization that works primarily on national level. It is an independent and brings together people from government, science, industry and NGOs. Choices International Foundation helps to improve people's daily diet, setting criteria which differentiate between more or less healthy products, and contributing in prevention of the double burden of malnutrition (DBM). This internship project is a part of my second-year master program which I conduct at Wageningen University and Research, the Netherlands.

I worked on an assignment project to view different food product classifications across the regions. The main content of the work was to compare the food product classifications across all regions, globally with Choices as reference in order to propose the recommendations to Choices that can be adapted across all regions of the world. This topic suits my expectations regarding to food product classification, and also brought me to a very new and interesting area of using food classification to help consumer choices and industry to reformulate food products. Through the assignment, I did not only gain a lot of knowledge but more importantly, I also had a great chance to sharpen my skills in working with professionals in different domain especially in nutrition. Not less important than the communication course that I have learnt is the communication skills that I have been trained and practiced through giving presentations, discussing with supervisors, experts in the field and other staffs within and outside the organization. I was also learned to work independently and to adapt to virtual communication technology where to meet face to face was not possible due to the corona situation.

I am very appreciated to Sylvie Van den Assum and Rutger Schilpzand, my supervisors at Choices International Foundation. They gave me very in-time valuable instructions and put me in contact with experts in the field like Prof. Lauren Lissner, the president of the Choices International Scientific Committee, who gave me extensive guidance regarding to the context of food product classification. I also would like to express my gratitude to Dr. ir. Alida Melse-Boonstra for her permission to be my academic supervisor and more importantly for her enthusiastic encouragements and precious instructions during my internship period. She gave me co-supervisor (Dessy) who gave me in-time feedback on my research and helped to organize an interesting presentation in which I could present my ideas and achievements to other professors and researchers of the faculty as well as to Choices staff.

Throughout the internship, I have also learnt many things about the Dutch culture whose benefits are far beyond what I could learn in a normal project. In short, I would like to thank Choices International Foundation and Wageningen University and Research, internship Office for introducing me to this great opportunity in which I have developed myself both academically, professionally and socially.

Finally, a very special gratitude goes out to OKP for helping and providing the funding for my Master program. Last but not least, I would like to thank my family: my parents and to my brothers and sister for supporting me spiritually throughout my studies and my life in general.

Executive summary

Background: The food product classification is a system organizing different food names into groups. The groups are defined based on commonalities or similarities primarily identified from a user viewpoint. In the comparison of the food product classifications, national and regional classifications depend on national criteria and foods groups. The regional and national classifications are useful to outline the specific food consumption patterns, while it is necessary to match these to international classification in order to make a comparison on an international level. The goal of this study is to help Choices to find a classification method that is suited to serve multiple policies such as reformulation, restriction marketing to children, consumer education, Front-of-package (FOP) logo, and taxation measures. The comparison of different food product classifications across the regions has also made and come up with recommendations to Choices.

Objective: To compare the food product classifications across all the regions with Choices as reference in order propose the recommendations to Choices that can be adapted across all regions of the world.

Methodology: We searched Scopus, PubMed, ScienceDirect, Google Scholar databases, WHO, governments, WUR library website. The search identified 542 reports, abstracts, and articles of which 508 were excluded on the basis of the titles, abstract, and the content. We reviewed 34 Food product classifications as full content and identified 19 eligible food product classifications i.e. Keyhole, Australia, Brunei, Singapore, Malaysia, Zambia, New Zealand, Croatia, Belgium, Dutch, WHO ER, WHO EMR, WHO SEAR, WHO AR, WHO WPR, EP, Ontario, Manitoba and Czech Republic. Eligible classifications were selected based on inclusion and exclusion criteria; and were grouped into five groups based on purposes they serve. To understand the ease of applying the food product classification, we explored classification method and characteristics of each food product classification.

Results: The food classifications were grouped based on their primary purpose they serve, (reformulation, marketing to children, FOP logo, and taxation measures) but none of them fitted with taxation measures. WHO NPM could also be adapted after suitable testing and validation for other purposes, such as defining tax policy to limit consumption of unhealthy foods and developing benchmarks for foods sold in school cafeterias. The classifications which have the same characteristics such as number of food categories, food product included and excluded, classification method, target group of people, types of food product, and how food items were grouped together.

Conclusion: The final analysis and comparison have made for all 19 eligible food product classifications and came up with 8 recommendations to Choices. The recommendations were 1) Classification of potatoes into fruit and vegetables category; 2) To classify plant-based meat alternatives in meat, fish, poultry and eggs group; 3) Rice should be classified as category; and Grain category should be defined as Grain and cereals products category; 4) Growing-Up Milks should be mentioned in classification and food product excluded based on age range should be adjusted ;5) Traditional food items consumed during cultural or religious festivities should be mentioned into classification; 6) Soups (all kind of soups and broths) should be classified in non-basic product groups; 7) Salad and dressing/mayonnaise should be mentioned in the oils, fats and fat containing spreads category; and 8) To make category specific approach dynamic (Basic vs. non-basic product groups), number of food categories. Food classifications aligned with international recommendations and other nutrition policies are needed to comply with different purposes. Food classification is a fundamental issue affecting how individual food choices interface with the wider food system, and considerable future work is needed to extend our understanding of food classification and to make it applicable across all regions of the world.

Keywords: Food classification; Food categories; Reformulation purpose; Recommendations.

Abbreviations

DAFNE: Data Food Networking
DBM: Double Burden of Malnutrition
EFAD: The European Federation of the Associations of Dietetics
EFSA: European Food Safety Authority
EP: European Union Pledge
FAO: Food and Agriculture Organization of the United Nations
FOPL: Front-of-pack nutrition labelling
FUF: Follow-Up Formulas
GUM: Grow-Up Milk
NCDS: Non-communicable Diseases
NGOs: Non-governmental Organizations
NIP: Nutritional Information Panel
NPM: Nutrient Profiling Model
PAHO: Pan American Health Organization
PNIG: Population Nutrient Intake Goals
TAC: Total Antioxidant Capacity
TDS: Total Diet Study
TFP: Traditional Food Products
UN SDGs: United Nations Sustainable Goals
UNICEF: United Nations Children's Fund
WHO AR: World Health Organization African Region
WHO EMR: World Health Organization Eastern Mediterranean Region
WHO ER: World Health Organization European Region
WHO SEAR: World Health Organization South-East Asian Region
WHO WPR: World Health Organization Western Pacific Region
WHO: World Health Organization
WUR: Wageningen University and Research
WW: World War

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1.Introduction

1.1. Background

1.1.1. Food product classification

The food product classification is a system organizing different food names into groups. The groups are defined based on commonalities or similarities primarily identified from a user viewpoint. Besides, the groups may be aggregated further into broader groups. In classification, food item identifies a food commonly considered as a single food or collection of very similar variants of the same food. However, the food group identifies a collection of food items not commonly being considered to be variants of the same food but sharing important characteristics in terms of nature, source, or use. The food group can have a food sub-group that identifies each of the narrower groups constituting a broader group. Therefore, the food category defines a collection of food groups and food items, only sharing some general characteristics in terms of nature or use (EFSA, 2011).

1.1.2. Importance of food product classification

The correct food product classification meets regulatory requirements and ensures consumer safety as well as a correct and cost-effective way to conduct business for the producers of food and drinks such as Industries and companies (Brien, 2002). Additionally, food product classification is a key method to improve understanding of how to prevent the double burden of malnutrition (DBM) and other diet-related diseases by setting limits within different food groups. Those limits should be in line with global recommendations that aim to reduce the amount of saturated and trans-fatty acids, added salts and sugar in processed food, and to enhance fruit, vegetable, and whole-grain consumption while limiting energy intake (Roodenburg et al., 2011). It is also a firmer basis for rational policies and effective actions designed to protect and improve public health at all levels from global to local. Moreover, it is in that line Choices International Foundation plays a role to identify the important nutrients and their cut-offs values into food categories by setting international criteria. Those criteria set by reading independent scientists; they indicated the healthiest option in each food group, which aim to help the consumers to select healthier food choice within the same food product (Choices Programme, 2019). The food product classification also reveals the link between food and health outcomes and proposing nutritional recommendations or actions. This association is accounted for different classification systems. For example, food classification based on how foods are processed seems to be more nutritionally relevant compared with classification based on the origin of plant and animal species (Fardet et al., 2015). The criteria that define food categories also demonstrated an increase in consumer awareness, a positive effect on product innovation and a potential impact on nutrient intakes (Roodenburg et al., 2011). Each food product classification has its purpose which beneficial either for the consumers or for the producers. For instance, the Keyhole food product classification serve different purposes which are targeting both food products consumers and producers, i.e. reformulation, Front Of Pack (FOP) Logo, and consumer education (The National Food Agency, 2015).

Likewise, the WHO Nutrient Profiling Models (WHO NPM) and EU Pledge (EP), their purpose is to implement the WHO recommendations on marketing of foods and non-alcoholic beverages to children by identifying unhealthy foods that should be subject to marketing restriction. But, these models could also be adapted after suitable testing and validation for other purposes, such as defining a tax policy to limit consumption of unhealthy foods and developing benchmarks for foods sold in school cafeterias (World Health Organization, 2015).

1.1.3. The history of food product classification

Food classification was established for the first time in 1834 by William Prout, who was an English physician. He classified food by grouping them into foods of an animal, foods of vegetables, and a group of fatty or oily foods. However, the modern food classification system was established during World War I (WWI) due to the interest in the dissemination of information on food and nutrition at those moments. The main argument of classification systems during the WWI period was to allocate all foods into a small number of categories. These primary guides were general in nature; therefore, they did not attempt to investigate nutritive contributions within groups. Since they were not interested in the association between food groups and health outcomes, they were only intended to serve as educational guides for the selections of the foods and the planning of the meals. For instance, the term "protective foods" means milk, eggs, and vegetables, which was invented by McCollum in 1918. However, the bodybuilding, and protective values of these foods had not been completely revealed (Alade, 1985). In 1936, the use of dietary standards was established through the league of Nations based on the limited knowledge of nutrition at those times. Food rationing during World War II (WW II) motivated the development of the new classification system. Besides, to select alternatives means to common foods that were in limited supply, the Basic Seven food guide was promoted. Hence, after WW II Basic Seven guide was reviewed, and the revised version was adopted in 1946. Moreover, the most recent food guide appeared in 1955; it was based on the 1946 version and was called "Food for Fitness: A Daily Food Guide." This guide contains the basic four food groups such as the milk group, the meat group, the cereal and grain group, and the fruits and vegetables group. This food classification has already adopted by the United States and Canada (Alade, 1985).

Obviously, to redesign the international Choices program which was unrelated to the US Smart Choices program, the Netherlands in collaboration with an international board of scientists created a generic, global front-of-pack nutrition logo system. The system was aimed to help the consumers to make healthier food choices and stimulates product reformulation. Additionally, the program is a product group-specific nutrient-profiling approach with a distinction between basic and non-basic foods food product groups. The generic criteria and decision framework were developed to further define food categories, in order to meet the unique country and region-specific dietary needs. As a result, it has been shown that the new criteria have contributed to an increase in consumer awareness, a positive effect on product innovation, and a potential impact on nutrient intakes (Roodenburg et al., 2011).

1.1.4. The previous research that compare different food classification

In the past, food product classifications have been fulfilled requirements set by the regulatory bodies such as classify food by origin (plants, animal), by function (energy-yielding, bodybuilding, and protective foods), and by nutritive value (proteins, carbohydrates, fats, vitamins and minerals, and water). It has been also shown that most country-specific food product classifications before to be updated were based on national criteria and food product groups which may be specific (Ireland & Møller, 2000). During harmonization of food product classification and food composition databases allowing comparability of consumption at both food and nutrients levels in Europe revealed that the task of creating a common food product classification was difficult because national food composition tables do not allow comparison of nutrients intakes between countries (Trichopoulou, 2002). In general, the previous food product classifications covered all foodstuffs (any substances that are used as food or to make food) and also deal with foods as marketed which makes it interesting in a food consumption context. The existing national food product classification is highly culture-dependent due to each country has its food preference. Besides, most of the national databases that used in the comparison of food product classifications have unique parts such as differences in the number of food groups (EFSA, 2011a). In the comparison of the food product classifications, National and regional classifications depended on national criteria and foods groups (Ireland & Møller, 2000).

Another example is Total Diet Study (TDS), where a comparison was made between the use of a national food product classification systems and the use of FoodEx-1, developed and recommended by the European Food Safety Authority (EFSA). In this study, the work was performed using data of six European countries: Belgium, Czech Republic, France, The Netherlands, Spain, and the UK. Moreover, a food product classification system was needed to link existing food consumption data with the analytical data i.e. occurrence data, obtained in the TDS. The study has shown that, in Europe, there is a need to develop a harmonized TDS approach as currently, each European country has its own approach, making it difficult to compare the results. The national or regional classification systems are purpose-specific and are not compatible with other systems. Therefore, regional and national classifications are useful to outline the specific food consumption patterns, while it is necessary to match these to international classification in order to make a comparison on an international level (Akhandaf et al., 2015).

1.2. Some example of food product classifications met the inclusion criteria

1.2.1. The Singapore food product classification

The Singapore food product classification serves multiple policies such as stimulation of development of healthier products, to help consumers making informed healthier food choices, to encourage food manufactures to reformulate existing products into healthier products, to improve the nutritional profile of food and beverages, and to increase the number of local beverages and food products with a healthier choice logo.

This classification was developed in collaboration with the Ministry of Health and Health Promotion Center. This classification was displayed into 14 main food groups (Beverages; cereals; dairy products; eggs and egg product; fats and oils; fruits and vegetables; legumes, nuts, and seeds; meat and poultry; seafood; sauces, soups, and recipe mixes; snacks; convenience meals; desserts; and miscellaneous). Thus, those main groups were also subdivided into 82 food categories, but the dessert group was newly introduced into classification. However, the classification excluded infant formula or any other food products for persons one year of age and below. The classification is in line with nutrient claims guidelines, whereby it takes into account the level of sugar, sodium, saturated fat, trans fat, and calcium in the product group. This food product classification is in line with public health policies, whereby all food products, and beverages that make nutritional claims are required to display the amount of nutrients being claimed in the Nutritional Information Panel (NIP). For instance, classification defined whole grain as an essential part of a nutritious diet due to the fact that, whole grains contain all parts of the grain such as germ, bran, and endosperm, it is healthier than refined grains (Health Promotion Board Singapore, 2018).

1.2.2. The Choices, Belgium, Dutch, Zambia, and Czech Republic Food Product Classifications

The Choices, Belgium, Dutch, Zambia and Czech Republic food product classifications were based on international product criteria. The criteria based on group specific have been developed by the Choices international Scientific Committee, an independent panel of leading international experts in nutrition, food technology and consumer behavior. Additionally, the international scientific committee periodically evaluates the product criteria to keep along the way with the latest scientific and technological developments in the field of nutrition and health. This in turn provides industry with the necessary guidance to develop or reformulate products. The international criteria are a guideline for the direction into which the criteria in a country should develop. National country organizations set the criteria for the assignment of the local logo to products in that market. The food product excluded for both classifications are products containing >0.5% alcohol, food supplements, products for use under medical supervision, and the foods for children under a year old. Furthermore, they all have a quite similar number of food categories, and food products were classified into two main product groups i.e. basic and non-basic product groups (Choices International Foundation, 2016). However, the Choices food product classification revised periodically, after every 4 years where the criteria are designed to identify the healthiest products within a category of food. Those criteria highlight the healthiest options in each food category. The criteria intended to be used where the definition of 'healthy' is required for the implementation of food and health strategies. For instance, FOP nutritional label systems, reformulation agenda, nutrition communication to the consumers, and responsible food marketing or financial incentives. The revision of Choices criteria has made a difference in its food product classification compare to other food product classification based on international criteria. For example the Choices classified rice into Grains category, while other food product classifications based on international criteria such as Dutch, Belgium, have separated rice from grains category i.e. rice was created as category (Choices Programme, 2019).

1.3. Choices International Foundation and its relevant in this context

The Choices International Foundation is a unique multi-stakeholder initiative designed to help the consumers to easily select healthy food options and to help the industry to improve their products. It was introduced in The Netherlands in 2006 as a response to the World Health Organization's call for the food industry to take an action role in helping to tackle the growing problem of obesity and non-communicable diseases (NCDs) around the world. WHO has since identified Choices as one of the best-validated nutrient profiling systems currently developed. Furthermore, the Choices logo was approved by the European Union in 2013 after the consultation of all member states. The Choices programme globally supports governments, scientists, and food companies in their efforts to encourage healthy lifestyles (Choices International Foundation, 2006). In the last 5 years Choices works more in Asia and Africa and broadened the scope of the program to include undernourishment and stunting on a national level. Moreover, at present, the Choices International Foundation has a global scope and a regional priority hierarchy i.e. East Asia, Africa, Europe, and South-Asia. However, Choices has no actions in Latin America and Australia.

To identify the healthiest option in each food category, the Choices programme consists of a nutrient profile model with product group-specific criteria. The Choices criteria specifically focus on healthier food choices, concerning both the prevention of NCDs and other forms of malnutrition, since they take into account a product's level of saturated and trans-fatty acids, added sugar, salt, and dietary fiber. Therefore, the Choices has been defined two types of product groups i.e. basic and non-basic product groups. The basic product groups have been defined according to the product group classifications that are used in more than 20 countries. The products found within basic product groups, for instance fruits and vegetables, milk and milk products contribute significantly to the daily intake of essential nutrients. However, food products from non-basic product groups for example snacks, sauces, and beverages generally do not contribute substantially to the intake of essential nutrients but provide great innovation potential. The criteria which were used to classify food products are based on international dietary guidelines and are periodically reviewed by the independent international scientific committee. Furthermore, these International criteria are dynamic; therefore, they need to be adapted to the national context where implemented and they must be revised periodically in order to respond the global development. Hence, the current Choices International criteria were revised in 2019. The choices criteria play a key role as its principals such as front-of-packaging (FOP) labeling, industry reformulation and innovation, consumer education, responsible marketing, coherence in national nutrition policies, and evaluation of product portfolio. As a result of success in reformulation, the product composition could significantly improve by using the Choices criteria as a guideline (Roodenburg et al., 2011).

Obviously, the way food can be classified strongly depends on the goal of classification such as harmonization of food classification which allows the comparability between different methods. For example, detailed food innovation strategies need a more detailed classification than classification for food taxation measures. However, even with similar goals in mind, classification seems like an arbitrary process. The Choices International aims to help governments to form their nutritional strategy to reduce the double burden of malnutrition globally.

The International Choices Criteria are used as a tool to define what are the healthiest products per product group. These criteria could potentially be used for multiple nutrition policies. The Choices International has been using and adapting the food product classification of Roodenburg et al. which is based on a decision tree that consists of three questions: a) Is there a healthier alternative of commonly consumed food, within a product group?; b) is there sufficient stimulation of innovation? ; c) is there alignment with recommendations? Many other food classifications exist, but it is often unclear how these classifications came about and if there is a scientifically reasoning behind it. To be able to use the Choices criteria for multiple purposes and to make them applicable internationally, an optimal food classification system should be established. Different food product classifications are very dependent on how you could use them, and they also have different purposes. The new classification method which is in alignment with international dietary patterns, new scientific insights, and current development within the food market is needed; which will also stimulate the food product industries to innovate by increasing the healthy food product options and decreasing unhealthy ones i.e. reformulation. Similarly, it is also indeed to have a classification method that will take marketing to children, FOP logo, consumer education, and taxation measures into account. The characteristics of different food product classifications need to be elaborated. The goal of this study is to help Choices to find a classification method that is suited to serve multiple policies such as reformulation, restriction marketing to children, consumer education, Front-of-package (FOP) logo, and taxation measures. The comparison of different food product classifications across the regions has also made and come up with recommendations to Choices.

2.Objective and Research question

2.1. Research question

- ◆ What is the food classification method that will serve multiple policies across the globe?

2.2. Objectives of the study:

2.2.1. Primary objective:

- ◆ To compare the food product classifications across all regions, globally with Choices as reference.

2.2.2. Secondary objective:

- ◆ To compare different food product classifications with Choices;
- ◆ To compare and grouping food product classifications based on their purposes and characteristics;
- ◆ To propose the recommendations to Choices that can be adapted across all regions of the world.

3. Methodology

3.1. Inclusion and Exclusion criteria

We searched Scopus, PubMed, ScienceDirect, Google Scholar databases, WHO, governments, WUR library websites to identify different food product classifications. The search terms included 'food product classification', 'food classification system(s)', 'non-processed food classification(s)', 'food classification framework(s)', 'food grouping', 'food and beverages categorization', 'food and beverages classification', 'food classification scheme(s)', 'national(s) food classification system(s)', 'international food product classification', 'classification of all food products', 'classification of packaged and non-packaged foods', 'classification of all sorts of food', 'WHO food classification system(s)', 'WHO nutrient profiling system', 'reformulation agenda', 'reformulation policy (ies)', 'marketing to children policy(ies)', 'restriction marketing to children', 'FOP Logo policy(ies)', 'consumer education policy(ies)', and 'food taxation measures policy(ies)'.

Food product classifications were eligible for inclusion if they were:

- ◆ contained processed and packaged food,
- ◆ contained all kinds of foods products,
- ◆ international or national classification,
- ◆ classified foods based on sorts of food,
- ◆ classified food based on reformulation agenda, marketing to children, taxation measures, FOP logo, and consumer education.

However, food product classifications were excluded if they met one (or more) of exclusion criteria, as follow:

- ◆ food product classification used by single industry or company,
- ◆ if the classification based on healthiness, smell, taste, texture,
- ◆ degree of processing (e.g. NOVA food classification),
- ◆ and classification that only describes the basic food.

3.2. Selection of eligible food product classifications

The search identified 542 reports, abstracts, and articles of which 508 were excluded on the basis of the titles, abstract, and the content (**Figure 1**). We reviewed 34 Food product classifications as full content (**Table 1**) and identified 19 eligible food product classifications i.e. Keyhole, Australia, Brunei, Singapore, Malaysia, Zambia, New Zealand, Croatia, Belgium, Dutch, WHO ER, WHO EMR, WHO SEAR, WHO AR, WHO WPR, EP, Ontario, Manitoba and Czech Republic. The food classifications were grouped based on their primary purpose they serve, but none of them fitted with taxation measures. The classifications which have the same characteristics such as number of food categories, food product included and excluded, classification method, target group of people, types of food product, and how food items were defined into categories were grouped together. Basic and non-basic food product groups were defined in response to the consumers communication and reformulation purposes. The information of eligible food product classifications was summarized based on their purposes and food groups.

In addition, other characteristics of each food product classification were defined in the section of remarks where the information was summarized from them (**Table 2**). After reviewing all 34 food product classifications, a total of 15 of food product classifications were excluded due to exclusion criteria (**Appendix 1**).

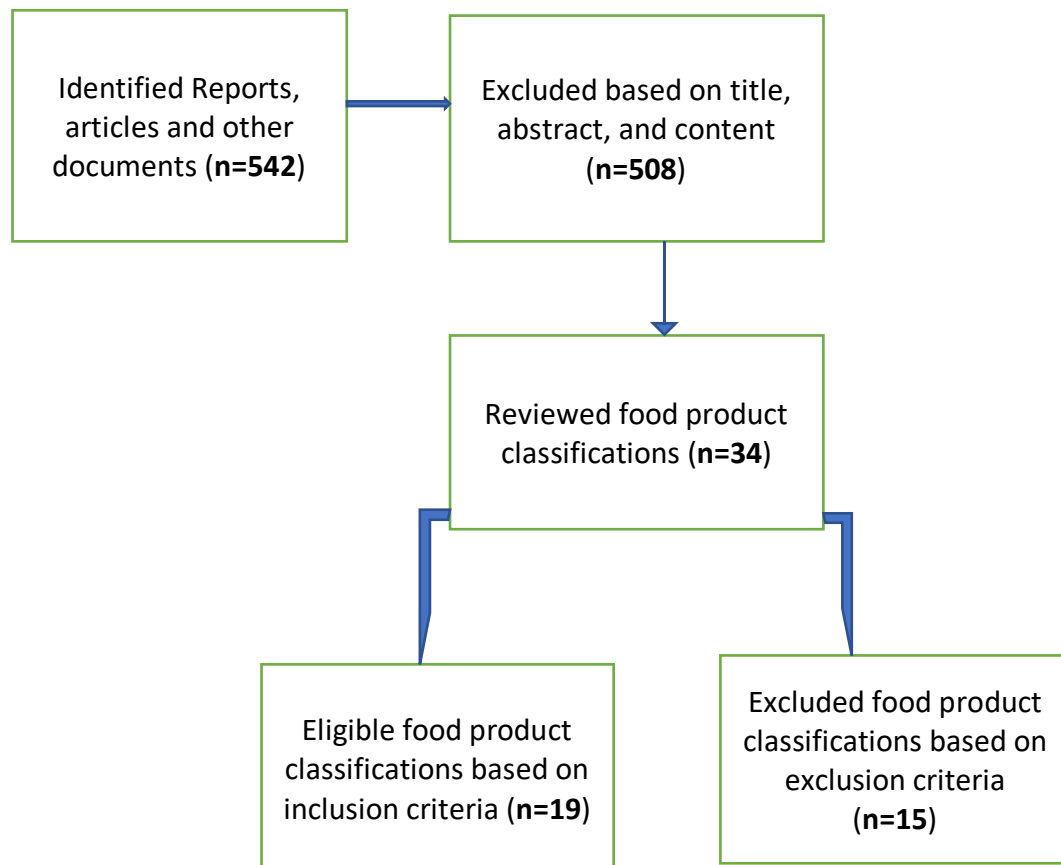


Figure 1: Flowchart describing search for food product classifications.

Table 1. Identified Food Product Classifications Across the regions.

SN	Region	Classification
1	Europe	WHO European Region Nutrient Profiling Model (WHO ER NPM), Keyhole, Croatia Healthy Living Food Criteria, Belgium Product Criteria, Dutch Product Criteria, EU Pledge (EP), EU Classification of food, NUTRISCORE, DAFNE Food Classification System, Euro-Food-Group Classification, and Czech Republic Product Criteria.
2	Africa	WHO African Region Nutrient Profiling Model (WHO AR NPM), Zambia Good Food Logo-Criteria, Nigeria Heart Foundation Approved Product.
3	America	Pan American Health Organization Nutrient Profiling Model (PAHO NPM), The Classification of Foods in the Canadian Nutrient File, School Food and Beverages Ontario, and Manitoba School Nutrition (Food and Beverages Groups).
4	Asia	India Food Categorization System, Singapore, Malaysia, Thailand, Brunei Darussalam, WHO South-Est Asia Region Nutrient Profiling Model (WHO SEAR NPM).
5	Australia/ New Zealand	New Zealand classification of food and beverages for year 1-13, Australia Healthy Choices, and Health Star Rating (HSR).
6	Other Regions	WHO Western Pacific Region Nutrient Profiling Model (WHO WPR NPM), WHO Eastern Mediterranean Region Nutrient Profiling Model (WHO EMR NPM).
7	Private and Company	The NOVA Food Classification, NESTLE Nutrient Profiling System, CODEX Classification of Foods and Animal Feeds, FOODEX Food Classification and Descriptive System, and Food and Beverages for Sports.

Table 2. Eligible food product classifications

Classification	Purpose	Food groups	Excluded food products	Remarks
Choices	To stimulate healthier food choices, and product reformulation	2 Product groups: Basic and non-basic product groups 21 categories in basic product groups; 9 categories in non-basic product groups.	Product containing >0.5% alcohol Food supplements Product for use under medical supervision Foods for children under a year old.	The food groups were created based on the nutrients content, the relation between consumption and the risk of non-communicable diseases (NCDs) and in coherence with the WHO recommendations for the prevention of NCDs.
Keyhole	Food product reformulation. To make it easier for consumers to find and choose healthier foods.	33 food product categories	Soft drinks, sweets and cakes, which are not part of a healthy and balanced diet; Foods with sweeteners are not eligible either; Foodstuffs intended for children up to the age of 36 months. The following ingredients must not be contained in foodstuffs labelled or presented with the Keyhole symbol: 1. Sweeteners (food additives), 2. approved novel foodstuffs or foodstuff ingredients with sweetening properties, and 3. phytosterols, phytosterol esters, phytostanols and phytostanol esters.	The food categories are based on scientific research and the Nordic and Swedish nutritional recommendations.
Australia Healthy Choices	Healthy Choices is a framework for improving availability and promotion of healthier foods and drinks in community settings. Setting-specific policy guidelines are available to support the implementation of Healthy Choices in hospitals and health services, workplaces, sport and recreation centers, and parks.	Apply to all foods and drinks, whether freshly made on the premises or supplied pre- packaged.	Not designed for: 1.Treatment of specific diseases or medical conditions requiring dietary intervention 2.Meals and snacks for inpatients, Meals on Wheels or aged care facilities 3.Foods and drinks staff and visitors purchase from outside a facility or bring from home for personal use.	Healthy Choices outlines a food and drink classification system that can be used to increase availability and promotion of healthier food and drink choices and reduce availability and promotion of less healthy choices in community settings. The Healthy choices: food and drink classification guide categorize foods and drinks as GREEN, AMBER or RED based on their nutritional value.
Brunei nutrient criteria-the healthier choices logo	To set the nutrient criteria of foods and beverages with the Healthy Choices Logo. To help facilitate food and beverage industry to meet the consumers' demand (to help consumers easily identify healthy foods and beverages).	66 food categories	Excluding infant formula	The Nutrient Criteria was adapted with permission from Singapore's Health Promotion Board Healthier Choice Symbol Nutrient Guidelines. The development of the Nutrient Criteria took into account the current nutritional status of existing products in Brunei Darussalam.

Singapore Healthier Choice Symbol	Food products general labelling for the use of the new Healthy Choice Symbol. Nutrition labelling was intended to provide point of sale information to assist manufactures make informed choices. This was also to assist manufactures, distributors, retailers other users in the labeling of food products.	82 foods categories	Excluding infant formula. (Guidelines do not apply to infant formula or any other food products for persons one year of age and below).	Desserts group was newly introduced into classification. The follow food groups are also new in Singapore food classification: 58. Asian Sweet sauce e.g. rojak sauce, plum sauce, yusheng sauce, sweet & sour sauce, coffee sauce, lemon sauce, satay sauce, etc. 61. Sweetened syrups - e.g. sugar syrup for cooking. 64. Asian Savoury sauce e.g. black pepper sauce, black bean sauce, belacan or sambal, kung bo sauce, XO sauce, etc. 76. Local Soup Desserts (Clear soup desserts, e.g. cheng tng, green bean soup, tau suan, red bean soup, etc.), Soup desserts containing cream e.g. black sesame paste, almond paste, walnut paste, pulut hitam, bobo chacha, chendol, etc. 79. Local and seasonal cakes e.g. nian gao, mooncakes, pineapple tarts, nonya kueh, tapioca kueh, etc.
Malaysia healthier choice logo	Nutritional guidelines on nutrient criteria for healthier choices logo.	46 food categories	Excludes infant formula, all special purposes food, any milk products that targeted to specific group, and fresh food products.	Some food groups have no many subgroups HCL Products shall not be labelled or promoted in any way that will promote the products under the scope of code of ethics for the marketing of the infant foods & related products directly or indirectly.
Zambia Good Food Logo-Criteria	Good Food Logo were developed product group specific in order to take into account the national variation of different food products.	32 food categories	Products containing >0.5% alcohol; Food supplements; Products for use under medical supervision; Foods for children under the age of one year.	The categorization was done solely for the development of the criteria taking into account the similarities of nutrient content as well as the positioning of products in the retail stores and consumer perceptions. The product categorization, thus, does not compete with and shall not be used as food categories in nutrition education materials.
New Zealand classification of food and beverages for year 1-13	To support healthy eating environments of early childhood education services and schools. To Make healthy foods and drinks readily available within the school environment in order to encourage students to make healthy choices and making a significantly contribution to improved nutrition in children and young people.	34 food categories	Foods include many biscuits, cakes, desserts, potato crisps (chippies), pastries, pies, lollies, chocolate and fizzy drinks.	The advice on how to select foods and drinks were based on three categories identified: – everyday foods – sometimes foods – occasional foods
Croatia Healthy Living_Food Criteria	The "Healthy living" programme consists of five components: health education, health and physical activity, health and nutrition, health and the workplace and health and the environment. (FOP is part of it).	48 food categories	Foodstuffs that contain sweeteners	"Healthy living." The goals of the programme are to inform, raise awareness and provide supporting environments to Croatian citizens of all ages as well as to vulnerable groups for adequate physical, mental and reproductive health in order to ensure healthier lifestyles for all. Therefore, the food criteria were elaborated and classified into groups in order to improve healthy eating.

Belgium food product criteria	To develop product criteria for Belgium. This, in turn, provides industry with the necessary encouragement to develop or reformulate products.	32 food categories	<ul style="list-style-type: none"> 1.products containing > 0.5% alcohol 2.food supplements 3.products for use under medical supervision 4.foods specifically for young children, including infant formula and follow-on formula 5.products carrying a claim that is not approved by an EU appointed organization 	Basic product groups have been defined according to product group classifications that are used in more than 20 countries. The products found within basic product groups contribute significantly to the daily intakes of essential nutrients. However, food products from non-basic product groups generally do not contribute substantially to the intake of essential nutrients but provide a great innovation potential. The criteria do not take the presence of allergens into account.
Dutch product criteria	Description of the criteria for a food choice logo	30 food categories	<ul style="list-style-type: none"> 1.products containing > 0.5% alcohol; 2.food supplements; 3.products for use under medical supervision; 4.foods and milk substitutes for children under a year old; 5.products carrying a claim which is not authorized by the for this case assigned European organization. 	The Dutch Choices logo deviates food into two groups: basic foods (logo with green circle), which contribute significantly to the daily intake of essential nutrients, and non-basic foods (logo with blue circle) that do not. Only products that meet all the criteria for a product group, can obtain the logo.
WHO European region	To take “decisive action to reduce food marketing pressure to children with regard to foods high in energy, saturated fats, trans fatty acids, free sugars or salt” and to develop and implement common policy approaches that promote, among other things, the use of common nutrient profiling tools.	17 food categories	<ul style="list-style-type: none"> 1.In category 1: Chocolate flavored breakfast cereals; cakes and pastries; biscuits and other baked goods covered in chocolate 2.In category 2: Bread and bread products 3.In category 4c: Cream 4.In category 4d:100% fruit and vegetable juices; milk drinks 5.In category 7: Milks and sweetened milks; almond, rice and oat milks 6.In category 11: Sweet biscuits; pastries; cakes 7.In category 12: Filled pasta and pasta in sauce 8.In category 14: Pepperoni pizza 9.In category 15: Tinned fruits, vegetables and legumes; fruit in syrup; dried fruit; frozen fruit with added sugar 10.In Category 16: Fruit juice 11. This nutrient profile model applies to products for children above 36 months. Follow-up formulas and growing-up milks are not covered by this model. 	The in-country pilot testing involved countries applying the proposed model to a nationally generated list of between 100 and 200 foods that are either: (i) frequently marketed to children, or (ii) commonly consumed (ideally a combination of both). There were some significant differences in the nutritional quality of frequently advertised and commonly consumed foods that countries reported, indicating that the marketing environment varies across the Region.
WHO Eastern Mediterranean Region	This model is designed for use by governments for the purposes of restricting food marketing to children.	18 food categories	<ul style="list-style-type: none"> 1.In category 1: Chocolate- flavored breakfast cereals; cakes and pastries; biscuits and other baked goods covered in chocolate. 2.In category 3c: Cream 	In response to region-specific dietary culture and cuisine, several changes were made to the European model when formulating the model for the Region. Traditional/regional/local consumption patterns of some products such as bread, fish and yoghurt products differ from the European Region, with higher levels of consumption of these items. In the regional model,

			<p>3.In category 3e: 100% fruit and vegetable juices; Milk drinks</p> <p>4.In category 6: Bread and bread products</p> <p>5.In category 7: Milks and sweetened milks; almond, rice, and oat milks</p> <p>6.In category 11: Sweet biscuits; pastries; cakes</p> <p>7.In category 12: Filled pasta and pasta in sauce; flour and ground grains</p> <p>8.In category 14: Pepperoni pizza</p> <p>9.In category 16: Tinned fruits, vegetables and legumes; fruit in syrup; dried fruit; frozen fruit with added sugar</p> <p>10.In category 17: Fruit juice</p> <p>11.Follow-up formulas and growing up milks are not covered by this model.</p>	<p>processed meat, poultry and similar products became a category for which marketing was not permitted, and a new category Processed fish was created, which retained the European model permissible salt levels of 1.7 g per 100g. There is no agreement on a definition of energy drinks. However, such a category of drinks includes a variety of non-alcoholic beverages. While caffeine is considered the main ingredient, a number of other substances are often present.</p>
WHO South-East Asia Region	<p>The primary purpose of this model is to help classify foods to implement the set of recommendations on marketing of food and non- alcoholic beverages to children.</p>	18 food categories	<p>Food products that do not pass Codex Alimentarius's standard on uses of food additives.</p> <p>Food products that contain >1% of total energy in the form of industrially produced trans-fatty acid or 0.5 g of trans fat per serving (1% of energy = 20 kcal = 2.2g trans-fat).</p> <p>Food products that contains > 0.5% of total energy in the form of alcohol.</p> <p>Food products with added with non-sugar sweetener</p> <p>Subject to the exclusionary criteria, if a product falls under a protected geographical or quality designation regime (e.g. traditional medication), then marketing may be permitted; if a product is a traditional item associated with a celebratory event, then marketing may be permitted within a reasonable period prior to the event.</p>	<p>Some components of the SEAR model were adapted from the model developed by WHO WPRO, which was developed from the WHO EURO model. Two categories of fresh foods, i.e. fresh and frozen vegetables and animal products have been included in the model to encourage the consumption of fresh foods over other products (e.g. lean animal products rather than animal parts such as pork rind and belly). The model is designed to measure the nutritional quality of the food regardless of the quantity consumed. These guidelines and goals are aimed at guiding overall daily food intake rather than individual food consumption.</p>

WHO African Region	<p>The primary purpose of the model is to implement the WHO recommendations on marketing of foods and non-alcoholic beverages to children by identifying unhealthy foods that should be subject to marketing restriction.</p>	<p>18 food categories</p>	<p>The nutrient profile model does not deal with special foods or supplements recommended for people with specific disease conditions. Foods and beverages for special uses, food supplements, dietetic formulations, alcoholic drinks, and breast milk substitutes, including so-called follow-up formula and growing-up milks are not included in this model (because they are subject to regulation by other standards). Food products that contain >1% of total energy in the form of industrially produced trans-fatty acid (1% of energy = 20 kcal = 2.2 g trans-fat). Food products with non-sugar sweeteners.</p>	<p>The South East Asia Region (SEAR) model was selected as the most suited and was adapted to the context of the African Region. The target population group for application of this model includes children and adolescents, aged 2 to 19 years (based on the WHO definition). The range excludes the first 1 000 days which are covered by the International Code of Marketing of Breast-milk Substitutes and other strategy documents. The 18 food categories are the same as those in the SEAR model, which were aligned with the food category systems used by Codex Alimentarius to set standards for food additives. Traditional food items consumed during cultural or religious festivities may be marketed for a determined period around the festive season. Marketing of pre-packaged or restaurant quick-service/take-away combo meals should be restricted if any of the menu items contains a nutrient or nutrients that exceed related thresholds.</p>
WHO Western Pacific Region	<p>This regional nutrient profile model was developed by the WHO Regional Office for the Western Pacific in collaboration with Member States to support the efforts of countries in protecting children from marketing of unhealthy foods and non-alcoholic beverages and implementing the recommendations. Specifically, the model can help countries identify foods for which marketing to children should be prohibited. This Nutrient profiling was developed as a tool to categorize foods, not diets, but can be used through policy to improve the overall nutritional quality of diets.</p>	<p>18 food categories</p>	<p>1. In category 1. Chocolate-flavored breakfast cereals, cakes and pastries, biscuits and other baked goods covered in chocolate, Chinese jelly. 2. In category 4a. Powdered juices 3. In category 4c. Unsweetened herbal tea 4. In category 4 d. 100% fruit and vegetable juices, milk drinks. 5. In category 7. Milks and sweetened milks 6. In category 11. Buttered toasted bread 7. In category 12. Filled pasta and pasta in sauce, instant noodles 8. In category 14. Pepperoni pizza, curry chicken 9. In category 16. Fruit juice 10. In category 17. Soya sauce, oils from soya, fresh soya beans According to the model, marketing to children for three categories should be prohibited, meaning that no nutrient criteria are required. These three categories include: Category 1. Chocolate and sugar confectionery, energy bars, and sweet toppings and desserts. Category 2. cakes, sweet biscuits and pastries, and other sweet bakery products and dry mixes for making such. Category 4c. energy drinks, tea and coffee.</p>	<p>The regional model maintained all 17 categories from the European nutrient model and added a new food category for “products made from soya” (e.g. tofu products, natto and tempeh). Unsweetened fresh coconut juice was included in Category 4a, as a common region-specific beverage. While processed, packaged coconut juices often contain more than 5g total sugars per 100g juice, unsweetened fresh coconut juice typically contains less.</p>

			The following two exclusion criteria are applied in the model: marketing is prohibited if a product contains >1% of total energy in the form of industrially produced trans-fatty acids or if the product contains $\geq 0.5\%$ of total energy in the form of alcohol.	
School Food and Beverages Ontario	The Ontario Ministry of Education is committed to making schools healthier places for students. The nutrition standards apply to all food and beverages sold in all venues in order to increase the consumer awareness.	31 food categories	Excluded food products were not specified but rather they classified food products into food for sale, food to eat, and food not permitted for sale.	Food is divided into six groups (the first four food groups are from Canada's Food Guide): <ul style="list-style-type: none"> •Vegetables and Fruit •Grain Products •Milk and Alternatives •Meat and Alternatives •Mixed Dishes •Miscellaneous Items Nutrition Standards for Beverages Beverages are divided into two groups: <ul style="list-style-type: none"> •Elementary Schools •Secondary Schools
Manitoba School Nutrition (Food and Beverages Groups)	The Manitoba School Nutrition has been developed to help school communities to: Promote healthy eating, consistent with what is taught in the school curriculum, Make the healthy choice the easy choice, and Support students in establishing healthy eating habits for a lifetime.	Apply to all foods and drinks, but the food and beverages were classified into categories based on 4 criteria: Served most often, served sometimes, served rarely, snacks from that foods that are better choices.	Not specified	These guidelines apply to foods that may be sold in, or provided by, schools in Manitoba. They are not intended to evaluate the food students bring into schools, although the nutrition information may be helpful to parents and communities.
EU Pledge	To change food and beverage advertising to children under the age of twelve on TV, print and internet in the European Union.	9 food categories, 16 sub-categories	The EU Pledge Nutrition Working Group agreed that the following product categories should therefore be treated as outside the scope of the EU Pledge Nutrition Criteria: <ul style="list-style-type: none"> - Bouillon/stock cubes - Herbs and spices - Coffee and tea (excluding coffee and tea-based drinks, which fall under the Beverages category) No nutrition criteria were developed for the following categories that are not advertised to	These criteria also make a tangible difference in practice: for many of the companies that used individual nutrition criteria, the common criteria meant that significantly fewer products became eligible for advertising to children under twelve.

			<p>children under 12 by EU Pledge member companies:</p> <ul style="list-style-type: none"> • Sugar and sugar-based products, which include: <ul style="list-style-type: none"> o Chocolate or chocolate products o Jam or marmalade o Non-chocolate confectionery or other sugar product o Sugar, honey or syrup • Soft drinks 	
Czech Republic Product Classification	<p>The criteria call for the development of new products and the reformulation of the composition of existing products on the market in order to improve their nutritional value.</p>	<p>Two product groups: Main product groups (23 food categories) and other product groups (9 food categories)</p>	<ol style="list-style-type: none"> 1. products containing more than 0,5% alcohol; 2. food supplements; 3. foods for special medical purposes; 4. foods for children under one year of age 	<p>The new revised criteria are simplified and at the same time tighten selected requirements that products must meet in order to know the logo I know what to Eat. The new revised criteria of the I Know What I Eat and Drink Initiative come into force. The criteria were compiled by the National Scientific Committee established by the non-profit organization I know what I eat and drink.</p> <p>The criteria are based on similar criteria approved by the International Scientific Committee of Choices International, an independent group of international experts in the field of nutrition, food technology and consumer behavior.</p> <p>Logo, I know what I eat and drink indicates the foods have</p> <ul style="list-style-type: none"> o Limited content of some nutrients (saturated fatty acids, trans fatty acids, salt, added sugar) o Guaranteed content of healthy nutrients (fiber) o Limited energy intake. <p>The aim of the initiative is not to divide products into healthy and unhealthy. Healthy and unhealthy foods do not even exist, everything is a question of the amount consumed and the proportion in the overall diet. However, if the consumption of products that meet the criteria I know what I eat predominates, the composition of the diet approaches the nutritional recommendations of professional societies.</p>

3.3. Data analysis

To summarize this qualitative data, for the final analysis, we kept 19 food product classifications for comparison purpose. The eligible food product classifications were grouped into five groups based on the following purposes: reformulation, marketing to children, FOP logo, consumer education, and taxation measures. However, there was not food product classification fitted with taxation measures, therefore the food product classifications fitted into those four groups were documented as qualified classifications for analysis (**Table 3**). Each classification was investigate based on the food product groups it covers. The number of food product categories were counted for the sake of comparison with Choices. Moreover, the analysis was also defined included vs. excluded food product groups of each food product classification. Thus, for both food product classifications, the number of food categories, included and excluded was differ. Besides, to understand the ease of applying the food product classification, we explored the characteristics of each food product classification. Likewise, we compared all eligible food product classifications with Choices which was considered as reference.

After analyzing each food product classification, we came up with recommendations to Choices, those recommendations were concerning to food categories that should be introduced and to adjust the entire classification. Not only new food sub-categories were suggested to be introduced but also some methodology was suggested to be revised based on consumers and reformulation perspectives. We assessed methodology used for each food product classification based on how food items should be allocated into classes i.e. (i) groups must be clearly defined (it should be clear to the coder which food items the group refers to); (ii) groups must be mutually exclusive (if a food item fits in one group, it should not fit into other groups as well); and (iii) groups must be collectively exhaustive (for any possible food item, there should be a suitable food group in the classification).

4.Results

4.1. Characteristics of the food product classifications

4.1.1. Food product classification based on the purposes

Of the 19 food product classifications, were grouped based on their primary purposes, simply 5 purposes were defined i.e. reformulation, marketing to children, FOP logo, consumer education, and taxation measures. However, there was not a food product classification fitted with taxation measures. The Keyhole, Belgium, and Dutch food classifications were found to be in more than one group (**Table 3**). Although there was no classification fitted with the taxation measures, we found that WHO South-Est Asia Region and WHO African Region nutrient profiling models could also be adapted after suitable testing and validation for other purposes, such as defining tax policy to limit consumption of unhealthy foods and developing benchmarks for foods sold in school cafeterias.

Table 3. Grouped food product classifications based on their primary purposes.

SN	Purpose	Food product classification
1	Reformulation	Keyhole, Belgium Product Criteria, and Dutch product criteria, Czech Republic Product Criteria.
2	Marketing to children	WHO European region, WHO Eastern Mediterranean Region, WHO South-Est Asia Region, WHO African Region, and WHO Western Pacific Region, and EU Pledge.
3	FOP Logo	Keyhole, Brunei Healthier Choice Logo, Singapore Healthy Choice Symbol, Malaysia Healthy Choice Logo, Zambia Good Food Logo, Croatia Healthy Living, Dutch product criteria, and Belgium Product Criteria, Czech Republic Food Product Criteria.
4	Consumer education	Keyhole, Australia Healthy Choices, New Zealand classification of food and beverages for year 1-13, Croatia Healthy Living, School Food and Beverages Ontario, and Manitoba School Nutrition (Food and Beverages Groups).
5	Taxation measures	N/A

Table 4. Summary table of food product classifications

SN	Groups based on purpose	Food classification	Number of food categories	Basic and Non-basic food products	Target audience	Processed food products
1	Reformulation	Keyhole	33	Not separated	All healthy people	Processed and non-processed foods were defined in some categories
		Belgium	32	Two separate groups	All healthy people	Processed and non-processed food products are separated in some food sub-categories
		Dutch	30	Two separate groups	All healthy people	Processed and non-processed food products are separated in some food sub-categories
		Czech Republic	32	Two separate groups	All healthy people	Processed and non-processed food products are separated in some food sub-categories
2	Marketing to children	WHO European Region	17	Not separated	Children	Processed food products were defined in the categories of meat, poultry, fish and fish products, and fruit and vegetables
		WHO Eastern Mediterranean Region	18	Not separated	Children	Processed food products were defined in the categories of meat, poultry, fish and fish products, and fruit and vegetables
		WHO South-East Asia Region	18	Not separated	Children	Processed food products were defined in the categories of meat, poultry, fish and fish products, fruit and vegetables, and ready to eat savories
		WHO African Region	18	Not separated	Children and Adolescents (aged 2 to 19 years old)	Processed food products were defined in the categories of meat, poultry, fish and fish products, fruit and vegetables, and ready to eat savories
		WHO Western Pacific Region	18	Not separated	Children	Processed food products were defined in the categories of meat, poultry, fish and fish products, and fruit and vegetables
		EU Pledge	16	Not separated	Under 12 years old	Processed foods were defined in Dairy products category
3	FOP logo	Brunei	66	Not separated	All healthy people	The processed food products were defined only for meat and poultry, and seafood categories.
		Singapore	82	Not separated	All health people	The processed food products were defined only for meat and poultry, and seafood categories.
		Malaysia	46	Not separated	All healthy people	Processed and non-processed foods were defined in some categories
		Zambia	32	Two separate groups	All healthy people	Processed and non-processed food products are separated in some food sub-categories
		Croatia	47	Not separated	All healthy people	Processed and non-processed foods were defined in some categories
4	Consumer education	Australia	161	Not separated	All healthy people	processed food products were not defined
		New Zealand	34	Not separated	1-13 years old children	Processed food products were defined in some categories
		Ontario	31	Not separated	School children	processed food products were not defined
		Manitoba	5 main categories	Not separated	K to 12 schools' children (from Kindergarten to Senior High School)	processed food products were not defined

NB: Keyhole, Belgium, Dutch, Czech Republic and Croatia food classification, were found to be in more than one group based on their purposes, therefore, they were summarized once in **table 4**.

4.1.2. Food product classifications with similar characteristics

The main characteristics of food product classifications were defined based on the number of food categories included and excluded, classification method, how food items were defined into categories, target group, and the type of foods applies for (e.g. all food and beverages, packaged and non-packaged foods, etc.).

4.1.2.1. Singapore and Brunei Darussalam food product classifications

Singapore Healthy Choice Symbol and Brunei Nutrient criteria share the same characteristics, since the Brunei Nutrient Criteria was adapted with permission from Singapore's Health Promotion Board Healthier Choice Symbol Nutrient Guidelines. These classifications are too much detailed, and the excluded food products for both were the same i.e. infant formula and any other food products for persons one year of age and below. Additionally, those food product classifications they did not classified foods into basic and non-basic food product groups but rather they classified them in detail with many food categories. The processed food products were defined only for meat and poultry, and seafood categories. However, the only difference between Singapore and Brunei food product classifications was the number of food categories i.e. 82 vs.66 food categories, respectively; and the desserts group which was newly introduced into Singapore food product classification. Those food product classifications apply to all healthy people.

4.1.2.2. Choices, Zambia, Belgium, and Dutch, and Czech Republic food product classifications

The Choices, Zambia Good Food Logo Criteria, Belgium food product criteria, Dutch food product criteria, and Czech Republic food product classifications have a quite similar number of food categories, 31, 32, 32, 30, and 32, respectively. The excluded food products for both classifications are the same (Product containing >0.5% alcohol, food supplements, product for use under medical supervision, and foods for children under a year old). Additionally, Belgium and Dutch food product classifications also excluded products carrying a claim that is not approved by an EU appointed organization. The rice was defined as a category for Zambia, Dutch, Belgium and Czech Republic classifications, whereas, for Choices, rice was classified in the grain category. For the Zambia Good Food Logo, the product categorization does not compete with and shall not be used as food categories in nutrition education materials. The classification method for both food product classifications is the same, food items were classified into 2 main groups i.e. Food products were classified into basic and non-basic food product groups based on the significant daily nutrient intake they contribute to. Furthermore, the food categories are not detailed, and processed and non-processed food products are separated in some food sub-categories for both classifications. Besides, those food product classifications are not able to control the new food products which continuously introduced onto the food market. Both food product classifications are applicable to all healthy people.

4.1.2.3. WHO ER, WHO SEAR, WHO EMR, WHO AR, WHO WPR, and EP. Food product classifications

The 5 WHO Nutrient Profiling Models (WHO NPM) and EU Pledge (EP) have many similarities and few differences in their food product classifications. The number of food categories are the same (18 food categories) for WHO SEAR, WHO EMR, WHO AR, and WHO WPR, except WHO ER, and EP, which have 17 vs. 16 food categories, respectively. The list of foods used in classifications was between 100 and 200 foods that are either: (i) frequently marketed to children, or (ii) commonly consumed (ideally a combination of both).

However, EP classified foods based on the criteria defined by the leading companies to change food and beverages advertising to children under the age of twelve on TV, print and internet in the European Union. There is no agreement on a definition of energy drinks for WHO ER NPM, but for other WHO NPM and EP the energy drinks were not mentioned into their food categories. Those WHO NPM and EP are category-specific, it has been shown that category-based approach was able to take into account the role that different types of food and beverages products play in the average diet. It also works better to discriminate between food products within categories. The exception was PAHO NPM which was excluded in this study due to lack of food product categories. Follow-up formulas and growing-up milk (GUM) were not covered by WHO ER, WHO EMR, and WHO AR NPM. Those food products were not covered due to the fact that, for instance GUM should not be promoted as a necessity in the nutrition of young children since GUM should be composed to decrease the overall protein intake which tends to be higher than the reference values for children especially aged between 1-3 years old.

WHO NPM were developed and adapted from one each other, except EP which was a voluntary initiative by leading companies to change the food and beverage advertising to children under the age of twelve on TV, print, and internet in the European Union. The draft of the WHO EMR model was created based on the model which has been developed by the WHO Regional office Europe. Likewise, some components of the WHO SEAR model were adapted from the model adopted by WHO WPR, which was developed from the WHO ER model. In addition, the justification for the thresholds was based on principles used in the PAHO NPM, i.e. the population Nutrient intake Goals. The WHO SEAR model was selected as the most suited and was adapted to the context of the WHO AR model. The WP NPM was developed by the WHO Regional Office in collaboration with member states. The final model consists of a total of 18 food categories, the regional model maintained all 17 categories from the European nutrient model and added a new food category for "products made from soya". Therefore, new food categories were introduced into classification of those models in response to region-specific dietary culture and cuisine accordingly: WHO EMR: Processed fish was created as a new category. WHO AR: Fresh and frozen vegetables and animal products have been included in the model in order to encourage the consumption of fresh foods. WHO WPR: They added a new food category for "products made from soya" (e.g. tofu products, natto, and tempeh). Additionally, unsweetened fresh coconut juice was also included in Category 4a, as a common region-specific beverage. WHO SEAR: Two categories of fresh foods, i.e. fresh and frozen vegetables and animal products have been included in the model.

Potatoes were classified in fruit and vegetable category due to the fact that potatoes are starchy root vegetables that are rich in fiber, vitamins, and minerals, they also high in antioxidant (e.g. Orange Sweet Potatoes).

We found that for both WHO NPM and EP, some basic and non-basic food products were excluded into classification (**Appendix 2**). Furthermore, WHO SEAR excluded food products if a product falls under a protected geographical or quality designation regime (e.g. traditional medication). Similarly, marketing was not allowed for food products that do not pass Codex Alimentarius's standard on uses of food additives. However, traditional food items consumed during cultural or religious festivities may be marketed for a determined period around the festive season. The study revealed that processed food products were defined in the categories of meat, poultry, fish and fish products, and fruit and vegetables.

Additionally, processed foods that fail to meet the criteria permitting their advertising to children might benefit from reformulation, enabling the manufacturer to continue to advertise them. The primary purpose of both models was to implement recommendations on the marketing of food and non- alcoholic beverages to children. However, these nutrient profiling models could also be adapted after suitable testing and validation for other purposes, such as defining tax policy to limit the consumption of unhealthy foods and developing benchmarks for foods sold in school cafeterias. Likewise, EP the criteria also make a tangible difference in practice i.e. for many of the companies that used individual nutrition criteria, the common criteria meant that significantly fewer products became eligible for advertising to children under twelve. The common nutrition criteria are based on a set of "nutrients to limit" and "components to encourage" (nutrients and food groups). The target population for both WHO NPM and EP were children but some of them, specified age group, i.e. the target group for EP are children aged under 12 years old, but WHO AR the target population group for application of this model includes children and adolescents, aged 2 to 19 years. However, the range excludes the first 1 000 days which are covered by the International Code of Marketing of Breast-milk Substitutes.

Apart from WHO NPM and EP, which have the primary purpose of taking decisive action to reduce food marketing pressure to children with regard to foods high in energy, saturated fats, trans-fatty acids, free sugars or salt; we also found that in response to the high levels of junk-food advertising targeting kids, some countries are taking the issue into their own hands by restricting broadcast advertising and other marketing attempts. Eight countries that have taken steps to limit the harmful impact of junk-food marketing were highlighted i.e. Canada, Chile, France, Ireland, Mexico, Norway, Taiwan, and the United Kingdom. Those countries did not classify food into categories as WHO NPM or EP did but rather they defined that foods exceeding set fat, sodium, and sugar content should not be advertised to children.

4.1.2.4. Keyhole, Malaysia, and Croatia Food product classifications

The Number of food categories for both Malaysia and Croatia food product classifications was quite similar, 46 vs.47, respectively. However, the Keyhole has a smaller number of food categories (33) compared to Malaysia and Croatia food product classifications.

The Keyhole excluded soft drinks, sweets and cakes, and foodstuffs intended for children up to the age of 36 months as well as the foodstuffs contained sweeteners (food additives), approved novel foodstuffs or foodstuff ingredients with sweetening properties, and phytosterols, phytosterol esters, phytosterols, and phytosterol esters. Similarly, Croatia food product classification also excluded the foodstuffs that contain sweeteners. Surprisingly, we found that Malaysia's food classification did not include fresh food products due to the fact that the classification was intended for the reduction of the fats content in food products. Not only fresh food products excluded from classification but also infant formula, all special purposes food, and any milk products that targeted specific groups were excluded. Both food product classifications did not define food items into basic and non-basic food product groups, instead they classified food items into categories accordingly. The Malaysia and Croatia food product classifications did not classify potatoes in any form either processed or non-processed, while the Keyhole food classification has classified potatoes in the fruit and vegetable category. Both food product classifications have defined processed and non-processed foods in some categories. The Keyhole is applicable to packaging and marketing materials (unpackaged). Those food product classifications are applicable to all healthy people.

4.1.2.5. Australia, New Zealand, Ontario, and Manitoba Food product classifications

It has been shown that Australia food product classification is a leading classification in terms of having many food categories (161) compared to other eligible food product classifications. Australia has multiple food product classifications: Traffic light classification system i.e. Green, Amber or Red; Classifying foods using nutrient information; Classification of foods and drinks using ingredient lists and recipes, and common foods and drinks classification. Moreover, common foods and drinks classification which have been chosen to be used in this study, its classification is based on the food you have to consume, foods to choose carefully, and food to limit. The Ontario school food and beverages classification has 31 food categories that were classified based on how food and beverages should be sold regarding the nutrients content, i.e. sell most, sell less, and not permitted for sale. In contrast, Manitoba School Nutrition did classify all food products into the main 5 food groups i.e. Grain products, Fruit and Vegetables, Milk Products, Meat and alternatives, and beverages. Additionally, the food items in food groups were categorized based on 4 criteria regarding the nutrients content: Served most often, served sometimes, served rarely, snacks from those foods that are better choices. The New Zealand food product classification has 34 food categories that were defined based on how they should be consumed regarding the nutrients content: Everyday, Sometimes, and Occasional.

The Australia, Ontario, and Manitoba food product classifications apply to all foods and drinks, whether freshly made on the premises or supplied pre-packaged. The New Zealand food product classification has excluded foods include many biscuits, cakes, desserts, potato crisps (chippies), pastries, pies, lollies, chocolate, and fizzy drinks. Both food product classifications have classified foods regardless whether the food item should be categorized in basic or non-basic groups, but rather they classified them based on the nutrient information against the nutrient criteria (Nutrient defined based on n (mg, g, or kj) per 100g, n (mg, g, or kj) per serve as sold i.e. Per product/packet, and portion size)).

Furthermore, processed and non-processed food products were not defined into classifications, except for New Zealand food product classification. The potatoes have classified in the category of fruit and vegetables for both food product classifications. The target group for Australia, New Zealand, Ontario, and Manitoba food product classifications is all people, 1-13 years old children, school children, K to 12 schools' children (from Kindergarten to Senior High School), respectively.

5. Discussion

5.1. Discussion of the findings

We found that, a variety of food product classification have been developed, each with different objectives. All food product classifications are designed for a specific purpose, which is both a strength and weakness. A classification system is designed not only for a given purpose, but also with particular level (food vs. ingredient) on which the foods are classified. Whereas most national classification systems are based on intake level (foods as consumed), some international systems are based on ingredient level and others on product level (Akhandaf et al., 2015).

The 19 food product classifications took the different approaches to the classification of foods but ultimately defined some major categories of products as unprocessed or processed in fairly similar proportions and a fairly similar way (e.g. Food product classifications based on international criteria). Accordingly, while research findings based on the purpose (reformulation, marketing to children, FOP Logo, consumer education, and taxation measures) of food product classifications grouped are likely to fit in 4 groups except taxation measures which had no classification fitted with this purpose. Preliminary evidence from existing taxes of food and beverages suggests that these have been effective in reducing purchases, but long run impact on consumption and population health is yet to be evaluated. The food industry remains firm that taxes are unnecessary and numerous companies have pledged to compromise with voluntarily agreement such as restricting food marketing to children, reformulating products, modifying food labels and promoting healthy eating guidelines. Many policies shown that taxes on unhealthy foods and beverages alone will not solve nutrition-related health problems. However, if well designed and communicated, in combination with other relevant policy measures, taxes can contribute to improve population health. Those policies on taxation measures were not defined based on the food categories, but rather were defined based on the rate of consumption of foods and beverages high in fat, sugar, and salt content, associated with heightened risk for obesity and diet related non-communicable diseases (NCDs), as the one of the biggest public health problems many countries are facing (Cornelsen & Carreido, 2015).

The results of the study revealed that WHO Nutrient Profiling Models in 5 regions (Europe, Africa, Eastern Mediterranean, South-Est Asia, and Western Pacific) and EU pledge have the purpose of implementing the WHO recommendations on marketing of foods and non-alcoholic beverages to children by identifying unhealthy foods that should be subject to marketing restriction. Although these models were provided as a tool to classify food and drink products that are in excess of free sugars, salt, total fat, saturated fat and trans-fatty acids, children are continuously exposed and vulnerable to the impacts of unhealthy food environments. The children and adolescents face pervasive and relentless exposure to emotional-based marketing strategies for unhealthy foods, across multiple media i.e. from television to digital media, including settings where they should be especially protected (e.g. schools), as well as retail environments where important decisions about food purchases are made on a daily basis. This undermines children's to healthy food and adequate nutrition, but also infringes on other interrelated rights (UNICEF, 2019).

It has been shown that, one of the reasons for the less than optimal progress in policy development may be the difficulty in overcoming the challenge of classifying foods for which marketing should be restricted, which in turn results from the lack of an appropriate nutrient profiling model or other means of classifying foods (World Health Organization, 2015).

The prevailing pattern of food and beverage products marketed to children has been high in total calories, sugar, salt, fat, and low in nutrients (McGinnis et al., 2006). The study shown that in response to region-specific dietary culture and cuisine, new food categories were created for some WHO NPM. The WHO EMR: Processed fish was created as a new category. The WHO AR: Fresh and frozen vegetables and animal products have been included in the model in order to encourage the consumption of fresh foods. The WHO WPR: They added a new food category for "products made from soya" (e.g. tofu products, natto, and tempeh). This was aimed to facilitate the consumers dietary choices according to the region based on their culture, cuisine, and economic environmental influences (McGinnis et al., 2006). Similarly, traditional food items consumed during cultural or religions festivities may be marketed for a determined period around the festive season. Therefore, subject to the excluded criteria, if product falls under a protect geographical or quality designation regime (e.g. traditional medication), then marketing maybe permitted; if a product is a traditional item associated with a celebratory event, then marketing may be permitted within a reasonable period prior to the event. For the traditional and celebratory foods, explanatory notes would be further elaborated to include the information on inclusion and exclusion criteria in the case of traditional herbal products used for medical purposes, and celebratory products pertaining to cultural events (World Health Organization, 2016).

The Models are designed for application to the nutritional quality of foods regardless of the quantities consumed. Additionally, food classification targeting consumers, a per serving approach introduces several difficulties, including the fact that serving sizes and consumption patterns are an individual matter and cannot be standardized, especially across different age groups. Therefore, the nutrient thresholds are calculated per 100 g or ml of product, irrespective of the amount of product consumed (WHO, 2017). The basic and non-basic food products were excluded into classification of WHO NPM, due to the fact that, the NPM were not intended to the healthy food products, instead they defined foods exceeding set fat, sodium, and sugar content that should not be advertised to children. Marketing is also not allowed for the food products that do not pass Codex Alimentarius's standard on uses of food additives. This should be done in terms of food labelling as the primary means of communication between the producer and seller on one hand, and purchaser and consumer of the other. Furthermore, to the general recommendations, the Codex committee on food labelling also provided guidance for the certain claims commonly found in the market in order to provide clear information to the consumers (Codex Alimentarius, 1999).

WHO NPM and EP have classified food and beverages into categories and were targeted to children. In contrast, PAHO Nutrient Prefiling model has not food categories and the target group was general population. Since the plan of action mandates that PAHO provide evidence-based information for the development of fiscal and other types of policies and regulation to prevent the consumption of unhealthy foods, including front-of-package (FOP) labeling and regional nutrition guidelines for school food environment (feeding programs and food and beverages sold in schools) (Pan American Health Organization, 2016).

In addition, the PAHO NPM is limited to processed and ultra-processed food and drink with high energy content and poor nutritional value. The PAHO was developed based on all of updated evidence, including the WHO Population Nutrient Intake Goals (PNIG) to prevent obesity and related NCDs and the WHO guidelines on sugar and other nutrients (EFAD, 2018).

we also found that in response to the high levels of junk-food advertising targeting kids, some countries are taking the issue into their own hands by restricting broadcast advertising and other marketing attempts. Eight countries that have taken steps to limit the harmful impact of junk-food marketing were highlighted i.e. Canada, Chile, France, Ireland, Mexico, Norway, Taiwan, and the United Kingdom. Those countries did not classify food into categories as WHO NPM or EP did, but rather they defined that foods exceeding set fat, sodium, and sugar content should not be advertised to children. This was due to the fact that, globally, children are exposed to a large volume of television advertisements for unhealthy foods and beverages, despite the implementation of food industry programmes. Therefore, governments should enact regulation to protect children from television advertising of unhealthy products that undermine their health (Kelly et al., 2019).

Accordingly, while other findings on food product classification based on purposes shown that several classifications were intended to the reformulation and FOP Logo (The Keyhole, Belgium Product Criteria, and Dutch product criteria, Czech Republic Product Criteria, Brunei Healthier Choice Logo, Singapore Healthy Choice Symbol, Malaysia Healthy Choice Logo, Zambia Good Food Logo, and Croatia Healthy Living). Obviously, reformulation is perceived by some as a tool to improve public health by making significant reduction in intake of free sugars by consumers. In addition, others acknowledged the need to promote healthy eating behavior, portion control, clarity in food labelling, addressing food/nutrition insecurity, educational and generating awareness as long-term strategies to achieve for instance weight loss (Raikos V. & Ranawana V., 2019). Likewise, in many cases food manufactures and food service operates already have commitments in place to reformulate products towards healthier nutritional profiles. For instance, the 10 largest global food and drink companies have sugar reduction policies and programs. Furthermore, the recent introduction of the voluntarily front-of-pack nutrition labelling scheme in Australia and New Zealand, the Health Star Rating (HSR) system, has been found to influence nutritional profiles of food products (Healthy Food Partnership Reformulation Program, 2019). The study shown that, some food product classifications take front of pack (FOP) into account. The front-of-pack nutrition labelling (FOPL) has been identified as potentially effective policy tool to help promote positive food environments and support consumers in making better and informed food choices through the presentation of nutritional information. In addition, the FOPL has been recognized as a cost effective policy to address the growth of obesity prevalence as well as other NCDs (World Obesity Federation, 2020).

The results of our study regarding to the grouping of classifications based on their purpose shown that some of them such as the Keyhole, Australia Healthy Choices, New Zealand classification of food and beverages for year 1-13, Croatia Healthy Living, School Food and Beverages Ontario, and Manitoba School Nutrition (Food and Beverages Groups) were intended to consumer education.

Many nutrition school programs and other policies targeting general population were used as strategy of choice to prevent the problems of undernutrition, vitamin and minerals deficiencies, obesity and diet related chronic diseases increasingly exist side by side across the world. This is regard to the fact that improvements in food production alone do not necessarily translate to improvements in nutrition status. Therefore, to avoid a crushing economic and social burden in the next coming years countries need to educate their people about eating the right foods, not just more or less. The people need to know what constitutes a healthy diet and how make a good food choice as many food product classifications were categorized foods based on the nutrient's contents. The consumer education is also demonstrably capable of improving dietary behavior and nutrition status of its own. Moreover, it has long-term effects on the independent actions of parents and through them on the health of their children. At the same time, it is low-cost, practicable and suitable (FAO, 2008). Many schools have developed nutrition policy and food classification system as a healthy nutrition interventions need to occur early in childhood and adolescence in order to prevent or reverse the adverse health effects of overweight and poor eating habits (World Health Organization, 2006). Manitoba school food and beverages classification were in line with this policy, whereby Energy drinks was defined as unhealthy food product that should be limited in consumption.

We found that different food product classifications share the same characteristics such as number of food categories, food product included and excluded into classification, methodology used for classifying food into groups, target group of people, classify foods in basic and non-basic product groups, foods covered i.e. packaged and non-packaged foods, food and drinks for children, classification of processed and non-processed foods, and where the classification is applicable i.e. schools, national, international, and private.

The Choices, Zambia, Belgium, and Dutch, and Czech Republic food product classifications made distinction between basic and non-basic product groups since they were both product-group-specific nutrient profiling approach. Basic product groups have been defined according to the product group classifications that are used in more than 20 countries. Additionally, the products found within basic product groups contribute significantly to the daily intakes of essential nutrients, while food products from non-basic product groups do not contribute substantially to the intake of essential nutrients but provide a great innovation potential (Choices International Foundation, 2015). The decision framework was used for defining new product groups or new product-group specific criteria based on three questions i.e. a) is there a healthier alternative of a commonly consumed food, within a product group? Or b) is there sufficient stimulation of innovation? Or c) is there alignment with recommendations? Therefore, for consume choices perspectives where they choose within a product group, a new product group rice was derived from grains and cereals products by defining a product-group-specific criterion for fiber (except Choices which classifies rice into grains category). This was due to the fact that rice has different variety such as boiled, dried, unpolished rice, white rice, basmati rice, whole grain rice, and risotto, so that some high fiber rice can comply, therefore, it may facilitate the consumers to choose the healthier option, (Roodenburg et al., 2011). Furthermore, the category of grain and cereals was defined in order to include all types of grains and cereals products other than bread and breakfast cereals. Likewise, Herbs, spices, and rehydrated legumes were classified in fruit and vegetables, except Choices which separated those food items from this category.

In non-basic food product groups, meals were categorized as main course, small meals, and meals mixes, however Choices has classified meals as one single category i.e. main meals. Similar to the desserts soup, bread topping including human-type products which were also classified in non-basic products groups. The food product containing > 0.5% alcohol, food supplements, product for use under medical supervision, and foods for children under a year old were excluded into both classifications due to the fact that those food products are not allowed for the certification (Choices Programme, 2019). Similarly, in comparison with the WHO NPM, they also excluded foods and beverages for special uses, food supplements, dietetic formulations, alcoholic drinks, and breast milk substitutes, including so-called follow-up formula and growing-up milks (GUM). For instance, it has been shown that the GUM should be composed to decrease the overall protein intake which tends to be higher than the reference values for children especially aged between 1-3 years old, therefore GUM should not be promoted as a necessity in nutrition of young children (Przyrembel & Agostoni, 2013).

The Singapore and Brunei Darussalam food product classifications have the same characteristics i.e. Methodology of classification, included and excluded food products. The Brunei food classification was adapted with permission from Singapore's Health Promotion Board Healthier Choice Symbol Nutrient Guidelines. Those classifications have classified foods without distinction between basic and non-basic product groups which may be difficult for reformulation purposes. This classification was intended to provide point of sale information to assist manufactures make informed choices. The study also shown that salad and dressings/mayonnaise were classified in the category of oils, fats and fat containing spreads. However, those food items are missing into Choices food classification, specifically within this category. In addition, they all excluded infant formula or any other food products for persons one year of age and below (Health Promotion Board, 2019). The Brunei and Singapore have defined plant-based meat alternatives as category, this was made in response to the consumer preferences for planted based and cultured meat, and targeting vegetarians as well (Slade, 2018). Regarding to the reformulation purpose, and the consumer interests, it has been shown that, the market for vegetarian foods is one of the fastest growing sectors of the food industry and is currently highly valuable. However, the greatest challenge facing the industry has been to substitute meat with proteinaceous food products which confer the eat characteristics, texture, and flavor of meat (Davies & Lightowler, 1998). Apart from that, a growing awareness in the population about healthy and sustainable foods has led to a rising interest in plant-based alternatives in many European countries and worldwide. Therefore, for the consumer perspectives, the change in eating pattern requires new products that fulfil consumer demands of healthy and tasty products which both replace the function of meat in a dish and contribute a similar high protein nutritional value (Wild et al., 2014).

The Australia food product classification applies to all foods and drinks, whether freshly made on the premises or supplied pre- packaged. The foods products were listed and classified based on the food you have to consumer, food to choose carefully, and food to limit. There is no distinction between processed and non-processes food products. The basic and non-basic food products were classified together. It has multiple classifications: Traffic right classification system i.e. Green, Amber or Red; Classifying foods using nutrient information; Classifying foods and drinks using ingredient lists and recipes; and common foods and drinks classification (Department of Health and Human Services, 2016).

This classification was intended to increase the consumer awareness, but the methodology of how foods were classified into many categories was not suitable for them. Because nutrient profile models designed to promote an achievable healthy diet should be category specific but with a limited number of categories. However, models which use a large number of categories are unhelpful for promoting a healthy diet (Scarborough et al., 2010).

The findings of the study shown that most of the food product classifications have defined processed and non-processed foods into categories for the sake of food and beverages manufactures (i.e. reformulation purpose) and consumer choices. This is the evident in international and national policies and strategies designed to improve population nutrition and health, in the dietary recommendations, and in public policies and actions guided by such recommendations (Carlos A Monteiro, 2012). As the criteria were defined in the classification of processed and non-processed food products, the consumer is encouraged to reduced consumption of critical nutrients commonly in excess in processed foods such as free sugars, sodium and trans-fats, but overlook the sources of these nutrients. The processed food in itself is not issue. One obvious reason is that nowadays, practically all food is processed in some sense and in some way. In contrast, the processes and the ingredients used in the manufacture of processed foods make them highly convenient and highly attractive for consumers, and highly profitable for their manufactures (Carlos Augusto Monteiro et al., 2019).

The Keyhole, Malaysia, and Croatia Food product classifications, they classified foods in details and there is no distinction between basic and non-basic food products groups due to the fact that those classifications they come to consumer communication. Furthermore, the Keyhole and Malaysia food product classifications were also intended to stimulate the industries for product development (The National Food Agency, 2015). However, for Malaysia food product classification, fresh foods were not classified because those foods were not the primary purpose of the classification, but rather, the classification was intended to encourage the reduction of the fat content into food products. The Malaysia classification excluded infant formula, all special purposes food, and any milk products that targeted to specific group. Furthermore, some food item, such as potatoes were not categorized into classification (Loong, 2012). The Keyhole excluded soft drinks, sweets and cakes, and foodstuffs intended for children up to the age of 36 months, and the following ingredients must not be contained in foodstuffs: (1) Sweeteners (food additives), (2) approved novel foodstuffs or foodstuff ingredients with sweetening properties, and (3) phytosterols, phytosterol esters, phytostanols and phytostanol esters. Similarly, the Croatia food classification excluded foodstuffs that contain sweeteners. The food categories of Keyhole, Croatia, and Malaysia (33, 47, and 46, respectively) are more or less similar to the food product classifications based on the international food product criteria (Choices International Foundation, 2016).

The study revealed that, except Classifications based on the international criteria, Croatia, and Malaysia (which did not mentioned potatoes into their classifications) food product classifications, other classifications categorized potatoes into fruit and vegetables.

Classifying potatoes in fruits and vegetables is necessary because sweet potatoes are starchy root vegetables that are rich in fiber, vitamins, and minerals, they also high in antioxidant (e.g. Orange Sweet Potatoes). To be of practical use to nutrition professionals and consumers, subgroup classifications for fruits and vegetables should be based on similarity in food composition and on easily identifiable classification characteristics (Pennington & Fisher, 2010). It has been shown that classifications for fruits and vegetables are most helpful for dietary assessment and guideline if they are based on the composition of these foods. Additionally, it also determined that whether levels of foods components in fruit and vegetables correlated with classification criteria based on the botanic family, color, part of plant, and total antioxidant capacity (TAC). Therefore the potatoes also share the same characteristics with other fruit and vegetables, which allow them to fit into this category (Pennington & Fisher, 2009). The fiber, vitamins, minerals, and phytochemicals provided by potatoes can help ward off diseases and benefit human health (Elsharif et al., 2019). However, sometimes, fruit and vegetables classification presents significant challenges due to interclass similarities and irregular intraclass characteristics (Hameed et al., 2018).

This study has also strength, this was the only study compared many food product classifications across the globe, in different regions, which was aimed to come up with the recommendations to Choices that can be adapted across all regions of the world.

5.2. Challenges and limitations of the study

Difficulty to recommend the introduction of new food product into Choices classification. Because the last food category in non-basic product groups was defined as all other products i.e. all types of food products that do not fall within any of the above-mentioned product groups.

Although, there were exclusion and inclusion criteria, it was so broad in terms of limited time to find out all classifications globally, national, international, NGOs, and compare them, where it is possible to find out more than 10 eligible food product classifications in one region (e.g. Europe).

6. Recommendations to Choices

6.1. Classification of potatoes into fruit and vegetables category

“Classifying potatoes in fruits and vegetables is necessary because potatoes are starchy root vegetables that are rich in fiber, vitamins, and minerals, they also high in antioxidant (e.g. Orange Sweet Potatoes). Additionally, potatoes are rich in vitamin C and potassium and provide the dietary fiber, especially if the skins are consumed, this is also clear evidence of the relationship between potatoes consumption and health, where the potatoes play the same role like fruit and vegetables (J. U. of M. Slavin & Lloyd Beate, 2012). In the classification of vegetables, they also include tubes where the potatoes belong (J. Slavin, 1998). To be practical use to nutrition professionals and consumers, subgroup classifications for fruits and vegetables should be based on similarity in food composition and on easily identifiable classification characteristics. The subgroups include tubers and roots where the potatoes belong based on similar food component such as total antioxidant capacity, vitamins and minerals, and fibers. Therefore, potatoes classified with other fruits and vegetables in the same category (Pennington & Fisher, 2010). Additionally, classification of vegetable by family groups and growth habits, it allows to classify sweet potatoes in subcategory of roots vegetable together with beets, carrots, parsnips, and turnips (Sagers, 2005). The Classification of vegetables based on plant part used which is important for the consumers point of view, potatoes and sweet potatoes were mentioned in the group of tuber vegetables. Similarly, classification of vegetables based on culture, where all vegetables crops requiring similar cultural requirements are grouped together, potatoes and sweet potatoes were classified into tuber vegetables (Punjab, 2017). The evidence was also based on other food product classifications such as the Keyhole, WHO NPM, EP, Singapore, Brunei, Australia, New Zealand, Ontario, and Manitoba which classified potatoes into fruit and vegetables category”.

6.2. To classify plant-based meat alternatives in meat, fish, poultry and eggs group

“Plant-based meat alternatives should be classified as a category, this should be made in response to the consumer preferences for planted based and cultured meat, and targeting vegetarians as well (Slade, 2018). Texturized vegetable proteins can substitute meat products while providing an economical, functional and high-protein food ingredient or can be consumed directly as a meat (Joshi & Kumar, 2015). Additionally, the future initiative lays out three potential pathways to meet the needs of the world’s growing population for protein in sustainable and healthy way: alternative proteins (other than meat), changes to current production systems, and consumer behavior change (World Economic Forum, 2018). For the consumers perspective, the category of meat alternative should be created, based on decision tree as defined by Roodenburg et al. that consists of 3 questions: Is there a healthier alternative of commonly consumed food, within a product group? is there sufficient stimulation of innovation? is there alignment with recommendations? For reformulation purpose, the food producers will take into account the level of sodium and saturated fat content of this food item into account. This is due to the fact that the consumers looking for healthy, low environment impact, ethical, cost-effective, and new food products that are generating renewed interest in meat analogues (Armanious G., 2019).

This recommendation was also supported by the findings of our study where we found that some food product classifications such as Brunei, Singapore, New Zealand, Ontario, and Manitoba have classified meat alternatives as a category”.

6.3. Rice should be classified as category; and Grain category should be defined as Grain and cereals products category.

“For consume choices perspectives where they choose within a product group, a new product group Rice should be derived from Grains and cereals products by defining a product-group-specific criterion for fiber. The rice has different variety such as boiled, dried, unpolished rice, white rice, basmati rice, whole grain rice, and risotto, so that some high fiber rice can comply, therefore, it may facilitate the consumer to choose the healthier option (Roodenburg et al., 2011). As the rice is the one of the most consumed food in the world, it has been shown that, the white rice is the vital food for the large part of the world population, and many different food products are made from different classes of the rice, therefore classifying rice as category is one of the most important factors for the consumers (Golpour et al., 2014). Except Choices, other food product classifications based on international criteria have classified rice as separate category from Grain and cereals products. The Choices has defined Grains category, but this category should be defined as Grain and cereals products, therefore, the category of grain and cereals products should include all types of grains and cereals products other than bread and breakfast cereals (e.g. maize flour, sorghum flour, as cereals or grain products)”.

6.4. Growing-Up Milks should be mentioned in classification and food product excluded based on age range should be adjusted.

“The follow-up formulas (FUF) and growing-up milk (GUM) were not covered with some food product classifications such as WHO NPM. Those food products were not covered due to the fact that for instance GUM should not be promoted as a necessity in the nutrition of young children since GUM should be composed to decrease the overall protein intake which tends to be higher than the reference values for children especially aged between 1-3 years old (Przyrembel & Agostoni, 2013). Additionally, Choices classification defined milk category as all types of milk and milk products from all mammals except humans. Besides, all food product classifications based on international criteria they only excluded foods for children under a year old. However, there are other food product classifications, for instance the Keyhole, which were excluded foodstuffs intended for children up to the age of 36 months. Similarly, the WHO NPM African Region, its food classification, the range excludes the first 1 000 days which are covered by the International Code of Marketing of Breast-milk Substitutes (World Health Organization, 2015). Therefore, the Choices should also exclude the food product for under 2 or 3 years”.

6.5. Traditional food items consumed during cultural or religious festivities should be mentioned into classification.

“Although, traditional food is a complex, not well-defined and sometimes very controversial concept, relate to specific cultural identity, historical period and heritage; explanatory notes on traditional and celebratory foods would be further elaborated to include the information on inclusion and exclusion criteria in the case of traditional herbal products, and celebratory

products pertaining to cultural events. Additionally, for instance, if a product is a traditional item associated with a celebratory event, then marketing maybe permitted within a reasonable period prior to the event (World Health Organization, 2015). Sometimes relatively new foods and dishes are perceived as traditional because of their popularity and presentation as such. Moreover, a very limited attempt has been made to define concept of traditional food. One of the definitions describes it as a coherent tradition of food preparation that rises from daily lives and kitchens of a people over an extended period in a specific region of country, or a specific country, and which, when localized, has notable distinctions from the cuisine of the country as whole (Ivanova, Ludmila et al., 2015). Similarly, for instance, it has been shown that, traditional food products (TFP) are an important part of European culture, identity, and heritage. In order to maintain and expand the market share of TFP, further improvement in safety, healthy, or convenience is needed by means of different innovations. In the study conducted in 6 European countries (Belgium, France, Italy, Norway, Poland, and Spain) which had the aim to obtain a consumer driven definition for the concept of TFP and innovation, four main dimensions were identified for the concept of TFP i.e. habit-natural, origin-locality, processing-elaboration, and sensory properties. Additionally, five dimensions emerged around the concept of innovation: novelty-change, variety, processing technology, origin-ethnicity and convenience. However, in some cases and according to the consumers 'point of view the application of innovations may damage the traditional character of TFP (Guerrero et al., 2009). This recommendation was also in line with our findings, where we founds that traditional food items consumed during cultural or religious festivities have defined by some WHO NPM such as Africa Region and South-Est Asia Region (World Health Organization, 2015)".

6.6. Soups (all kind of soups and broths) should be classified in non-basic product groups

"Soup designed as unstrained vegetable meat or fish soups garnished with bread, pasta, or rice. Additionally, soup can be served at the beginning of the meal or a snack. The soup should be classified based on their nutrients and energy content, as well as its contribution to daily nutrient consumption. For the consumer perspectives, many food items are consumed in the form of soup. It has been shown that some types of soup are linked to the health benefits, for instance, the consumption of vegetables soup is associated with a reduction of non-communicable diseases may be explained their relatively high content of micronutrients, anti-oxidant compounds, polyphenols, and fibers, which may each counteract the biochemical processes that cause NCDs and other diet related diseases (Van Buren et al., 2019). For the reformulation purpose, should refer to the nutrient content of the soup, for example, where iron, calcium, phosphorus, sodium and potassium have defined as the main nutrient content in some soup (Kayode et al., 2010). This recommendation is also similar to the classification of desserts soup and bread topping as well, that can be introduced into non-basic product groups".

6.7. Salad and dressing/mayonnaise should be mentioned in the oils, fats and fat containing spreads category.

"Dressings and mayonnaises are commonly used in the everyday life of many consumers. They are usually packed in easy to use, that could be regarded as convenience foods. Dressings of different taste are common used in food preparation to make meals attractive. Mayonnaise

also used in numerous national kitchens, for many purposes, they are mainly used as binders for salads. Moreover, they also increase attractiveness and tastiness of such products (Sikora et al., 2008). Those food items should be classified into this category because, these food items share the same characteristics such as physical, chemicals, and application of these products as well. For the consumers' s perspectives, it will help them to identify and define the healthy option within category. Additionally, for the reformulation purposes, should be based on the set nutrients content, for instance, healthy dressings and sauce should have low sodium, reduced fat and cholesterol".

6.8. To make category specific approach dynamic (Basic vs. non-basic product groups), number of food categories.

"Although, the food product classification which has multi-purpose may introduces challenges, when defining products groups and setting criteria, it would therefore be dynamic in order to serve both consumers and reformulation purposes. For the reformulation purpose, non-basic product groups should be included into classification, due to the fact that the food products from non-basic groups generally do not contribute substantially to the intake of essential nutrients but provide a great innovation potential. In addition, the criteria for non-basic food groups can be a challenge to communicate to consumers as a healthier choice but are on the other hand necessary to encourage reformulation and to indicate a healthy or unhealthy option in the specific category. However, for the consumer communication, non-basic food product should be excluded, thus, the number of food product groups should be expanded for the reformulation purposes, where the sub classification will be introduced in order to have one single classification without distinction between basic and non-basic food product groups. For example, Keyhole food product classification, excluded all non-basic products, but this will affect the reformulation of a larger number of unhealthy food products (National Food Agency, 2015). The reference was also made from other food product classification across the regions (except food product classification based on international criteria), where they classified food without making distinction between basic and non-basic food product groups. Some food product classifications have more number food categories, other have a smaller number of food categories. As recommendation to Choices, the approach will depend on the primary purpose of the Choices, either for the reformulation, or consumer communication purpose. But based on the literature and my point of view, I would suggest that the classification should exclude non-basic food product groups because this classification approach will also cover both purposes, even it is not too much for the reformulation purpose. Additionally, Choices should keep limited number of food categories, due to the fact that, the nutrient profile models designed to promote an achievable healthy diet should be category specific but with a limited number of categories. However, models which use a large number of categories are unhelpful for promoting a healthy diet. Therefore, to keep Choices communicative to the consumers, should not include many food categories into its classification (Scarborough et al., 2010)".

7. Further research

Further research however is required to explore further the food product classifications in African regions, due to the fact that, many African countries have left behind to create the classification systems based on their available foods and their culture food specific, and the current development of nutritional science, as outlined in this review of existing food product classifications.

Traditional food is one of the milestones in conveying local culture to the people. It is therefore very important that Choices programme in collaboration with international scientific committee, should be studied adequately in elaborating the criteria of traditional and cultural foodstuffs in order to introduce them into classification.

8. Conclusion

This study reviewed existing food product classifications across the globe in comparison to Choices classification and outlined basic recommendations to Choices that can be adapted across all regions of the world. It presented a background for understanding the different method of food classification. It showed how food classifications are contextual. It revealed that food product classifications based on international criteria are unique compared to their counterparts. These analyses demonstrated that each food product classification has at least one of the primary purposes to serve, i.e. reformulation, marketing to children, FOP logo, consumer education, except taxation measures. Although there was no classification fitted with the taxation measures, the WHO nutrient profiling models could also be adapted after suitable testing and validation for other purposes, such as defining tax policy to limit consumption of unhealthy foods and developing benchmarks for foods sold in school cafeterias. Many food product classifications across regions share the same characteristics, such as number of food categories, food product included and excluded into classification, classification method, target group of people, types of food product addressed, and how food items were defined into categories. Food product classifications based on international criteria classified food products into two main food categories i.e. basic and non-basic food product groups by targeting consumer communication and reformulation purposes. Most of the food classifications categorized processed and non-processed food products in some categories to delineate how healthy and unhealthy foods do not even exist, but rather everything is a question of the amount consumed and the proportion in the overall diet. The study shown some exceptional food classifications such as Malaysia food classification which excluded fresh foods, and WHO NPM which mentioned cultural and traditional foodstuffs as foods that should be marketed to children. After analysis of all 19 eligible food product classifications we came up with 8 recommendations to Choices. The recommendations were 1) Classification of potatoes into fruit and vegetables category; 2) To classify plant-based meat alternatives in meat, fish, poultry and eggs group; 3) Rice should be classified as category; and Grain category should be defined as Grain and cereals products category; 4) Growing-Up Milks should be mentioned in classification and food product excluded based on age range should be adjusted ;5) Traditional food items consumed during cultural or religious festivities should be mentioned into classification; 6) Soups (all kind of soups and broths) should be classified in non-basic product groups; 7) Salad and dressing/mayonnaise should be mentioned in the oils, fats and fat containing spreads category; and 8) To make category specific approach dynamic (Basic vs. non-basic product groups), number of food categories. Finally, food classifications aligned with international recommendations and other nutrition policies are needed to comply with different purposes. Food classification is a fundamental issue affecting how individual food choices interface with the wider food system, and considerable future work is needed to extend our understanding of food classification and to make it applicable across all regions of the world.

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10. Appendices

Appendix 1: Excluded food product classifications

SN	Food product classification	Why excluded
1	Codex Classification of Foods and Animal Feeds	The Codex Classification includes food commodities and animal feedstuffs for which Codex maximum residue limits will not necessarily be established. The Classification is intended to be as complete a listing of food commodities in trade as possible, classified into groups on the basis of the commodity's similar potential for pesticide residues. The Codex Classification is intended to promote harmonization of the terms used to describe commodities which are subject to maximum residue limits and of the approach to grouping commodities with similar potential for residue for which a common group maximum residue limit can be set.
2	Nestle Nutrient Profiling System	Food product classifications used by industry and companies were intended to be excluded, because their classification reflect their portfolio and not the products in the market.
3	EU Classification of Food	Its purpose was to standardize the recording of the particulars of a foodstuff submitted for testing by an authorized officer to the official laboratories. The standardized information will enable the correct completion of official statistical returns and clearer identification of food safety issues. The coding system is important to enable electronic capture of information in a database form at a national level.
4	NOVA Food Classification	NOVA is the food classification that categorizes foods according to the extent and purpose of food processing, rather than in terms of nutrients.
5	NUTRISCORE	The food product classification is not defined, and many important food groups are not covered by Nutriscore. (it based on scoring system). They only outlined food that not covered by the Nutriscore.
6	FOODEX Food Classification and Description System	FoodEx2 is a comprehensive food classification and description system aimed at covering the need to describe food in data collections across different food safety domains.
7	Food and Beverages for Sports	This classification is limited to the main food product groups and menus for spectators and athletes.
8	PAHO Nutrient Profiling Model	It based on the nutrients content criteria, but it has not food product groups. In addition, the PAHO NPM is limited to processed and ultra-processed food and drink with high energy content and poor nutritional value.
9	Nigeria Heart Foundation Approved Product	It was excluded due to its purposes (The purpose was to categorize the food products based on the guidelines for acceptability).
10	DAFNE Food Classification System	It was excluded based on its purposes which did not meet the inclusion criteria (The development of the common classification system that would allow international comparisons of dietary data which is a central element in the development of the European food databank).
11	India Food Categorization System	It was excluded into eligible classifications due to its purposes (One of the Food Categorization System (FCS) was intended to provide a scientific basis to the Indian food laws, improving product quality for Indian consumers and International consumers of Indian food).
12	The Classification of Foods in the Canadian Nutrient File	It was excluded due to its purpose (The classification of foods in the Canadian Nutrient File (CNF) according to Canada's Food Guide (CFG or Food Guide) was developed as a surveillance tool to assess the food intakes of Canadians relative to Food Guide guidance. The CNF is used by various groups of stakeholders, other governmental organizations (such as Agriculture and Agri-Food Canada, Canadian Food Inspection Agency, Statistics Canada), institutions (such as hospitals and universities), food manufacturers, and the general public.
13	Euro Food Group Classification System	It was excluded due to its purposes (The European Food Groups (EFG) classification system was developed as a project of Cooperation Science and Technology (COST) action 99/Eurofoods. The European Cooperation in the field of Scientific and Technical Research started in 1995 and ended in 1999. The purpose of this project was to evaluate the level of food description and classification that would permit international comparisons of the results of available food consumption and food availability survey).
14	Thailand Food Classification	It has not all food products, (e.g. meat and meat products were not classified). In general, it has not all food products, therefore should be excluded into eligible classifications.
15	Health Star Rating	The classification based on healthiness, i.e. HSR system is an interpretive front of pack labelling system that rates the nutrition content of packaged food in half-star increments from half a star (least healthy) to five stars (most healthy).

Appendix 2: The characteristics of food product classifications

SN	Classification	Characteristics
1	CHOICES	<p>It has 31 food categories</p> <p>The food products classified into 2 groups: Basic and non-basic product groups.</p> <p>Processed and non-processed products are separated for some food sub-categories.</p> <p>The following product groups are not included:</p> <p>Product containing >0.5% alcohol,</p> <p>Food supplements,</p> <p>Product for use under medical supervision, and</p> <p>Foods for children under a year old.</p> <p>All other health aspects of food products, such as food safety, the presence of additives and artificial sweeteners and potential allergens are supposed to be regulated by national food legislation.</p>
2	Keyhole	<p>The Keyhole has 33 food categories.</p> <p>Food products excluded: soft drinks, sweets and cakes, and foodstuffs intended for children up to the age of 36 months.</p> <p>The following ingredients must not be contained in foodstuffs:</p> <ol style="list-style-type: none"> 1. Sweeteners (food additives), 2. approved novel foodstuffs or foodstuff ingredients with sweetening properties, and 3. phytosterols, phytosterol esters, phytostanols and phytostanol esters. <p>Fishery products and live mussels were defined as category.</p> <p>Processed food products were not defined into classification except in category 1.</p> <p>There is no distinction between basic and non-basic food groups.</p> <p>The Criteria of Keyhole include Whole grain.</p> <p>Keyhole is applicable to all healthy people.</p> <p>It Applicable to packaging and marketing materials (unpackaged).</p> <p>It is important for industry, which stimulation product development.</p>
3	Australia Healthy Choices	<p>It has 161 food categories.</p> <p>The classification applies to all foods and drinks, whether freshly made on the premises or supplied pre- packaged.</p> <p>The foods products were listed and classified based on the food you have to consumer, food to choose carefully, and food to limit.</p> <p>There is no distinction between processed and non-processes food products.</p> <p>Basic and non-basic food products were classified together.</p> <p>It has multiple classifications: (Traffic right classification system i.e. Green, Amber or Red; Classifying foods using nutrient information; Classifying foods and drinks using ingredient lists and recipes; and common foods and drinks classification).</p> <p>Healthy Choices uses a similar traffic light classification system to school food services across Australia.</p> <p>the foods were defined based on the nutrient information against the nutrient criteria.</p> <p>This classification is not designed for:</p> <ol style="list-style-type: none"> 1.Treatment of specific diseases or medical conditions requiring dietary intervention, 2.Meals and snacks for inpatients, meals in aged care facilities, <p>Classification categorized foods and drinks as Green, Amber or Red based on their nutritional value</p>
4	Brunei Nutrient Criteria Healthy Choices Logo	<p>It has 66 food categories.</p> <p>It excluded out infant formula.</p> <p>The Nutrient Criteria was adapted with permission from Singapore's Health Promotion Board Healthier Choice Symbol Nutrient Guidelines.</p> <p>It applies to all healthy people</p> <p>It helps to facilitate food and beverage industry to meet the consumers' demand (to help consumers easily identify healthy foods and beverages).</p> <p>Alcohol was not mentioned into classification,</p> <p>Table salt was classified as category.</p> <p>It has many food categories compared to Choices.</p> <p>Processed food products were only defined in the meat and meat products category.</p> <p>There was no distinction between basic and non-basic product groups.</p>
5.	Singapore Healthy Choice Symbol	<p>It has more twice food categories than Choices (82 food categories).</p> <p>Desserts group was newly introduced into classification.</p> <p>Guidelines do not apply to infant formula or any other food products for persons one year of age and below.</p> <p>The classification is too much detailed</p> <p>There is not distinction between basic and non-basic food product groups.</p> <p>Processed food products were only defined in meat and meat products category.</p> <p>This classification was intended to provide point of sale information to assist manufactures make informed choices.</p>
6	Malaysia Healthy Choice logo	<p>It has 46 food categories (quite similar to Croatia food product classification).</p> <p>The classification excludes infant formula, all special purposes food, any milk products that targeted to specific group.</p> <p>Fresh food products were not classified.</p> <p>Classification was used on nutrient criteria for healthier choices logo to help consumers healthier choices.</p> <p>It also helps the industry to improve their products.</p> <p>Basic and non-basic food products were classified together.</p>

7.	Zambia Good Food Logo-Criteria	<p>It has 32 food categories.</p> <p>It used the same approach with Choices, Belgium food product criteria, and Dutch product Criteria.</p> <p>Food products were classified into basic and non-basic groups based on significant daily nutrient intake they contribute.</p> <p>Rice was defined as category.</p> <p>Processed and non-processed food products were defined in some food categories.</p> <p>The product categorization does not compete with and shall not be used as food categories in nutrition education materials.</p> <p>It excluded products containing >0.5% alcohol;</p> <p>food supplements; products for use under medical supervision; foods for children under the age of one year.</p> <p>Foods will only be considered for carrying the logo when national regulations are followed, and it is eligible to carry the quality logo from the Zambian Bureau of Standards (ZABS).</p>
8	New Zealand classification of food and beverages for year 1-13	<p>It has 34 food categories.</p> <p>The number of food categories is approximate to the number of categories of other food product classification such as Choices, Belgium food product criteria, Dutch product Criteria, and Zambia Good Food Logo-Criteria.</p> <p>It excluded foods include many biscuits, cakes, desserts, potato crisps (chippies), pastries, pies, lollies, chocolate and fizzy drink.</p> <p>They classified foods based on how they should be consumed regarding to the nutrients content: Everyday, Sometimes, and Occasional.</p> <p>It applies to children aged from 1-13 years in New Zealand.</p> <p>In some food categories food items were defined as processed and non-processed (e.g. meat and meat products).</p> <p>There was no distinction between basic and non-basic food groups.</p>
9	Croatia Healthy Living Food criteria	<p>It has 47 food categories.</p> <p>It excluded Foodstuffs that contain sweeteners.</p> <p>The food classification is detailed, i.e. food items are well defined into groups.</p> <p>Most of the food categories did not defined processed and non-processed food items.</p> <p>There is not distinction between basic and non-basic food groups (all foods are classified together).</p> <p>For this classification, health safety is prerequisite. e.g. milk and dairy products: Milk, unflavored fermented milk, flavored fermented milk products, fresh cheese, dairy spreads, cream cheese, and cheese.</p> <p>It is applicable to all healthy people.</p> <p>It takes into account health safety issue as prerequisite.</p>
10	Belgium food product criteria	<p>It classified food into 2 food groups (Basic and Non-basic) which were categorized into 32 food categories.</p> <p>The following foods products were excluded:</p> <ol style="list-style-type: none"> 1. products containing > 0.5% alcohol 2. food supplements 3. products for use under medical supervision 4. foods specifically for young children, including infant formula and follow-on formula 5. products carrying a claim that is not approved by an EU appointed organization. <p>The criteria do not take the presence of allergens into account.</p> <p>It provides industry with the necessary encouragement to develop or reformulate products.</p> <p>It is periodically evaluating the product criteria to keep abreast with the latest scientific and technological developments in the field of nutrition and health.</p> <p>Food product sub-categories are not detailed.</p> <p>This classification used the same approach with Choices, Dutch product Criteria, and Zambia Good Food Logo-Criteria.</p>
11	Dutch product Criteria	<p>It has 30 food categories.</p> <p>It excluded:</p> <ol style="list-style-type: none"> 1. products containing > 0.5% alcohol; 2. food supplements; 3. products for use under medical supervision; 4. foods and milk substitutes for children under a year old; 5. products carrying a claim which is not authorized by the for this case assigned European organization. <p>In some food categories processed and non-processed food products are separated.</p> <p>Food are classified into basic and non-basic food groups.</p> <p>Food product sub-categories are not detailed.</p> <p>In beverages category (in non-basic group) they excluded fruit juices.</p> <p>The classification is not able to control the new food products which continuously introduced onto the food market.</p> <p>It applicable to all healthy people</p> <p>It used the same approach with Choices, Belgium food product Criteria, and Zambia Good Food Logo-Criteria.</p>
12	WHO European Region	<p>It has 17 food categories.</p> <p>The list of foods used in classification was between 100 and 200 foods that are either: (i) frequently marketed to children, or (ii) commonly consumed (ideally a combination of both).</p> <p>Follow-up formulas and growing-up milks are not covered by this model.</p> <p>There is no agreement on a definition of energy drinks.</p> <p>It is category-specific model.</p> <p>It takes decisive action to reduce food marketing pressure to children with regard to foods high in energy, saturated fats, trans fatty acids, free sugars or salt.</p> <p>Some basic and non-basic food products were excluded.</p> <p>Processed foods were defined for meat, fruit and vegetables.</p> <p>Unprocessed food products were not defined in food sub-categories.</p>

13	WHO Eastern Mediterranean Region	<p>The regional model consists of a total of 18 food categories (with some subcategories). In the regional model, processed meat, poultry and similar products became a category. Follow-up formulas and growing up milks are not covered by this model. The list of foods used in classification was between 100 and 200 foods that are either: (i) frequently marketed to children, or (ii) commonly consumed (ideally a combination of both). Some basic and non-basic food products were excluded from classification. Processed and non-processed foods were defined within some sub-categories. The model was used for the purposes of restricting food marketing to children. Processed fish was created as new category.</p>
14	WHO South-Est Asia Region	<p>It has 18 food categories. The primary purpose is to implement recommendations on marketing of food and non- alcoholic beverages to children. Two categories of fresh foods, i.e. fresh and frozen vegetables and animal products have been included in the model. This model could also be adapted (after suitable testing and validation) for other purposes, such as defining tax policy to limit consumption of unhealthy foods and developing benchmarks for foods sold in school cafeterias. Processed products were defined in the category of meat, poultry, game, fish and fish products, and fruit and vegetables. Food products were not defined as unprocessed into categories. Marketing is not allowed for the following: Food products that do not pass Codex Alimentarius's standard on uses of food additives; food products that contain >1% of total energy in the form of industrially produced trans-fatty acid or 0.5 g of trans fat per serving (1% of energy = 20 kcal = 2.2g trans-fat); food products that contains > 0.5% of total energy in the form of alcohol; food products with added with non-sugar sweetener; subject to the exclusionary criteria, if a product falls under a protected geographical or quality designation regime (e.g. traditional medication).</p>
15	WHO African Region	<p>It has 18 food categories. The 18 food categories are the same as those in the SEAR model. Two categories of fresh foods, i.e. fresh and frozen vegetables and animal products have been included in the model. The target population group for application of this model includes children and adolescents, aged 2 to 19 years. The range excludes the first 1 000 days which are covered by the International Code of Marketing of Breast-milk Substitutes. The following food products are excluded: Special foods or supplements recommended for people with specific disease conditions. Foods and beverages for special uses, food supplements, dietetic formulations, alcoholic drinks, and breast milk substitutes, including so-called follow-up formula and growing-up milks. Marketing is systematically prohibited for the following: Food products that contain >1% of total energy in the form of industrially produced trans-fatty acid (1% of energy = 20 kcal = 2.2 g trans-fat). Food products with non-sugar sweeteners. Traditional food items consumed during cultural or religions festivities may be marketed for a determined period around the festive season. The purpose of the model is to implement the WHO recommendations on marketing of foods and non-alcoholic beverages to children by identifying unhealthy foods that should be subject to marketing restriction. This model could also be adapted (after suitable testing and validation) for other purposes, such as defining a tax policy to limit consumption of unhealthy foods and developing benchmarks for foods sold in school cafeterias.</p>
16	WHO Western Pacific Region	<p>It has 18 food categories. Some basic and non-basic product were excluded from the model. Model helps countries to identify foods for which marketing to children should be prohibited. can be used through policy to improve the overall nutritional quality of diets. They added a new food category for "products made from soya" (e.g. tofu products, natto and tempeh). Unsweetened fresh coconut juice was included in Category 4a, as a common region-specific beverage. Marketing is prohibited if a product contains >1% of total energy in the form of industrially produced trans-fatty acids or if the product contains ≥0.5% of total energy in the form of alcohol.</p>
17	EU Pledge	<p>It has nine categories and 16 subcategories. It is a category-based approach. Processed food products were only defined in category 5: Dairy products (e.g. processed cheese) The purpose is to change food and beverage advertising to children under the age of twelve on TV, print and internet in the European Union. These criteria also make a tangible difference in practice i.e. for many of the companies that used individual nutrition criteria, the common criteria meant that significantly fewer products became eligible for advertising to children under twelve. The common nutrition criteria are based on a set of "nutrients to limit" and "components to encourage" (nutrients and food groups). The EU Pledge, namely to limit the types of food and beverage products that are advertised to children, while incentivizing competition for the development of better-for-you options, through innovation and reformulation. The following food product were excluded in the model: Bouillon/stock cubes - Herbs and spices - Coffee and tea (excluding coffee and tea-based drinks, which fall under the Beverages category) No nutrition criteria were developed for the following categories that are not advertised to children under 12 by EU Pledge member companies: Sugar and sugar-based products, which include: Chocolate or chocolate products, Jam or marmalade, Non-chocolate confectionery or other sugar product, sugar, honey or syrup; soft drinks.</p>

18	School Food and Beverages Ontario	<p>It has 31 food categories.</p> <p>There is no distinction between basic and non-basic food groups.</p> <p>Processed and non-processed foods were not defined.</p> <p>Food and beverages were categorized based on how that should be sold regarding to the nutrients content: Sell most, sell less, and not permitted for sale.</p> <p>The classification was also aimed for consumer education and increases awareness on which to choose based on what.</p> <p>It is applicable only on food and beverages sold in school.</p> <p>The nutrition standards are divided into two sections: food and beverages.</p>
19	Manitoba School Nutrition (Food and Beverages Groups)	<p>Apply to all foods and drinks.</p> <p>Its purpose is to support students in establishing healthy eating habits for a lifetime, and to make the healthy choice the easy choice.</p> <p>Processed and non-processed foods were not defined.</p> <p>There is no distinction between basic and non-basic food product.</p> <p>The food and beverages were classified into categories based on 4 criteria regarding to the nutrients content: Served most often, served sometimes, served rarely, snacks from that foods that are better choices.</p> <p>This classification applies only to the food and beverages provided or sold at school.</p> <p>Potatoes were classified in category of fruit and vegetables that should be served most often.</p>
20	Czech Republic Food Product Criteria	<p>It has 32 food categories.</p> <p>Two product groups: Main product groups (23 food categories) and other product groups (9 food categories).</p> <p>It excluded: 1. products containing more than 0,5% alcohol; 2. food supplements; 3. foods for special medical purposes; 4. foods for children under one year of age.</p> <p>The criteria call for the development of new products and the reformulation of the composition of existing products on the market in order to improve their nutritional value.</p> <p>The criteria are based on similar criteria approved by the International Scientific Committee of Choices International, an independent group of international experts in the field of nutrition, food technology and consumer behavior.</p> <p>The new revised criteria are simplified and at the same time tighten selected requirements that products must meet in order to know the logo I know what to Eat.</p> <p>Logo, I know what I eat and drink indicates the foods I have</p> <p>Limited content of some nutrients (saturated fatty acids, trans fatty acids, salt, added sugar)</p> <p>Guaranteed content of healthy nutrients (fiber)</p> <p>Limited energy intake.</p>