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Front-of-pack nutrition labelling to promote healthier diets: current practice and opportunities to strengthen regulation worldwide

Alexandra Jones ,[1,2] Bruce Neal,[1,3] Belinda Reeve,[4] Cliona Ni Mhurchu,[1,5] Anne Marie Thow[6]

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For numbered affiliations see end of article.

Correspondence to
Ms Alexandra Jones;
ajones@georgeinstitute.org.au

ABSTRACT

Unhealthy diets are a leading cause of death and disability globally. The WHO recommends Member States implement front-of-pack (FOP) nutrition labels to guide consumers towards healthier food choices, as part of comprehensive strategies to prevent diet-related non-communicable diseases. Interest in FOP nutrition labelling is increasing, but there is limited guidance for policymakers developing regulations necessary for effective implementation.

A rapidly evolving evidence base, limited regulatory capacity and possibility of legal challenge by affected food industry stakeholders can create 'regulatory chill', whereby governments are dissuaded from progressive public health policymaking. We use a framework for analysing public health law and available best-practice guidance to evaluate key components of 31 FOP nutrition labelling regulations endorsed by governments up to June 2019. Analysis of regulatory form shows recent rapid uptake of label formats that are easier for consumers to understand and increasing use of mandatory legislation. However, policymakers must decide much more than whether to apply 'stars', 'traffic lights' or 'stop signs'. The substance of effective regulation must contain strategic regulatory objectives, clear specifications for displaying the label on pack, a valid scoring mechanism and a justified scope for including foods. While there are limited data on current practice, good governance of FOP nutrition labelling regulation also requires transparency and accountability in processes of label development, implementation, evaluation and enforcement to promote continuous improvement and withstand undue commercial interference. Whether developing new FOP nutrition labels or reforming existing ones, our findings support policymakers to design and implement best-practice, evidence-informed regulation.

Summary box

- Simple, graphical front-of-pack (FOP) nutrition labels are part of the package of policies recommended by the WHO to address the growing global burden of diet-related non-communicable disease.
- Food industry resistance to progressive FOP nutrition labels threatens to stifle policy innovation, creating need to support policymakers to design and implement best-practice regulation.
- A framework for analysing public health law applied to 31 existing FOP nutrition labelling regulations endorsed by governments highlights strengths of current practice and areas where it could be further improved.
- While public health attention has focused on label format (eg, stars, traffic lights, stop signs), regulators must also consider the legal framework used (ie, voluntary or mandatory), which foods are within scope, how foods will be scored and how labels should be displayed on pack, as well as incorporating procedural mechanisms to promote transparency and accountability at all stages of the policy cycle.
- FOP nutrition labels implemented through evidence-informed, strategically designed regulation are less likely to be successfully contested in national and international courts and more likely to achieve public health impact.

INTRODUCTION

Unhealthy diets are a leading cause of death and disability globally.[1] Unprecedented availability, accessibility and affordability of processed and prepackaged foods is a key driver of obesity and diet-related non-communicable diseases (NCDs) including high blood pressure, cardiovascular disease, type-2 diabetes and some cancers.[2 3] As part of a comprehensive policy response to promoting healthier diets and preventing NCDs, the WHO recommends that governments implement front-of-pack (FOP) nutrition labels.[4–11] These simple, often graphical labels provide at-a-glance information on nutritional quality on the primary display panel of foods and beverages (hereafter 'foods') to complement detailed nutrient declarations on back-of-pack. A growing body of evidence suggests such labels may aid consumer understanding of nutritional quality, encourage selection

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and purchase of healthier foods, and promote reformulation by industry.[12–15]

Existing authoritative guidance supports government action but provides limited detail on the appropriate content of national FOP nutrition labelling regulation.[11 16 17] Recent policy developments at a national level include a shift away from 'softer' positive signposts that highlight healthier options within category such as Sweden's green 'Keyhole',[18] towards formats such as Chile's 'stop-sign' warnings[19] which signal product unhealthfulness and discourage consumption, thereby potentially decreasing sales.

Resistance to these newer FOP nutrition labels can be seen in legal challenges launched or threatened under domestic and international law, including at the World Trade Organization (WTO).[20–22] The potential impact of different national requirements on food trade has also prompted the international food standards agency, the Codex Alimentarius Commission (Codex), to commence negotiating further guidance on FOP nutrition labelling.[23] These developments illustrate the multisectoral nature of food governance and competing authorities at play: nutrition labelling lies within the remit of the health sector but requires balancing with the interests of stakeholders in agriculture, industry and trade.[16 21 24]

A significant body of health research compares the efficacy of different FOP nutrition label formats (eg, stars, traffic lights, stop signs),[14 25] but there has been less systematic examination of other essential features of regulation. Questions faced by policymakers include which foods FOP nutrition labels should apply to, how foods should be scored and which stakeholders should be involved in developing, evaluating and enforcing FOP nutrition labelling.

A rapidly evolving public health evidence base, limited regulatory capacity and the possibility of costly legal challenge driven by affected food industry stakeholders creates the risk of 'regulatory chill', whereby governments are dissuaded from progressive public health policymaking.[26] To avert this risk and accelerate continued policy innovation, our aim was to provide policymakers with support to prepare evidence-informed, strategically designed and well-governed FOP nutrition labelling regulations.

We analysed current practice using a framework developed by Reeve and Magnusson for analysing and improving the performance of public health regulation.[27] Building on public health and regulatory studies literature, the framework allows evaluation of multiple 'regulatory domains': considering the form of regulation used, its substantive terms and conditions, and the application of good governance in its development, administration and enforcement. We adapted this framework to the specific context of FOP nutrition labelling regulation by reference to recent best-practice guidance from the WHO and World Cancer Research Fund (table 1).[11 16 17]

To apply the framework, we created a database of existing regulations. Existing FOP nutrition labels were identified by a search of existing global policy databases and reports.[16 17 28–30] We included government-led or officially supported (hereafter 'government endorsed') initiatives identified as FOP nutrition labelling by at least one of these sources. We adopted a broad definition of regulation to capture both *voluntary* FOP nutrition labels, for example, those implemented through sets of government-issued rules that industry voluntarily apply, and *mandatory* systems, which impose binding requirements on industry through government legislation. Inclusion of voluntary schemes acknowledges that this kind of 'self-regulation' is often relied on in lieu of more traditional government legislation and that public interest in their effectiveness thereby warrants their subjection to the same scrutiny. We refer to both mandatory and voluntary labelling schemes as 'regulation' throughout.

For each FOP nutrition label, we collated publicly available information on each component of regulation identified in the framework. Information from the primary global policy databases and reports was supplemented by targeted searches of peer-reviewed and grey literature, for example, government websites. Results are summarised in table format, and the database provided in full as online supplementary appendix 1.

For the purposes of this analysis paper, we present findings by regulatory domain to highlight strengths of existing practice and make recommendations for where and how FOP nutrition labelling regulation could be improved.

REGULATORY FORM

Our search of current practice identified 31 unique FOP nutrition labels, each governed by their own regulatory rules. Some jurisdictions had more than one FOP nutrition label (eg, Israel had both red warnings for specific nutrients, and a green endorsement logo), and some labels operated in more than one jurisdiction (eg, Australia and New Zealand's Health Star Ratings (HSR)).

In total, 32 governments had endorsed some form of FOP nutrition label (figure 1). Most (23/32) of these had done so since 2010 (online supplementary appendix 1). In 2019, countries including Argentina, Brazil, Canada, Fiji, Germany, Guatemala, India, Portugal and South Africa were reportedly considering FOP nutrition labelling,[16 17] highlighting the need to disseminate regulatory best-practice.

Regulatory framework

When designing regulation, an initial consideration for policymakers is selection of an appropriate legal framework (table 1).[16] Mandatory FOP nutrition labels are specifically recommended by the WHO High Level Commission on Ending Childhood Obesity[6 7] and provide an important way to overcome suboptimal uptake of voluntary labels.[17] Despite sometimes being raised as a barrier to mandatory labels, international trade agreements governed by the WTO do allow governments to

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Table 1 A framework for analysing and improving the performance of FOP nutrition labelling regulation

Component	Recommendation	Application to FOP nutrition labelling
Domain One: Regulatory form		
Regulatory framework	The regulatory framework is appropriate to the jurisdiction's legal context.[27]	Governments should consider mandatory legal frameworks to overcome suboptimal voluntary uptake.[16 17] Existing laws (eg, constitutions) may determine whether mandatory implementation is legally possible.[16]
FOP nutrition label format selection	The FOP nutrition label format selected supports the regulatory objective(s), that is, can be understood and used by consumers to inform healthier choices.	The FOP nutrition label format should be interpretive, that is, use words, colours and/or symbols to make judgments[11 16 17] and be understandable to all population subgroups.[11 16 29] Formats indicating unhealthfulness appear more effective in guiding consumers to nutritionally favourable products.[17]
Domain Two: Regulatory substance		
Regulatory Objective(s)	Clear, measurable objectives by which success of regulation can be assessed.[27]	The aim of FOP nutrition labelling is to inform and guide consumers towards healthier food choices; a secondary aim is to stimulate healthier formulation by the food industry.[11 16 17]
Operative terms and conditions	Key terms and conditions are clearly defined; regulatory rules are sufficiently expansive to achieve the regulatory objectives.[27]	Operative terms include: display specifications that promote visibility and salience; nutrients and food components included that link to health evidence; valid scoring criteria and reference amount; justified scope (products included and excluded).[11 16 17]
Policy coherence	Regulation is framed within comprehensive policies to promote healthier diets.[4–7]	FOP nutrition labelling should be aligned with and enhance operation of other national public health and nutrition policies, food regulations and relevant WHO and Codex guidance.[11]
Domain Three: Regulatory governance		
Drafting regulatory rules and scheme design	Transparency and accountability mechanisms are incorporated into regulatory regimes from their inception, including when developing substantive regulatory rules.[27]	Government retains ultimate responsibility and authority for setting regulatory objectives and scope; developing and validating scoring criteria with independent expert input; setting a review framework; leading a stakeholder engagement process for development of a trusted system, including use of multistakeholder committees or public consultation to develop label format, content and supporting documents (eg, style guides). Information should be transparent and easily accessible (eg, submissions to public consultation released, public meetings and minutes of committees).[11] There should be appropriate safeguards for managing conflicts of interest.[16]
Administration	Administration by a government or independent body which monitors and enforces compliance, publicly disseminates information on performance to facilitate external scrutiny.[27]	Administration granted to an independent statutory authority (eg, food standards agency), government body (eg, ministry of health) or multistakeholder group with appropriate safeguards for managing conflicts of interest. The administrative body must be provided with requisite authority and resource to conduct monitoring and enforcement activities and to publicise performance outcomes.[11 27]
Monitoring	Monitoring informs continuous improvement through collection of baseline data, setting of process and outcome indicators and timeframes for achievement, ongoing data collection.[27]	Baseline and follow-up data collected on: uptake and label compliance by industry (eg, using a database with photographs of labels and/or licensing scheme), consumer understanding and use, product purchases, population dietary intakes, nutrient composition of foods and reformulation.[11 16]
Evaluation	Structured, regular review ensures regulation meeting its objectives. A review framework set during development includes baseline data and, performance indicators and timeframes to evaluate effectiveness.[27]	Government-led and/or carried out by independent body or research group (eg, auditor, consultant) with authority to assess achievement of the regulatory objectives using a transparent framework and sufficient data to assess whether performance indicators met in the specified timeframes.[11 16 17]
Enforcement	A wide range of enforcement options are available, including incentives to encourage and reward high levels of compliance, 'soft' enforcement measures such as persuasion and more punitive measures for instances of serious or persistent non-compliance. Publication of decisions enhances transparency, allows development of 'precedent' for users.[27]	Enforcement may be supported by premarket approval, for example, licensing; or auditing of products in the market. The administrative body possesses range of sanctions, including positive and negative publicity, written requests for action, withdrawal of right to use (positive) labels, fines or legal action under new or existing law. A complaints handling mechanism may allow all stakeholders to raise issues with regulation or instances of non-compliance.[27]

FOP, front-of-pack.

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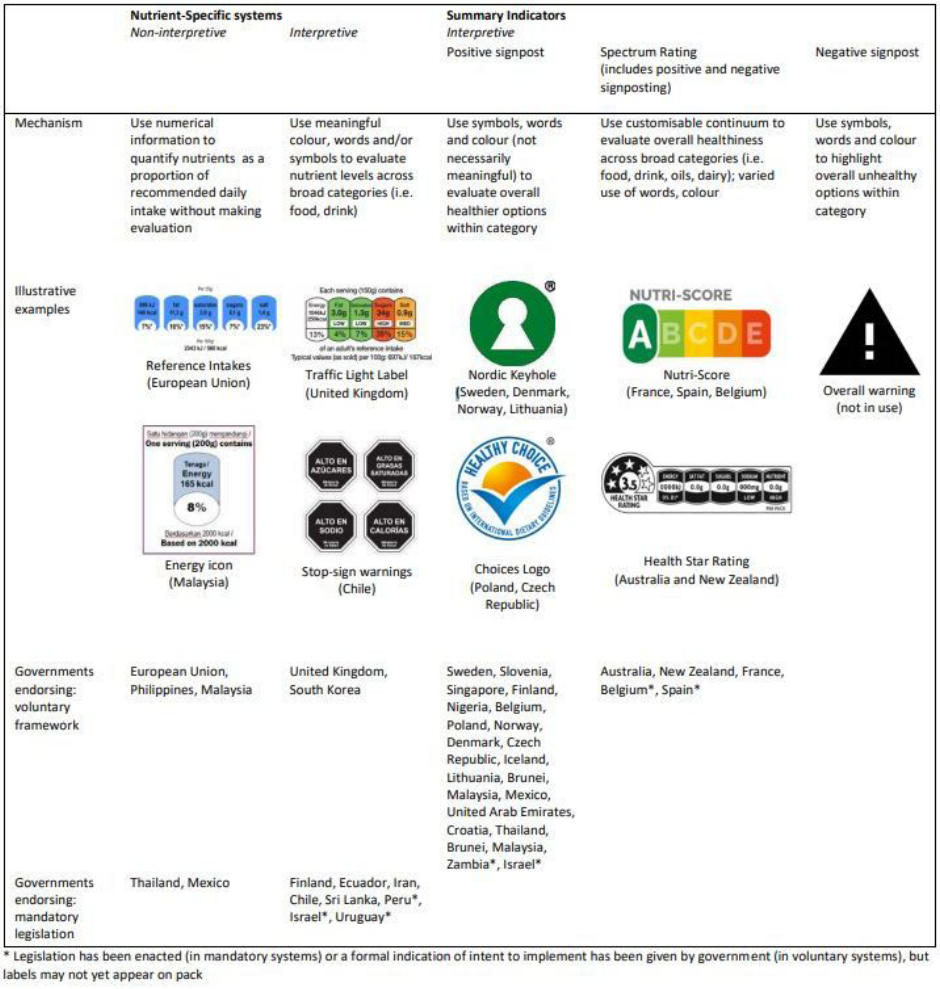


Figure 1 FOP nutrition labels by regulatory form (label format and legal framework). FOP, front-of-pack.

implement mandatory measures, provided regulation is crafted carefully to maintain coherence with international trade obligations.[21] In each jurisdiction, policymakers must determine whether any existing law restricts implementation of a mandatory label. For example, European Union (EU) legislation may constrain EU member countries from applying mandatory national legislation.[31] Where a mandatory label is not legally possible, a voluntary system can be pursued.[16]

While the majority of labelling schemes in current practice remained voluntary, 10 countries now have mandatory FOP nutrition labels (figure 1). Eight of these were adopted since 2014, including regulations in Ecuador,[32] Iran,[33] Sri Lanka,[34] Mexico,[35] Chile,[36] Peru,[37] Israel[38] and Uruguay.[39]

Label format

For FOP nutrition labelling to promote healthier diets, policymakers must select a label format that consumers can understand and use (table 1). A significant body of public health evidence suggests formats with interpretive elements that show judgement or recommendation are most useful.[11 13 14] As outlined in figure 1, these include nutrient-specific interpretive labels and multiple types of summary indicator formats.

Of 31 current FOP nutrition labels, 26 used interpretive elements. Fourteen positive signposts used subjective words (eg, good, healthier), symbols (eg, ticks, hearts) and colour to signal relative healthfulness within category. However, included elements such as the Keyhole symbol did not necessarily hold intuitive meaning (figure 1). While the marketing value of positive signposts makes them appealing to industry, a summary of recent evidence suggests they encourage consumers to overestimate healthfulness and may also facilitate price premiums on healthier options that policymakers may find undesirable for low socioeconomic consumers.[17]

By contrast, the past 5 years has brought rapid innovation in labels that evaluate product *un*healthfulness, which appear more effective in supporting consumers to choose nutritionally favourable products.[17] These include 10 nutrient-specific formats which used descriptive words (eg, low, medium, high); meaningful colour (red, yellow, green, black) and salient symbols (eg, stop signs, traffic lights) to illustrate specific nutrient content (figure 1). Recent regulation adopted in Uruguay elected

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to use 'excess' rather than 'high in' for specific nutrients,[39] reflecting research in that context that 'high in' was prone to more positive connotations.[40]

In a similar manner, Australasia's HSR[41] and France's NutriScore[42] (now also endorsed by Belgium and Spain) indicated both healthfulness and unhealthfulness but did so on a customisable continuum to summarise nutritional quality overall. Nutri-Score used colour to reinforce its evaluation (ie, A was dark green to signify healthiest)[42] whereas HSR allowed manufacturers to display the logo in any colour.[41] No jurisdiction had yet extended this focus on evaluating unhealthfulness to providing only a summary negative signpost (figure 1).

The remaining five labels (figure 1) were non-interpretive, that is, presented monochrome numerical information. While preferred by industry, consumers cannot understand and use such information,[11 13 14] particularly those with lower nutrition literacy, education or members of minority ethnic groups.[11] For FOP nutrition labelling to effectively guide consumers towards healthier choices, policymakers should avoid non-interpretive label formats.

REGULATORY SUBSTANCE

Effective implementation of FOP nutrition labelling also requires policymakers to ensure sufficient attention to Domain Two, the substantive terms and content of regulation. In this domain of regulatory substance, loopholes and gaps in current practice provide insight for strengthening future regulation.

Regulatory objectives

The objectives of regulation provide the basis by which policy 'success' will be judged, both in routine evaluation and in the event of legal challenge.[16 21] Strategic regulatory objectives should reflect measurable pathways of effect, for example, changes in consumer understanding, behaviour and/or food composition (table 1) demonstrable by short-term evaluation. While improved food labelling may contribute to broader goals, for example, prevention of NCDs or longer-term changes in obesity prevalence, difficulty in producing short-term evidence of these outcomes makes them less suited as explicit objectives of regulation.[16 21]

Current practice summarised in table 2 aligns with WHO Guidance on the objectives of FOP nutrition labelling.[11] Where identified, all regulations specified a measurable consumer-focused objective that is, informing and/or helping them make healthier food choices. Uruguay's law was even more strategic; its objective was to allow consumers to 'identify foods with excessive amounts of specific nutrients',[39] a threshold foreseeably easier to demonstrate. Seventeen interpretive labelling regulations also contained explicit reference to the additional benefit of incentivising industry reformulation (table 2).

Specifications for displaying FOP nutrition labelling on pack

Regulation can specify requirements to enhance visibility and salience of the FOP nutrition label on pack. Examination of current practice identified at least some display specifications in 22 FOP nutrition labelling regulations. Specifications included size, contrast, colour and/or font (table 2). Where display was not explicitly required on the front or principal panel, it sometimes occurred elsewhere (eg, Ecuador),[16] weakening visibility.

Only four regulations directed uniform placement, for example, top right (table 2). More common were minimum space requirements around the FOP nutrition label; the Nordic Keyhole also specified separation from competing claims (eg high in protein).[18] Chile's law required removal of marketing tools on pack (eg cartoon characters), for foods carrying a stop sign label.[19] Six regulations incorporated written government endorsement (eg, Ministry of Health); two provided directions for use (eg avoid excessive consumption) (table 2). These progressive examples, along with lessons from refined display specifications in settings such as tobacco control,[43] suggest potential for future regulatory innovation.

Included nutrients and/or food components

As part of a comprehensive approach to NCDs, nutrients and/or food components included in regulation should relate to evidence of diet-related risk.[1] Current WHO guidance also suggests they be focused on nutrients already required to be declared on back-of-pack.[11]

Information on current practice was identified in the regulations of 30 labels (table 2). Twenty-eight included one or more nutrients associated with increased NCD risk: sodium (28); saturated fat (22), total sugar (21), trans fat (8), total fat (8) and added sugar (6).

Fewer regulations incorporated food components associated with decreased NCD risk: fibre (15), whole grain (5) and 'fruit, vegetable, nut and legume' content (2). This may reflect caution in highlighting packaged sources of these components over whole food counterparts.[11]

Other components included in current regulations were energy (14), artificial sweeteners (4), calcium (3), protein (3), cholesterol (1), unsaturated fat (1), caffeine (1) and added preservatives (1). Zambia indicated it would address NCDs and micronutrient deficiency,[44] though nutrient criteria were not identified. To mitigate the risk of potential challenge, policymakers should ensure all inclusions are informed by health evidence.

Nutrient profiling criteria or scoring system

Nutrient profiling is the science of classifying or ranking foods according to their nutritional composition for reasons related to preventing disease and promoting health.[17] For FOP nutrition labelling to successfully guide consumers towards healthier choices, regulation must specify a valid set of nutrient profiling criteria, that is, ones that appropriately evaluate nutritional quality.[11 16 17]

Nutrient profiling criteria were identified for 22/26 interpretive labels. Positive signposts used nutrient thresholds that varied by category; some had >60 categories (table 2). Nutrient-specific interpretive labels also used nutrient thresholds but across broader categories of

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Table 2 Substantive content of FOP nutrition labelling regulation

Label, Jurisdiction (Year Endorsed)	Regulatory objectives	Display specifications	Nutrients/Food components included	Nutrient scoring mechanism	Reference amount used	Criteria validated	Scope	Specified exclusions	Policy coherence
Nordic Keyhole Sweden (1989); Denmark And Norway (2009), Lithuania (2013)	Inform consumers, incentivise reformulation	Exact colour, clearance around label, separation from other claims	Sodium, saturated fat, total fat, total sugar, fibre, wholegrain, artificial sweeteners	Thresholds, multiple category	Per 100 g/100 mL, per serve, % energy	Construct validity; peer-reviewed	Packaged foods and drinks, unpackaged fresh foods, restaurant meals	Non-basic foods, for example, snacks	Education campaign, integration into school curricula
High Salt Warning Label Finland (1993)	Inform consumers, incentivise reformulation	Main panel not specified	Sodium	Thresholds, multiple category	Per 100 g		Limited categories of high salt foods, (including unpackaged)	N/A	Education campaign, part of major heart health programme with public institution partners/media
Protective Food Logo Slovenia (1993)	Inform consumers		Sodium, saturated fat, total fat, added sugar, fibre, energy	Thresholds, multiple category	Per 100 g/100 mL		Packaged foods and drinks, restaurant meals		
Healthier Choice Symbol Singapore (1998)	Inform consumers	Size, clearance around label, separation from other claims, written government endorsement	Sodium, saturated fat, total fat, total sugar, fibre, calcium, artificial sweeteners	Thresholds, multiple category	Per 100 g/100 mL, per serve	Predictive validity	Packaged foods and drinks, unpackaged fresh foods, restaurant meals		Education campaign, can be used in advertising with approval
Heart Symbol Finland (2000)	Inform consumers, incentivise reformulation		Sodium, saturated fat, unsaturated fat, added sugar, fibre, energy	Thresholds, multiple category	Per 100 g/100 mL	Construct validity	Packaged foods and drinks, restaurant meals		Education campaign
Heart Tick Nigeria (2005)	Inform consumers		Sodium, total fat, trans fat, added sugar, fibre	Thresholds, multiple category			Packaged foods and drinks		
Traffic Light System UK (2006)	Inform consumers, Incentivise reformulation	Legibility, colour, contrast and delineation	Sodium, saturated fat, total fat, total sugar, energy	Thresholds, foods and drinks	Per 100 g/100 mL, per serve		Packaged foods and drinks	Foods exempt from mandatory nutrition labelling in EU law	
Choices Programme Poland (2008), Czech Republic (2011)	Inform consumers	Colour (different colours used for basic and non-basic foods)	Sodium, saturated fat, trans fat, added sugar, fibre, energy, artificial sweeteners	Thresholds, multiple category	Per 100 g/100 mL, per serve, % energy	Multiple construct/ predictive validity peer-review	Packaged foods and drinks, unpackaged fresh foods		
Guideline Daily Amount Thailand (2011)		Written direction: 'should consume in small amounts and exercise for better health'	Sodium, total fat, total sugar, energy	N/A	Per serve	N/A	Limited categories	N/A	Education campaign (consumer facing and food manufacturers)
Traffic Light Labels South Korea (2011)	Inform consumers		Sodium, saturated fat, total fat, total sugar, caffeine		Per serve		Limited categories of children's snack	N/A	Education campaign, part of regulated school zones restricting sales and advertising of unhealthy products
Reference Intakes European Union (2011)	Inform consumers	Size, legibility	Sodium, saturated fat, total fat, total sugar, energy	N/A	Per serve	N/A	Packaged foods and drinks		

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Table 2 Continued

Label, Jurisdiction (Year Endorsed)	Regulatory objectives	Display specifications	Nutrients/Food components included	Nutrient scoring mechanism	Reference amount used	Criteria validated	Scope	Specified exclusions	Policy coherence
Guideline Daily Amount Malaysia (2012)	Inform consumers	Size, monochrome colours	Energy	N/A	Per serve	N/A	Packaged foods and drinks	Special purpose foods, infant formula	Education campaign
Guideline Daily Amount Philippines (2013)	Inform consumers, incentivise reformulation	Size, contrast, placement (lower right hand portion)	Energy	N/A	Per serve	N/A	Packaged foods and drinks		Education campaign (industry led)
Traffic Light Labels Ecuador (2014)	Inform consumers	Size, not compulsory principal panel	Sodium, saturated fat, total fat		Per 100 g/100 mL		Packaged foods and drinks	'Traditional' (unprocessed) foods, for example, fruit, meat, milk; foods without nutritive value	Education campaign
Guideline Daily Amount Mexico (2014)	Inform consumers	Size	Sodium, saturated fat, total fat, total sugar, energy	N/A	Per serve	N/A	Packaged foods and drinks	Herbs and spices, vinegar, foods with less than 1% daily amounts or bulk sale products	
Nutrio-Sello Mexico (2014)	Inform consumers, incentivise reformulation	Size, colour	Sodium, saturated fat, total sugar, energy		Per Serve		Packaged foods and drinks		
Health Star Rating System Australia (2014), New Zealand (2014)	Inform consumers, incentivise reformulation	Five design variants permitted, colour not specified provided sufficient contrast	Sodium, saturated fat, total sugar, protein, fibre, fruit vegetable nut legume, energy	Overall algorithm, operating in six broad categories	Per 100 g/100 mL	Construct validity; peer-reviewed	Packaged foods and drinks	Foods without nutrient declaration, infant formula, formulated supplementary sports foods, foods for special dietary uses, alcohol	Education campaign, aims to align with dietary guidelines, nutrition claims legislation, nutrient reference values, some link to public procurement
Stop Sign Labels Chile (2015)	Inform consumers, incentivise reformulation	Font, size, removal of proximal marketing tools (eg, cartoons), small packs can display on side, written government endorsement	sodium, saturated fat, total sugar, energy	Thresholds, foods and drinks	Per 100 g/100 mL		Packaged foods and drinks	Products with no added sugars, sodium or saturated fat, bulk foods, infant formula, baby food unless has added sugar, foods for special uses, supplements, some sports foods, table-top sugar substitutes	Education campaign Implementing law integrates with advertising restrictions, school food procurement

Continued

Table 2 Continued

Label, Jurisdiction (Year Endorsed)	Regulatory objectives	Display specifications	Nutrients/Food components included	Nutrient scoring mechanism	Reference amount used	Criteria validated	Scope	Specified exclusions	Policy coherence
Traffic Light Labels Iran (2015)	Inform consumers, incentivise reformulation		Sodium, total fat, trans fat, total sugar, energy	Thresholds, foods and drinks	Per 100 g/100 mL		Packaged foods and drinks		
Weqaya Logo United Arab Emirates (2015)	Inform consumers, incentivise reformulation		Sodium, saturated fat, total fat, trans fat, total sugar, fibre, wholegrain, artificial sweeteners	Thresholds, multiple category	Per 100 g/100 mL, Per Serve		Packaged foods and drinks, restaurant meals	Deep fried foods	Link to hospital retail procurement, food outlet menu labelling, part of broader Weqaya NCD reduction programme
Healthy Living Guarantee Croatia (2015)	Inform consumers, incentivise reformulation	Written government endorsement	Sodium, saturated fat, total fat, fibre, wholegrain, added aromas and preservatives	Thresholds, multiple category	Per 100 g/100 mL		Packaged foods and drinks, unpackaged fresh foods		One of five components of Healthy Living National Programme
Traffic Light Labels Sri Lanka (2016 drinks, 2019 food)	Inform consumers, incentivise reformulation	Size, colour, multiple languages, main panel	Sodium, total fat, total sugar	Thresholds, foods and drinks	Per 100 g/100 mL		Packaged foods and drinks	Primary agricultural products, spices, foods for special dietary uses, bulk packs, infant formula	Education campaign, part of National Multisectoral Action Plan on NCDs
Healthier Choices Logo Thailand (2016)	Inform consumers	Size, separation from other statements, contrast	Sodium, saturated fat, total fat, total sugar, fibre, calcium, protein	Hybrid: overall algorithm broad categories and thresholds, multiple categories	Per 100 g/100 mL		Limited categories of food and drink	Infant formula, special purpose foods, supplements, alcohol, medical foods, water	Education campaign
Red Warning Labels Israel (2017)		Principal panel (small pack exception), 'conspicuous manner', size, colour	Sodium, saturated fat, total sugar	Thresholds, foods and drinks	Per 100 g/100 mL		Packaged foods and drinks	Water, tea, coffee, yeast, infant formula, alcohol, special purpose foods	Part of national development strategy
Green Signpost Israel (2017)	Inform consumers		Sodium, saturated fat, total sugar, fibre	Thresholds, multiple categories			Not yet outlined	Products with artificial sweeteners; products that carry red warning labels	Part of national development strategy
Stop Sign Labels Peru (2017)	Inform consumers, incentivise reformulation	Size, front panel, placement (top right corner), written government endorsement and directions 'avoid excessive consumption'	Sodium, saturated fat, trans fat, total sugar	Thresholds, foods and drinks	Per 100 g/100 mL		Packaged foods and drinks		Stop signs must also appear in advertisements, linked to school food procurement

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Table 2 Continued

Label, Jurisdiction (Year Endorsed)	Regulatory objectives	Display specifications	Nutrients/Food components included	Nutrient scoring mechanism	Reference amount used	Criteria validated	Scope	Specified exclusions	Policy coherence
Nutri-Score France (2017), Spain (2018), Belgium (2019)	Inform consumers, incentivise reformulation	Colour, size, placement (lower left hand corner)	Sodium, saturated fat, total sugar, protein, fibre, fruit vegetable nut legume, energy	Overall algorithm, operating in three broad categories	Per 100 g/100 mL	Multiple construct and predictive, peer-reviewed	Packaged foods and drinks	Infant formula, aromatic herbs, teas, coffees, yeasts, alcohol	Part of National Nutrition Health Programme, use will be mandatory in advertisements
Healthier Choice Logo Malaysia (2017)	Inform consumers, incentivise reformulation	Max and min size, colour, separation from brand name, paired with energy icon	Sodium, saturated fat, trans fat, added sugar, fibre, wholegrain, calcium	Thresholds, multiple category	Per 100 g/100 mL, per serve, % wholegrain		Packaged foods and drinks		Education campaign, integrated into school curriculum, part of National Action Plan for Nutrition
Healthier Choice Symbol Brunei (2017)	Inform consumers		Sodium, saturated fat, total fat, trans fat, total sugar, added sugar, fibre, wholegrain, energy, cholesterol	Thresholds, multiple category	Per 100 g/100 mL, % energy, % composition		Packaged foods and drinks		Education campaign
Stop Sign Labels Uruguay (2018)	Inform consumers, incentivise reformulation	Size, main panel, cannot be covered by other elements, placement 'preferably at top'	Sodium, saturated fat, total fat, total sugar (NB fat not counted if from nuts and seeds, sugar does not count if lactose or naturally present in fruit and vegetables)	Thresholds, foods and drinks	Per 100 g/100 mLrecent rapid uptake of label		Packaged foods and drinks	Foods with no added sugars, fats and sodium; foods for medicinal purposes, supplements, infant formula and baby food, sweeteners	Linked to school curricula, linked to public procurement
Good Food Logo Zambia (2018)			Anticipated to cover nutrients relevant to NCDs and micronutrient deficiencies						Education campaign

Notes: Blank cells indicate no relevant information was identified; N/A indicates metric not applicable for example, non-interpretive labels do not employ nutrient criteria.
FOP, front-of-pack; NCD, non-communicable disease.

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'foods' and 'drinks' to determine eligibility for a label (eg, stop sign) or its colour coding (eg, red, orange, green). The two overall spectrum ratings used algorithms to score overall nutritional quality, for example, HSR combined points from up to seven food components to generate an overall rating of 0.5–5.0 in one of six categories.[41]

To produce meaningful scores, regulation must specify a reference amount of the product to be used. Most regulations (20/31) applied criteria per 100 g/100 mL (table 2), consistent with WHO recommendation that this is most useful to facilitate standardised comparisons between products. 'Per serving' was used always or sometimes as a basis for nutrient profiling in 12 regulations, with potential to cause consumer confusion.[11]

Validation of nutrient profiling criteria is important to assess whether they correctly classify product healthfulness. However, some form of validity testing was identified for only six labels (table 2). Five criteria had been assessed against other measures of healthiness (eg, dietary guidelines); only three had been subject to stronger predictive testing of links between scoring criteria and health outcomes.[45] Our results support existing calls to improve the science and selection of nutrient profiling criteria to ensure FOP nutrition labelling promotes genuinely healthier choices.[11 45]

Scope of products included in regulation

WHO guidance suggests regulations apply across most packaged foods to facilitate product comparisons and improve familiarity with the FOP nutrition label.[11] Most current regulations (26/31) aligned with this guidance, applying broadly to packaged foods and drinks that carried a nutrient declaration. Some regulations applied beyond packaged food: six applied to unpackaged foods (eg, fruit, vegetables, fresh meat and seafood); five applied to meals served in restaurants or other catering services (table 2).

WHO guidance also suggests FOP nutrition labelling may not be appropriate for some foods.[11] While exclusions were often not clearly specified in current regulation, no FOP nutrition labelling was allowed on infant formula; other frequent exclusions were foods for special dietary or medical uses, supplements and alcoholic beverages (online supplementary appendix 1). Foods not displaying nutrient declarations (eg, herbs, tea, small packs) were commonly exempted (but not necessarily excluded) (table 2).

Some exclusions varied by label format: for example, Chile and Uruguay excluded products with no added sugars, sodium or saturated fat, meaning intrinsic sources of these nutrients did not carry stop-sign warnings.[19 39] Conversely, the positive Keyhole was not permitted on snacks.[18]

Findings suggest some flexibility for policymakers to determine national scope, provided decisions are justified by health evidence and apply equally to local and imported products.[21]

Policy coherence

Recognising no single action will be sufficient to address the global burden of unhealthy diets; policymakers should support and frame FOP nutrition labelling as part of a comprehensive suite of measures to promote healthier diets.[16 21] To maximise public health impact, the substance of regulation should be aligned with existing measures, for example, food-based dietary guidelines (table 1).[11]

We identified 16 FOP nutrition labels that were supported by education campaigns to promote label use and/or broader nutrition messages, but only six that explicitly identified FOP nutrition labelling as part of broader nutrition, NCD or development plans (table 2). There is potential for innovative regulation to extend utility of FOP nutrition labelling beyond the point of food purchase: six regulations integrated labelling with other interventions, including Chile who stopped foods carrying labels from being sold in schools or marketed to children,[19] and France's agreement to make Nutri-Score mandatory in all food advertisements from 2021.[42]

REGULATORY GOVERNANCE

In addition to form and substance, good governance of the processes by which regulation is developed, implemented, evaluated and enforced is critical to consumer confidence in FOP nutrition labelling (table 1).[27] A summary of data identified on current practice is provided in table 3. The limited nature of available data suggests need for greater attention from policymakers and/or increased transparency in activities undertaken.

Drafting regulatory rules and scheme design

WHO recommends that governments initiate FOP nutrition labelling and retain specific responsibility for setting regulatory objectives, scope and nutrient scoring criteria (table 1).[11] Government-led development is perceived as more credible by consumers.[17]

All mandatory and most voluntary current regulations were initiated by governments, typically through health ministries or statutory food authorities. Five governments noted early engagement across sectors (eg, trade, agriculture, education) (table 3), which is recommended to promote whole-of-government coordination.[16 21] Three voluntary regulations were initiated by civil society, two by industry and one was multistakeholder.

During policy development, government-led stakeholder engagement can facilitate due process and assist development of feasible and acceptable regulation.[11] At the same time, there is a need to ensure that public health policymaking is conducted with safeguards to appropriately manage conflicts of interest.[46]

We identified at least some detail on stakeholder engagement for 19 FOP nutrition labels. Mandatory regulations followed standard procedures for legislative development. In jurisdictions with functioning rule of law, these typically embed principles of good governance

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Table 3 Governance of FOP nutrition labelling regulation

Label, Jurisdiction (Year endorsed)	Initiated by	Stakeholder engagement	Nutrient criteria developed by	Administration	Monitoring	Government-supported evaluation/Review	Review of nutrient criteria	Enforcement strategies
Nordic Keyhole Sweden (1989); Denmark And Norway (2009), Lithuania (2013)			Government, Swedish Food Standards Agency with reference to Nordic Nutrition Recommendations	Government (varies by jurisdiction)	Consumer use, Uptake (industry self-report), compliance, reformulation	Government led evaluation, timeline and framework varies by jurisdiction	Yes, criteria reviewed five times since 1989	Varies by jurisdiction, includes publicity (Denmark), legal remedies under trademark and food law (Sweden)
High Salt Warning Label Finland (1993)	Government, multisectoral engagement			Government (Ministry of Social Affairs and Health)	Reported, detail not available	Broader cardiovascular initiative evaluated, reformulation reported	Thresholds lowered in 2009, extended to unpackaged equivalents 2016	Audits
Protective Food Logo Slovenia (1993)	Civil society (Slovenian Heart Foundation)		Independent experts from Society of Cardiovascular Health	Civil society (Slovenian Heart Foundation)				
Healthier Choice Symbol Singapore (1998)	Government		Government, developed with industry to promote feasibility	Government (Health Promotion Board)	Consumer use, register of products using	Government led evaluation resulted in revisions in 2015	Yes, criteria updated on rolling basis	Licensing, audits, publicity, legal remedies under trademark, removal of approval to use
Heart Symbol Finland (2000)	Civil society (Finnish Heart Association and Finnish Diabetic Association)	Food industry and consumer groups consulted, endorsed by Ministry of Social Affairs and Health	Independent experts, input from government Food Safety Authority and reference to national dietary guidelines	Civil society	Consumer use, uptake		Regular update by independent expert group	Audits
Heart Tick Nigeria (2005)	Civil society (Nigerian Heart Foundation)		Civil society, approved by National Agency for Food and Drug Administration	Civil society, later joined Choices Programme			Now subject to Choices Programme updates	Licensing by Nigerian Heart Foundation
Traffic Light System UK (2006)	Government	Public consultation	Government	Government (Food Standards Agency)	Uptake (industry self-reported)			
Choices Programme Poland (2008), Czech Republic (2011)	Industry	Multistakeholder collaboration	Independent expert group separate of industry collaborators for this process	Multistakeholder committee	Varies by jurisdiction, Consumer use, reformulation		Reviewed every 3–4 years by independent expert committee	Licensing
Guideline Daily Amount Thailand (2011)	Government	Legislative process	N/A	Government (Food and Drug Administration)	Consumer use, uptake	Government, positive results published	N/A	
Traffic Light Labels South Korea (2011)	Government	Legislative process	Government, Minister delegated authority to set thresholds	Government (Ministry for Food and Drug Safety)				Legal remedies under implementing act, including fines
Reference Intakes European Union (2011)	Government	Legislative process, public consultation,	N/A				N/A	
Guideline Daily Amount Malaysia (2012)	Industry	Was initiative of International Food and Beverage Alliance, endorsed by government	N/A	Government (Ministry of Health)				
Guideline Daily Amount Philippines (2013)	Government		N/A	Government (Food and Drug Administration)				Licensing
Traffic Light Labels Ecuador (2014)	Government	Legislative process	Government, adapted from UK traffic lights but adapted to Ecuadorian intake	Government (Ministry of Public Health)	Consumer use			

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Table 3 Continued

Label, Jurisdiction (Year endorsed)	Initiated by	Stakeholder engagement	Nutrient criteria developed by	Administration	Monitoring	Government-supported evaluation/Review	Review of nutrient criteria	Enforcement strategies
Guideline Daily Amount Mexico (2014)	Government	Legislative process, lack of transparency in consultation noted as concern by civil society	N/A	Government (Mexican Federal Commission of Sanitary Risk Prevention)			N/A	
Nutrio-Sello Mexico (2014)	Government		Developed by International Food and Beverage Alliance, not publicly available	Government (Mexican Federal Commission of Sanitary Risk Prevention)				Licensing
Health Star Rating System Australia (2014), New Zealand (2014)	Government	Multistakeholder collaboration with industry, public health, consumer involvement; public consultation	Multistakeholder committee, including industry, public health, consumer groups	Multistakeholder committee, has authority to manage complaints	Framework available: includes consumer use, uptake, reformulation, compliance. Two year monitoring report and data fed into 5year review.	Formal 5year review led by government-appointed independent consultant, public consultation	Yes, focus of formal 5year review	Audits, written requests for amendments, complaint handling mechanism, listing on HSR website
Stop Sign Labels Chile (2015)	Government, multisectoral engagement	Legislative process, public consultation, strategic media engagement	Government, independent experts, tested against data from US Department of Agriculture Database	Government (Ministry of Health)	Consumer use, reformulation, uptake, compliance	Formal evaluation in cooperation with academics, includes changes in product purchases and dietary intakes	Progressively lowering thresholds built into legislation	Audits prioritising school foods
Traffic Light Labels Iran (2015)	Government	Legislative process, consultation with technical committee including food industry and nutrition representatives		Government (Food and Drug Administration)	Uptake			Written requests for amendments, withhold marketing permission
Weqaya Logo United Arab Emirates (2015)	Government	Government led public consultation	Government, thresholds derived from Nordic Keyhole	Government (Health Authority, Food Control Authority, Quality and Conformity Council)				Licensing, audits
Healthy Living Guarantee Croatia (2015)	Government		Government	Government (Croatian Institute of Public Health)		Government evaluation as part of broader Healthy Living strategy		Licensing
Traffic Light Labels Sri Lanka (2016 drinks, 2019 food)	Government	Legislative process, public consultation	Independent experts, drawing on other country experiences	Government (Ministry of Health)	Reformulation, sales			General sanctions available under Food Act
Healthier Choices Logo Thailand (2016)	Government	Multistakeholder, developed with agreement of industry, academics and public sector	Adapted from Choices Programme criteria developed by independent experts	Government (owned by Thai Food and Drug Administration, use managed by Nutrition Promotion Foundation)	Uptake			Licensing, unauthorised use can face jail sentences and fines

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Table 3 Continued

Label, Jurisdiction (Year endorsed)	Initiated by	Stakeholder engagement	Nutrient criteria developed by	Administration	Monitoring	Government-supported evaluation/Review	Review of nutrient criteria	Enforcement strategies
Red Warning Labels Israel (2017)	Government	Legislative process, multistakeholder committee with open meetings and publicly available recordings, public consultation	Government, independent experts	Government	Planned, no detail available	Planned, stated to include sales data	Progressively lowering thresholds built into legislation	
Green Signpost Israel (2017)	Government	Multistakeholder committee with open meetings and publicly available recordings, public consultation	Government, independent experts, adapted from Nordic Keyhole	Government				
Stop Sign Labels Peru (2017)	Government	Legislative process		Government			Progressively lowering thresholds built into legislation	Fines
Nutri-Score France (2017), Spain (2018), Belgium (2019)	Government	Formal process directed by government under Health Law, public consultation,	Government, French High Council of Public Health commissioned to affirm	Government (Santé Publique France)	Consumer Use, Uptake (industry must register use on government website), Reformulation	Government-supported, conducted after 3 years, conducted by Observatory of Nutritional Food Quality.	Planned to review as part of evaluation framework	Written requests for action, suspending or revoking right to use logo, legal action to protect trademark misuse
Healthier Choice Logo Malaysia (2017)	Government	Multistakeholder collaboration, input from Choices Programme	Adapted from Choices Programme developed by independent expert group	Government (Ministry of Health)	Uptake (list of products available on government website)		Criteria reviewed 'from time to time'	Licensing, audits, withdrawal of approval, other legal remedies
Healthier Choice Symbol Brunei (2017)	Government		Government, adapted from Singapore's Healthier Choice Logo and WHO criteria	Government (Ministry of Health)	Uptake, surveillance of labels in supermarkets			Licensing, written requests for amendment
Stop Sign Labels Uruguay (2018)	Government, multisectoral engagement	Legislative process, international expert input, public consultation	Government, modifying the Pan American Health Organisation Nutrient Profile Model	Government (Ministry of Public Health)	Stated but detail not available			Legal remedies under Law of Public Health
Good Food Logo Zambia (2018)	Multistakeholder		Multistakeholder with experts from government, nutritionists, academics, scientists with input from private sector	Government				

Notes: Blank cells indicate no relevant information was identified; N/A indicates metric not applicable for example, non-interpretive labels do not employ nutrient criteria.
FOP, front-of-pack.

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such as due process and public consultation. While useful in promoting accountability, these procedures are not necessarily failsafe: in Mexico, lack of transparency during public consultation raised concern that industries were more heavily consulted than academics or civil society organisations.[47] Mexico subsequently adopted a non-interpretive label (figure 1). Voluntary regulations were also frequently preceded by public consultation, but in limited cases also elevated industry to collaborator or member of committees developing the substance of regulation (table 3). Beyond a right to be heard through consultation, these collaborative arrangements create additional need for safeguards to ensure health objectives are not undermined by commercial interests.

The particular need to maintain the scientific integrity of committees developing nutrient profiling criteria is recognised in WHO recommendations that this process run parallel but independent and siloed from broader stakeholder engagement.[11] Where detail was identified for current regulations, only 4/22 governments engaged industry in nutrient profiling development (table 3). They include Australia and New Zealand's HSR system, where a government-commissioned independent review recently recommended industry be distanced from future nutrient profiling updates.[41] The need for nutrient profiling to remain free from commercial interests can be seen elsewhere in the industry-led Choices Programme, which created a separate 'independent scientific committee' specifically for this task.[48]

Unlike the Framework Convention on Tobacco Control's Article 5.3 in a tobacco control context,[49] there is currently no binding international law requiring government to exclude the food industry from health policy development. Available guidance includes a proposed approach for prevention and management of conflicts of interest in national nutrition policymaking discussed by the WHO Executive Board in 2018.[46] In Canada, where FOP nutrition labelling regulations are currently being developed, the government will accept submissions during public consultation periods but will not meet with the food and beverage industry outside this to safeguard policy development.[50] Divergence in current practice more broadly highlights the need for further guidance for policymakers on appropriate engagement with the food industry in the governance of FOP nutrition labelling.[23]

Administration

To promote accountability, labelling regulations should be administered by government or an independent body with requisite authority to monitor and enforce regulation (table 1). Evaluation of current practice suggested governments administered 25/31 current labelling schemes. Three were administered by civil society organisations, which were independent but may lack authority or resource to enforce regulation (table 3). HSR and Choices used multistakeholder committees, again creating need for conflict of interest safeguards. In the context of administrative committees, appropriate measures could include conducting meetings publicly with publicly available minutes, and stakeholders recusing themselves from decisions where a conflict exists (eg, where an industry representative is required to assess the compliance of one of their members with regulation).

Monitoring and evaluation

Structured, regular review ensures regulation is meeting its objectives and supports continuous improvement. Best-practice requires policymakers to set a framework during development that includes baseline data, performance indicators and appropriate timeframes (table 1).

The absence of systematic monitoring and evaluation with publicly available outcomes was a key limitation of current practice in our evaluation. Government-supported monitoring was reported for just over half of regulations; only one-third of regulations had been subject to some form of evaluation. There was suboptimal monitoring of outcomes necessary to demonstrate achievement of regulatory objectives: 10 labels monitored consumer understanding and use, 7 monitored reformulation. Only 11 monitored industry uptake, necessary to judge impact and compliance with regulation (table 3).

Some newer regulations showed elements of stronger practice. HSR had a government-appointed independent reviewer with publicly available Terms of Reference.[41] Nutri-Score was implemented with publicly funded evaluation using a variety of data sources.[42] Governments of Chile and Israel proposed evaluation with independent academics;[36] Israel also planned to obtain sales data (online supplementary appendix 1).

FOP nutrition label performance was also subject of ad hoc independent research. For example, the HSR website noted 45 peer-reviewed papers between 2014 and 2019.[41] While contributing valuable insight, this work does not obviate the need for systematic government-supported evaluation.

Specific evaluation of nutrient profiling criteria is necessary to ensure regulation evolves with nutrition science.[11] Only one-third of current regulations had relevant mechanisms to trigger this process. Legislation in Chile, Israel and Peru incorporated progressively lowering nutrient thresholds to incentivise continuing industry reformulation; Finland had also updated salt warning legislation. Five positive signposts reviewed criteria at prespecified intervals; Keyhole criteria had been updated five times.[18] HSR's algorithm was a focus of its 5-year review.[41]

Enforcement

Effective enforcement of regulation promotes compliance with regulation (table 1). Sanctions or rewards were identified in only around half of FOP nutrition label regulations but provided insight into the range of options available (table 3). Ten labels licensed products prior to market sometimes with associated cost (online supplementary appendix 1), though utility of this feature may be practically limited to positive signposts. Other

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incentives for voluntary uptake included listing participating companies on government websites.

Once on shelves, at least seven regulations audited products for compliance. Sanctions for non-compliance varied widely. Positive signposts could withdraw approval for use. Four labels used written requests to manufacturers for amendment (table 3). Non-compliance with Ecuador's label could result in cancellation of advertising permits.[32] In South Korea, Sri Lanka and Uruguay, general sanctions under relevant Food Acts applied, for example, fines and potentially jail sentences (online supplementary appendix 1). Even in voluntary systems, legal action was possible, for example, to protect misuse of trademarked logos. HSR was the only system identified that had its own complaints handling mechanism.[41]

For all systems, lack of identified information on whether sanctions are being used suggests potential to strengthen enforcement action and/or improve transparency of activity.

CONCLUSION

Development and implementation of FOP nutrition labelling regulation requires much more than the selection of 'stars', 'traffic lights' or 'stop signs.' While growing government endorsement of more effective label formats and use of mandatory legal frameworks holds public health promise, policymakers must still ensure the substance of regulation is strategically drafted to support policy objectives. They must also apply principles of good governance in regulatory processes to protect health policymaking from undue commercial interference, support continuous improvement and retain the trust of consumers as end users.

This paper applies a comprehensive public health law framework to demonstrate how factors often considered outside the realm of public health such as regulatory drafting and good governance can support or undermine health outcomes. This study benefited from its global remit but was limited by reliance on publicly available information, particularly on governance processes. Whether developing new FOP nutrition labels or reforming existing ones, these findings provide support for policymakers to design and implement best-practice, evidence-informed regulation.

Author affiliations
[1]Food Policy, The George Institute for Global Health, UNSW, Sydney, NSW, Australia
[2]Charles Perkins Centre, University of Sydney, Sydney, NSW, Australia
[3]Department of Epidemiology and Biostatistics, School of Public Health, Faculty of Medicine, Imperial College London, London, United Kingdom
[4]Sydney Law School, University of Sydney, Sydney, NSW, Australia
[5]National Centre for Health Innovation, The University of Auckland, Auckland, New Zealand
[6]Menzies Centre for Health Policy, School of Public Health, The University of Sydney, Sydney, NSW, Australia

Twitter Alexandra Jones @alikjones and Cliona Ni Mhurchu @ClionaNiMhurchu

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ORCID iD
Alexandra Jones http://orcid.org/0000-0001-5039-144X

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