

Landscape analysis of environmental, social and governance (ESG) investing metrics for consumer nutrition and health in the food and beverage sector

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ABSTRACT

Introduction The private sector plays a critical role in influencing food choices and health outcomes of consumers. Among private sector actors, investors are a powerful yet underutilised stakeholder for driving scalable public health impact. There are systems to facilitate investors' involvement, notably environmental, social and governance (ESG) investing, which is well placed to include an assessment of business risks to social well-being. However, nutrition efforts within the ESG agenda (ESG-Nutrition) are nascent. We aimed to critically assess the strength of existing ESG-Nutrition metrics to advance the science of measuring business impacts on consumer nutrition and health.

Methods ESG-Nutrition metrics were extracted from eight ESG frameworks and categorised across four domains: product portfolio healthfulness; product distribution and equity; product marketing and labelling; and nutrition-related governance. The strength of each metric was evaluated and scored 1–3 (best), independently by two researchers, based on six attributes: materiality, objectivity, alignment, activity, resolution and verifiability. The total score (range 6–18) and intercorrelation for each attribute was calculated.

Results Across 529 metrics, most related to product marketing and labelling (n=230, 43.5%), followed by product healthfulness (n=126, 23.8%), nutrition-related governance (n=108, 20.4%) and product distribution and equity (n=65, 12.3%). Across all metrics, average total score was 10.94 (1.58), with average attribute scoring highest for verifiability (mean: 2.36 (SD: 0.57)), objectivity (2.11 (0.61)) and materiality (2.01 (0.68)) and lowest for activity (1.83 (0.74)), alignment (1.37 (0.67)) and resolution (1.26 (0.65)). Most intercorrelations were null, suggesting attributes were measuring distinct characteristics of each metric. Significant heterogeneity across domains and frameworks was also observed.

Conclusions This research identifies a range of nutrition-related metrics used in ESG frameworks with respect to food companies, but with substantial heterogeneity in relevant nutrition domains covered and strength of each metric. Efforts are required to improve the quality of metrics across frameworks, establish standardised reporting and align these with investor priorities.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Environmental, social and governance (ESG) investing is increasingly recognised as a powerful lever to shift business practices, but the types and quality of existing ESG metrics for evaluating business risks relevant to nutrition are uncertain.

WHAT THIS STUDY ADDS

⇒ ESG metrics for evaluating food business risks are available, but substantial heterogeneity was identified in the nutrition domains considered and strength of each metric.
⇒ Particular gaps were seen in metrics to evaluate equitable distribution of healthy foods, raising questions about the impact of market-based food sector solutions on health inequities.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Efforts are required to unify around a definition of product healthfulness, develop quantitative definitions of affordability and accessibility and advance relevant aspects of marketing and governance for nutrition impact.
⇒ Further research and implementation of standardised ESG-Nutrition metrics can help drive scientifically rigorous ESG investing to improve nutrition, health and health equity.

INTRODUCTION

Poor nutrition is a leading cause of global morbidity, mortality and health, economic and social inequities for current and future generations.¹ Critically, these burdens have now become recognised as private sector risks due to consumer demand for healthier food and accountability; increasing healthcare spending and reduced work productivity due to diet-related diseases; and building political momentum for strong policy and regulatory actions including taxation, marketing restrictions, procurement standards and warning labels on unhealthy foods.^{2–8} Public

health efforts should better leverage private sector actors, including investors, as these risks present tremendous opportunities for driving financial success through the development and distribution of food products that improve health, increase health equity and reduce health-care spending.

In recognition of sustainability-related business risks and opportunities, an increased focus on environmental, social and governance (ESG) factors as a part of investment decision-making has popularised in recent years, driving measurement of non-financial risks and investments in improvements to planetary and societal well-being. Global assets invested using ESG principles may surpass \$41 trillion by the end of 2022 and \$50 trillion by 2025, representing a third of projected assets under management (AUM) globally.⁹ While the food sector has seen some investment momentum towards sustainable agriculture and planetary health,^{10 11} investing efforts to address the nutrition and human health risks of the food system (ESG-Nutrition) have not been rigorously evaluated.

Investor interest and activism in the area of nutrition are growing, supported by non-profit organisations such as Access to Nutrition Initiative (ATNI), Food Foundation and ShareAction. For example, ShareAction has launched a Healthy Markets Initiative to pressure food companies and retailers to publicly report on and increase the proportion of their healthful product portfolio and sales.^{12 13} At the 2021 Nutrition-4-Growth Summit, a landmark pledge by 53 institutional investors representing \$12.4 trillion AUM called on food and beverage companies to use a nutrient profiling system (NPS) to define healthy products; report on the healthfulness of product portfolios and sales and adopt SMART (specific, measurable, achievable, relevant and time bound) governance, strategy, lobbying and transparency commitments.¹⁴ In parallel to the US White House Conference on Hunger, Nutrition and Health in September 2022, a coalition of investors developed the Food, Nutrition and Health Investor Coalition, pledging \$2.5 billion in private investment at the convergence of food technology and human health.¹⁵ Yet, while these investor and advocacy efforts are building momentum around nutrition, there are not standardised measurement tools used across the food sector to rate their approach.

For ESG-Nutrition investing to yield meaningful health outcomes, a set of standardised, science-based metrics is required, validated for impact and with appropriate data sources. In previous work, broad global trends and developments in approaches taken by capital markets to address nutrition and obesity prevention were summarised, including a review of ESG reporting standards and food-sector specific accountability initiatives.¹⁶ However, to date, the quality of metrics and gaps in such reporting standards/initiatives has not been comprehensively analysed.

To address these knowledge gaps, we critically documented and assessed the strength of metrics across ESG

frameworks aiming to measure food sector business practices and reporting related to consumer nutrition and health across four major domains. We further synthesised gaps in the universe of available ESG-Nutrition metrics, and provided recommendations for how to advance the science and implementation of a rigorous and evidence-based ESG-Nutrition agenda.

METHODS

Identification of existing ESG frameworks

An overview of the methods for the present investigation is provided as a flowchart (figure 1).

Building on previous work, we identified major non-governmental ESG reporting standards and benchmarking and accountability initiative indices relevant to the food and beverage industry,¹⁶ here referred to as 'ESG frameworks'. This exploration was limited to standards relevant to consumer-facing food and beverage business: manufacturing, retail, restaurants and food service. An ESG framework was defined as a standardised disclosure guideline, framework or assessment for investors, businesses or non-profit organisations to measure, manage and report impacts on ESG issues. From the identified ESG frameworks, we selected for our review those that met all of the following criteria: (1) non-proprietary and publicly accessible; (2) prescribes specific measurement methods such as material metrics or guiding questions to assist a company's ESG disclosure; (3) includes any mention of nutrition and health within the framework and (4) in English and published between 2012 and 2022.

Metric identification and extraction

For each identified ESG framework, we identified and categorised metrics across four thematic domains, previously recognised for businesses impact on nutrition² (figure 1): product portfolio healthfulness; production distribution and equity; product marketing and labelling and nutrition-related governance. We excluded non-nutrition metrics related to employee health and wellness, food loss and food waste, food safety and non-food-related health hazards, and also excluded corporate metrics related to strategy, governance, management and stakeholder engagement, unless a goal around nutrition or health was explicitly included. For each selected metric, we extracted the details on metric use (ie, scoring criteria, categories of assessment or any additional information about definitions and referenced codes or guidelines) and the food subsector pertaining to the metric (manufacturing, retail, restaurants, or food service).

Product portfolio healthfulness metrics encompassed those that assess the healthfulness of a company's product portfolio. Such metrics could assess commitments, targets, performance or outputs; assess either the full portfolio or specific components; and assess healthfulness based on a broad definition or specific nutrients/ingredients of concern. Product distribution and equity metrics were those that assess company efforts around

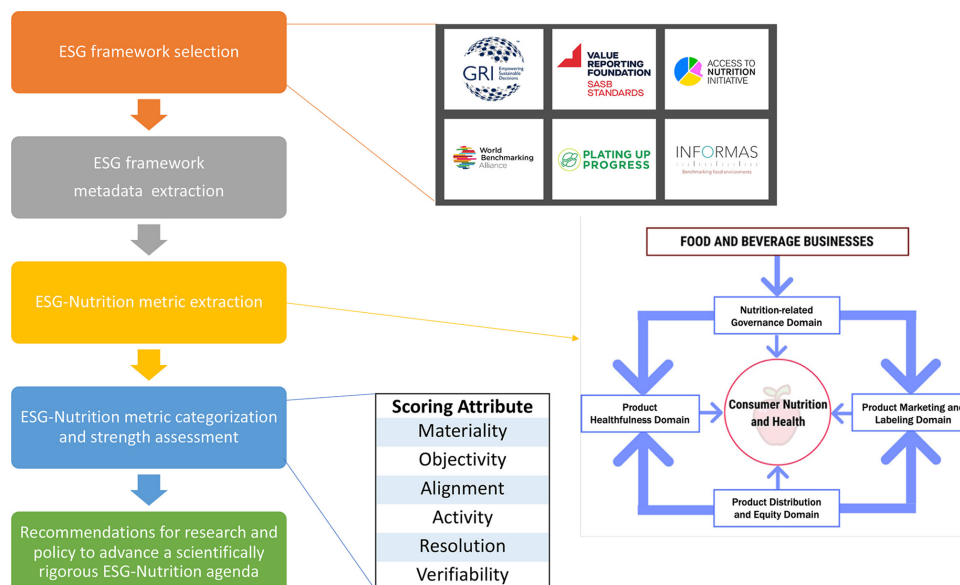


Figure 1 Overview of methods for the landscape analysis of environmental, social and governance (ESG) investing metrics for consumer nutrition and health. ESG frameworks were selected from two ESG global reporting standards (GRI and SASB) and four food sector-specific accountability initiatives/indices (ATNI, WBA, PUP and INFORMAS). Metrics were extracted across four thematic domains related to consumer nutrition and health: product healthfulness, product distribution and equity, product marketing and labelling and nutrition-related governance. Six scoring attributes developed de novo were used to assess the strength of each metric: materiality, objectivity, alignment, activity, resolution and verifiability. Each attribute was graded on a scale of 1–3 (best), and scoring was conducted independently by two investigators on the research team. Any differences in scoring were resolved by discussion and consensus. See table 1 for definitions, scoring delineations and examples for each scoring attribute. Semi-quantitative analysis of the scoring of all extracted metrics was used to provide recommendations for future research and policy to advance a scientifically rigorous ESG-Nutrition agenda. ATNI, Access to Nutrition Initiative; GRI, Global Reporting Initiative; INFORMAS, International Network for Food and Obesity/Non-communicable Diseases (NCDs) Research, Monitoring and Action Support; PUP, Plating Up Progress; SASB, Sustainability Accounting Standards Board; WBA, World Benchmarking Alliance.

the distribution of healthful versus less healthful products, for example across geographic, socioeconomic, racial and ethnic groups. Such metrics could assess commitments, specific strategies employed or performance on these commitments and strategies to enhance the affordability and accessibility of healthful products and/or disincentivise less healthful products. Product marketing and labelling metrics included those that assess company efforts related to the marketing and labelling of healthful versus less healthful products, and how marketing efforts varied across subpopulations. Such metrics could assess commitments, strategies, adherence to national or international standards and performance on promoting the consumption of healthful products and reducing the consumption of less healthful products through responsible marketing and labelling. Business nutrition-related governance metrics involved those that assess a company’s broader governance practices related to nutrition and human health. Such metrics could assess commitments, strategies, adherence to international guidelines and performance related to commercial and philanthropic operations, risk assessments, accountability arrangements, reporting, lobbying, partnerships and engagement, funding and research, development and innovation.

Assessment of metric strength

Without an established or validated set of metric scoring criteria from the literature, we constructed a set of six scoring attributes de novo based on common challenges raised by stakeholders in the ESG investing space as well as expert opinion on metric development. The six scoring attributes used to assess the strength of each metric were as follows: materiality, objectivity, alignment, activity, resolution and verifiability, each graded on a scale of 1–3 (best) independently by two investigators on the research team (table 1). Any differences in grading were resolved by discussion and consensus. *Materiality* assesses the metric’s validity and relevance for evaluating impacts on consumers nutrition and health through its ascribed impact pathway (ie, ESG-Nutrition domain). See online supplemental text S1 for what constitutes an ideal, materiality metric for each domain. *Objectivity* evaluates the extent to which subjective decisions are required for reporting and scoring based on how the metric is worded and thereby interpreted, as well as the clarity of guidance for reporting, with objective metrics that require few assumptions scoring highest. *Alignment* assesses the extent to which the metric references specific, existing targets or guidelines within international and national frameworks, standards or codes. *Activity* assesses which output of the

Table 1 Scoring attributes, definitions, scoring delineation and illustrative ESG-Nutrition metric examples used in the present investigation

Scoring attribute and definition	Scoring delineation and examples		
	1	2	3
Materiality: validity and relevance for evaluating impacts on consumers nutrition and health through ascribed ESG-Nutrition domain*	Not valid or relevant <i>Example: Company has a target for, and reports on, a % shift in protein procurement or sales that comes from animal vs plant-based protein sources</i>	Limited validity or relevance <i>Example: Has the company committed to removing or reducing the number of less healthy items from at least one prominent location (eg, store entrances, aisle ends, checkouts, etc, and their online equivalents)?</i>	Highly valid and relevant <i>Example: Assessment of the overall healthiness of the product portfolio, measured as the sales-weighted mean HSR score: (value between 0 and 100)</i>
Objectivity: extent to which subjective decisions are required for reporting and scoring, as well as the clarity of guidance for reporting	Many substantial subjective decisions required <i>Example: Has the company committed to using other shelf/in-store (and online equivalents) labelling to identify less healthy products and/or healthy products?</i>	At least one substantial, or several moderate, subjective decisions required <i>Example: Does the company have a policy to limit their in-store promotion of unhealthy products?</i>	No substantial subjective decisions required <i>Example: Revenue from zero-calorie and low-calorie, no-added-sugar and artificially sweetened beverages</i>
Alignment: references specific, existing international or national frameworks, standards or codes	No reference <i>Example: Does the company have a clear strategy, and one or more quantitative targets, to specifically improve the affordability of healthy products?</i>	Broad reference <i>Example: Percentage of meal options consistent with national dietary guidelines, and revenue from these options</i>	Specific references to targets or guidelines <i>Example: Does the company's policy position support WHO's position on product reformulation in relation to nutrients of concern, as articulated in the Global Action Plan for the Prevention and Control of NCDs 2013–2020?</i>
Activity: What aspect of business operations are measured?	General commitments <i>Example: Does the company commit not to sponsor materials, people or activities popular with children and/or adults except in conjunction with healthy products/products low in sugar/calories/salt/fat?</i>	Processes, strategies or targets <i>Example: Does the company fortify only products of high underlying nutritional quality, that is, meeting certain nutrition criteria?</i>	Outputs, sales or impacts on key stakeholders <i>Example: Total number of incidents of non-compliance with regulations and/or voluntary codes concerning product and service information and labelling</i>
Resolution: type of data reported	Binary or categorical <i>Example: Does the accountability arrangement for implementing the company's nutrition strategy and/or programme explicitly cover: The company's commercial strategy/programme for improving the affordability and availability of its healthy products?</i>	Detailed description <i>Example: Policies and practices on communication to consumers about ingredients and nutritional information beyond legal requirements</i>	Quantitative <i>Example: In what percentage of relevant markets has the company rolled out its full Front-Of-Pack labelling commitments, that is, all products (95% or more) in those markets are labelled according to the commitments?</i>
Verifiability: source of data for reporting/scoring	Not clearly available from private or public sources <i>Example: Percentage of advertising impressions (1) made on children and (2) made on children promoting products that met dietary guidelines</i>	Commonly available from private sources, or can be aggregated from public sources with substantial effort <i>Example: What progress has the company made in achieving its saturated fats target?</i>	Readily available from public sources <i>Example: Does the company publicly state that its approach to formulation or reformulating products is aligned to (inter) national (or regional, eg, EU) dietary guidelines?</i>

*See online supplemental text S1 for what a material metric for each ESG-Nutrition domains.

ESG, environmental, social and governance; EU, European Union; HSR, Health Star Rating; NCD, non-communicable diseases.

company the metric evaluates (commitments, processes/strategies or performance/sales), with performance/sales outputs scoring highest. *Resolution* evaluates the type of data the metric collects (categorical, descriptive or continuous/quantitative), with continuous/quantitative data scoring highest. *Verifiability* assesses whether the information required for measurement and reporting on a metric is likely to be publicly or privately available.

Statistical analyses

The number and frequency (%) of metrics and mean (SD) score for each attribute within each ESG-Nutrition domain and ESG framework were calculated. Scoring across the six attributes were also summed for a total score, and reported for each metric (range 6–18). The Spearman intercorrelation for the six scoring attributes was calculated to assess the independence of each attribute. Heatmaps were utilised to summarise the relative scoring of metrics within a particular ESG-Nutrition domain and by ESG framework. All analyses were performed using R statistical software, R V.4.0.0 (4 August 2022).

Patient and public involvement

It was not appropriate or possible to involve patients or the public in the design, conduct, reporting or dissemination plans of the present research investigation.

RESULTS

Characteristics of ESG-Nutrition metrics

Eight major ESG frameworks were evaluated, including the Access to Nutrition Initiative (ATNI) Global Index 2021, ATNI UK Retail Index 22 (ATNI UK), International Network for Food and Obesity/NCDs Research, Monitoring and Action Support (INFORMAS) Business Impact Assessment-Obesity 2019 (BIA-Obesity), Global Reporting Initiative Global Standards 2016 (GRI), GRI Processed Food Sector Standards 2014 (GRI PF), Food Foundation Plating Up Progress 2022 (PUP), Sustainability Accounting Standards Board 2018 (SASB) and World Benchmarking Alliance Food and Agriculture Benchmark 2022 (WBA) (online supplemental table S1). Across the eight ESG frameworks, a total of 529 ESG-Nutrition metrics were identified and assessed, including 401 unique metrics (ie, several metrics were repeated for different food subsectors within a given ESG framework). Most metrics related to product marketing and labelling (n=230 metrics, 43.5%), followed by product healthfulness (126, 23.8%), nutrition-related governance (108, 20.4%) and product distribution and equity (65, 12.3%) (table 2).

By framework, the greatest number of metrics were from BIA-Obesity (189, 35.7%), followed by ATNI (122, 23.1%); and the least from GRI (4, 0.8%) and GRI processed foods (6, 1.1%) (online supplemental table S2). Most of the identified metrics were specific to the food manufacturing (212 40.1%) and food retail (198,

37.5%) subsectors, with the remainder specific to restaurants (88, 16.6%), catering (27, 5.1%), or general to all sectors (4, 0.8%).

Strength of ESG-Nutrition metrics

Across all 529 metrics, the mean (SD) total score for all six attributes (range 6 to 18 (best)) was 10.94 (1.58). Attribute scores were generally highest for *verifiability* (2.36 (0.57)), followed by *objectivity* (2.11 (0.61)) and *materiality* (2.01 (0.68)), while *activity* (1.83 (0.74)), *alignment* (1.37 (0.67)) and *resolution* (1.26 (0.65)) scored lowest (table 2). The rationale for assigned scoring across the six attributes is provided for illustrative metrics within each of the four ESG-Nutrition domains (online supplemental table S3). The list of unique metrics, metric guidance and scoring for all six scoring attributes are provided in the supplement (online supplemental table S4).

Intercorrelations of scoring attributes

Considering the intercorrelation of each scoring attribute, *activity* and *resolution* had a positive correlation (0.40), followed by *objectivity* and *alignment* (0.21) (online supplemental figure S1). This suggests that metrics evaluating performance or sales outputs tended to be quantitative, while metrics evaluating commitments tended to be categorical. For example, 'percentage of total sales volume of consumer products, by product category, that are lowered in saturated fat, trans fat, sodium and added sugar' (GRI Processed Foods) requires the reporting entity to provide a quantitative sales estimate; whereas 'Does the company publish a comprehensive set of commitments or objectives related to new product development and reformulating its existing products with respect to reducing the nutrients of concern and energy (salt, saturated fats, trans fats, free sugar and kilojoules)?' (BIA-Obesity) has categorical response options for the reporting entity to select. While more objective metrics generally aligned with existing standards, codes or frameworks, some metrics with clear alignment to national standards still require complex and subjective decisions (eg, 'percentage of children's meal options consistent with national dietary guidelines for children, and revenue from these options' (SASB, restaurants) requires the reporting entity to decide on the range of meal option permutations available and how to map single meal options to guidelines about overall diet quality).

Verifiability and *activity* had the strongest inverse correlation (−0.65) followed by *verifiability* and *resolution* (−0.34). In other words, metrics requiring data that were publicly available tended to measure commitments and be categorical in resolution. All remaining scoring attributes had null intercorrelations, suggesting they represent independent measures of distinct characteristics of each metric.

Strength of ESG-Nutrition metrics by domain

There was little variation in the mean total score by domain, with highest mean total scores in the product healthfulness and nutrition-related governance (11.04

Table 2 Characteristics and mean attribute score of 529 ESG-Nutrition metrics,* by ESG-Nutrition domain

	ESG-Nutrition domain				Total
	Product healthfulness	Product distribution and equity	Product marketing and labelling	Nutrition-related governance	
	126 metrics (23.8%)	65 metrics (12.3%)	230 metrics (43.5%)	108 metrics (20.4%)	529 (100%)
Frameworks, n (%)†					
ATNI	19 (15.1)	15 (23.1)	40 (17.4)	48 (44.4)	122 (23.1)
ATNI UK	35 (27.8)	12 (18.5)	33 (14.3)	11 (10.2)	91 (17.2)
BIA-Obesity	32 (25.4)	19 (29.2)	92 (40)	46 (42.6)	189 (35.7)
GRI	0 (0)	0 (0)	4 (1.7)	0 (0)	4 (0.8)
GRI-processed foods	2 (1.6)	0 (0)	1 (0.4)	3 (2.8)	6 (1.1)
PUP	9 (7.1)	3 (4.6)	6 (2.6)	0 (0)	18 (3.4)
SASB	9 (7.1)	0 (0)	6 (2.6)	0 (0)	15 (2.8)
WBA	20 (15.9)	16 (24.6)	48 (20.9)	0 (0)	84 (15.9)
Subsector, n (%)‡					
All	0 (0)	0 (0)	4 (1.7)	0 (0)	4 (0.8)
Catering	8 (6.3)	5 (7.7)	14 (6.1)	0 (0)	27 (5.1)
Manufacturing	39 (31)	24 (36.9)	83 (36.1)	66 (61.1)	212 (40.1)
Restaurants	24 (19)	12 (18.5)	37 (16.1)	15 (13.9)	88 (16.6)
Retail	55 (43.7)	24 (36.9)	92 (40)	27 (25)	198 (37.4)
Scoring attributes, mean score (SD)§					
Materiality	1.94 (0.78)	2.28 (0.74)	1.87 (0.88)	2.20 (0.72)	2.01 (0.68)
Objectivity	1.93 (0.75)	1.83 (0.74)	2.15 (0.76)	2.39 (0.78)	2.11 (0.61)
Alignment	1.40 (0.83)	1.14 (0.68)	1.53 (0.87)	1.15 (0.67)	1.37 (0.67)
Activity	2.17 (0.85)	1.80 (0.88)	1.66 (0.89)	1.82 (0.69)	1.83 (0.74)
Resolution	1.58 (0.93)	1.03 (0.42)	1.24 (0.80)	1.07 (0.54)	1.26 (0.65)
Verifiability	2.02 (0.73)	2.48 (0.71)	2.50 (0.75)	2.40 (0.73)	2.36 (0.57)
Total score¶	11.04 (1.30)	10.55 (1.02)	10.95 (1.35)	11.04 (1.02)	10.94 (1.58)

*Metrics extracted from eight ESG frameworks across four broad domains. Metrics on topics related to employee health and wellness and workforce nutrition; food loss and food waste; food safety and non-food-related health hazards (chemical exposure, etc) were excluded from this analysis. We also excluded general metrics related to strategy, governance, management and stakeholder engagement, unless health or nutrition was explicitly mentioned.

†ESG frameworks included non-governmental ESG reporting standards and food sector benchmarking and accountability initiative indices, and were selected for this investigation based on the following criteria: non-proprietary and publicly accessible; prescribes explicit measurement methods such as material metrics or guiding questions to assist a company's ESG disclosure; includes any mention of nutrition and health within framework; in English and published between 2012 and 2022.

‡ESG frameworks defined subsector of the food industry each metric was relevant for. Duplicative metrics (ie, same metric within a framework, but for different subsector) were counted separately in this table. Of the 529 ESG-metrics assessed, 401 were unique.

§Scoring delineations (1–3) for each scoring attribute provided in table 1. Scoring was completed in duplicate by two investigators, and any discordance in scoring was discussed until consensus was reached.

¶Sum of six scoring attributes, all with equal weight. Theoretical range from 6 to 18.

ATNI, Access to Nutrition Initiative; BIA, Business Impact Assessment; ESG, environmental, social and governance; GRI, Global Reporting Initiative; PUP, Plating Up Progress; SASB, Sustainability Accounting Standards Board; WBA, World Benchmarking Alliance.

(1.30) and 11.04 (1.02), respectively) domains, followed by marketing and labelling (10.95 (1.35)) and product distribution and equity (10.55 (1.02)) domains (table 2). Although these mean total scores did not vary much by domain, individual attribute scores across domains were heterogeneous (table 2, figures 2 and 3).

Materiality scored highest for product distribution and equity (2.28 (0.74)) and nutrition-related governance (2.20 (0.72)) metrics, suggesting that metrics within these domains tended to be better, more relevant surrogates for their respective domain. In general, metrics scored

higher for *materiality* when they comprehensively assessed the content and quality of activities within a domain of interest, not just whether the activity exists or its coverage. This included when metrics defined healthy food based on a robust, externally validated NPS rather than isolated nutrients or ingredients; assessed business efforts comprehensively (eg, financial incentives or increased marketing for healthful foods and disincentives or marketing restriction for unhealthful products for the entire population; all marketing efforts rather than one narrow aspect); evaluated governance efforts closest to improving nutrition

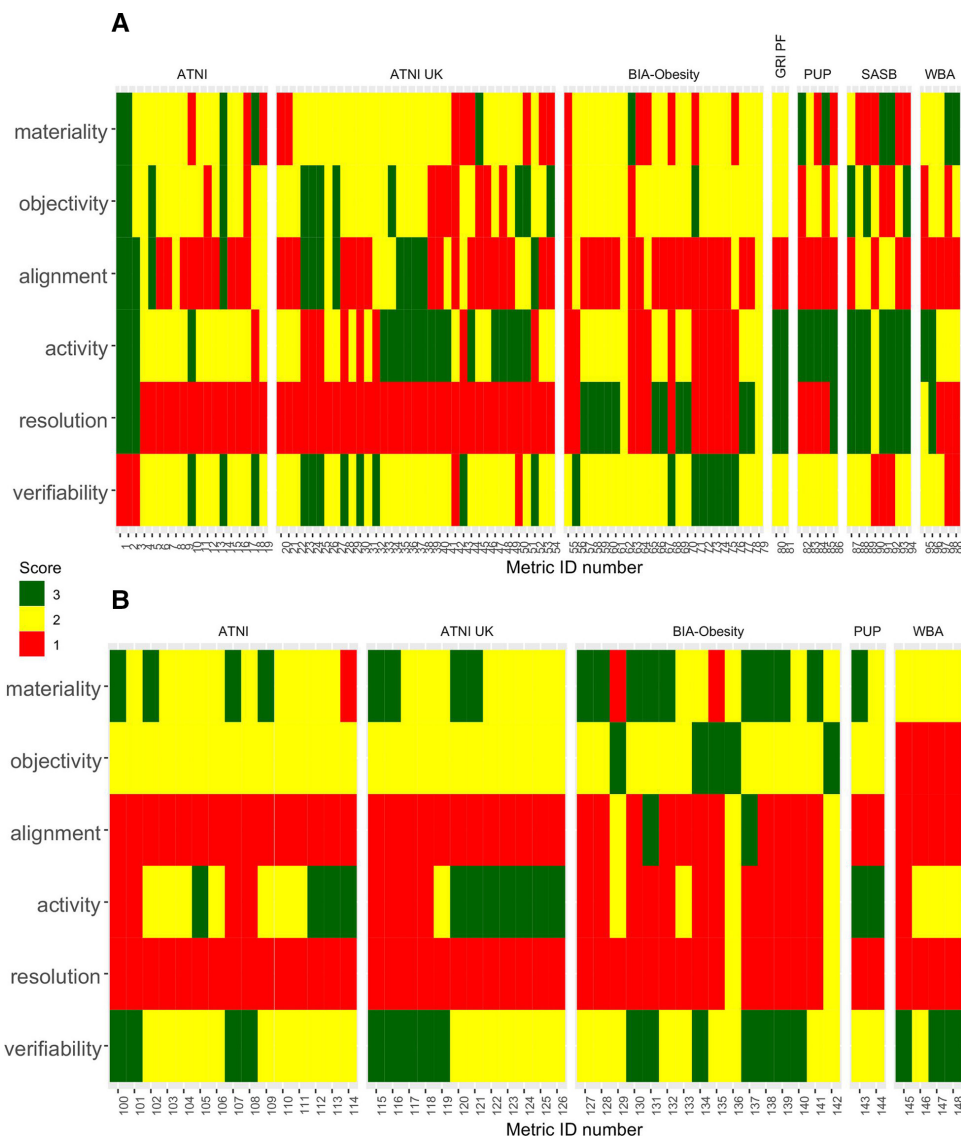


Figure 2 Scoring results of each ESG-Nutrition metric within the product healthfulness and product distribution and equity domains, grouped by ESG framework. Heatmap representing the strength of all unique, extracted ESG-Nutrition metrics in the (A) product healthfulness and (B) product distribution and equity domains, assessed on a scale of 1 (red) to 3 (green), for six scoring attributes: metric materiality, metric objectivity, metric alignment, metric activity, metric resolution and verifiability. See table 1 for scoring delineation for each scoring attribute. The metric strength assessment was completed in duplicate by two research team members, and any discrepancies in scoring were discussed until consensus was reached. Duplicative metrics (ie, same metric within a framework with identical scoring, but for different subsector) were removed for the purposes of these heatmaps. Full metric description, metric guidance and scoring results for all 401 unique ESG-Nutrition metrics provided in online supplemental table S3. ATNI, Access to Nutrition Initiative; BIA-Obesity, Business Impact Assessment-Obesity; ESG, environmental, social and governance; GRI, Global Reporting Initiative; GRI PF, Global Reporting Initiative Processed Foods; PUP, Plating Up Progress; SASB, Sustainability Accounting Standards Board; WBA, World Benchmarking Alliance.

and health such as commercial strategy and corporate accountability arrangements and assessed efforts beyond government mandate (eg, front-of-pack (FOP) labelling vs non-compliance with global labelling standards). Several metrics were considered ‘prerequisite’ metrics and scored lowest for metric materiality, as they provided context, but did not evaluate business impacts on nutrition and health.

Mean *objectivity* score was highest for nutrition-related governance (2.39 (0.78)) and product marketing and labelling (2.15 (0.76)) metrics, indicating these metrics

tended to provide clear definitions and guidance for metric use compared with metrics in the product healthfulness and production distribution and equity domains. In general, metrics scored lower for objectivity when they required the reporting entity (usually the business itself) to define outcomes (eg, ‘healthy food’, ‘accessibility’, etc), identify ‘priority’ populations, or used ambiguous language (eg, ‘consistent with’, ‘match’, ‘lower in’, ‘roll out’, etc) without clear definitions for these characteristics or actions.

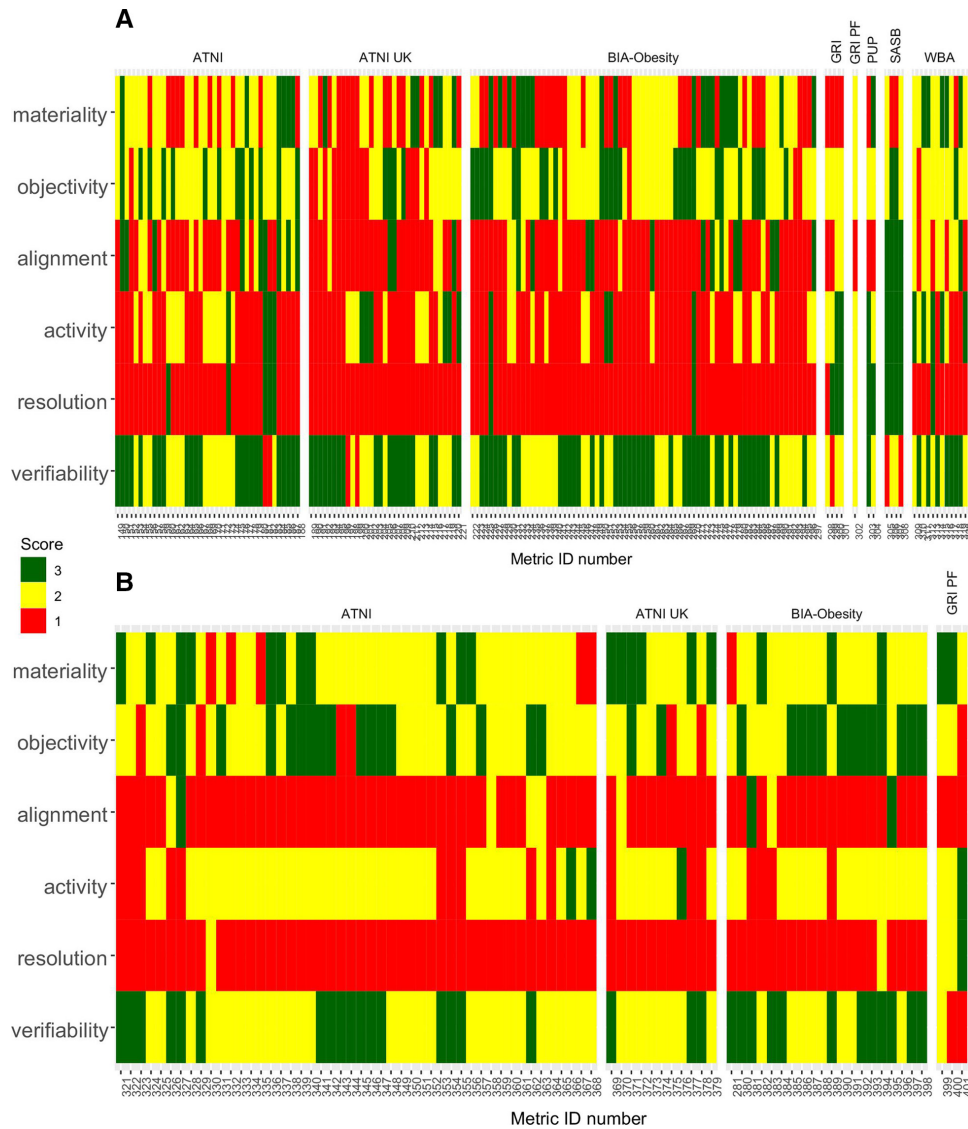


Figure 3 Scoring results of each ESG-Nutrition metric within the product marketing and labelling and nutrition-related governance domains, grouped by ESG framework. Heatmap representing the strength of all unique, extracted ESG-Nutrition metrics in the (A) product marketing and labelling and (B) nutrition-related governance domains, assessed on a scale of 1 (red) to 3 (green), for six scoring attributes: metric materiality, metric objectivity, metric alignment, metric activity, metric resolution and verifiability. See table 1 for scoring delineation for each scoring attribute. The metric strength assessment was completed in duplicate by two research team members, and any discrepancies in scoring were discussed until consensus was reached. ESG frameworks defined subsector of the food industry each metric was relevant for. Duplicative metrics (ie, same metric within a framework with identical scoring, but for different subsector) were removed for the purposes of these heatmaps. Full metric description, metric guidance and scoring results for all 401 unique ESG-Nutrition metrics provided in online supplemental table S3. ATNI, Access to Nutrition Initiative; BIA-Obesity, Business Impact Assessment-Obesity; ESG, environmental, social and governance; GRI, Global Reporting Initiative; GRI PF, Global Reporting Initiative Processed Foods; PUP, Plating Up Progress; SASB, Sustainability Accounting Standards Board; WBA, World Benchmarking Alliance.

Though mean scores were consistently low for the *alignment* and *resolution* scoring attributes, the highest scores were observed for metrics in the product marketing and labelling (1.53 (0.87) and 1.24 (0.80), respectively) and product healthfulness domains (1.40 (0.83) and 1.58 (0.93)), respectively). This indicates that, of the available ESG-Nutrition metrics, product marketing and labelling and product healthfulness tended to be more aligned with existing frameworks, codes or

standards, as compared with metrics in the distribution and equity and nutrition-related governance domains. The majority of metrics evaluated scored low for *resolution* as they were categorical measures, with the exception of some quantitative metrics in the product healthfulness and product marketing and labelling domains (eg, ‘assessment of the overall healthiness of the product portfolio, measured as the sales-weighted mean Health Star Rating score’ (ATNI); ‘total monetary losses as a result of legal

proceedings associated with marketing and/or labelling practices' (SASB)).

For *activity*, product healthfulness metrics had the highest score (2.17 (0.85)), suggesting metrics in this domain tended to evaluate performance activities rather than commitments and business processes, as compared with other domains. *Verifiability* scores were highest across all domains, as most metrics were perceived to be based on publicly available data (and if not, private data from standard documentation), with highest mean scores in the product marketing and labelling (2.50 (0.75)) and product distribution and equity (2.48 (0.71)) domains. Additional quantitative findings of scoring attributes within domains presented in online supplemental text S2.

Metric scoring by framework and sub-sector

We observed marked differences in attribute scoring by ESG framework (see online supplemental text S3 for quantitative results). ATNI, ATNI UK and BIA-Obesity had the largest number of metrics and covered all four domains, consistent with their objectives as benchmarking tools to comprehensively evaluate businesses on their nutrition-related commitments, practices and performance for informing diverse stakeholders;^{17 18} while GRI and SASB are both frameworks providing sustainability accounting standards to help businesses voluntarily disclose on financially material ESG factors to investors (with consumer nutrition and health a very minor component).^{19 20} Metrics from BIA, ATNI and ATNI UK had higher *verifiability* and *objectivity* scores, as these third-party initiatives are the reporting entities and rely heavily on publicly available, clearly defined information. In contrast, GRI and SASB scored lower on these attributes as the business, rather than the standards organisation, is the reporting entity. Instead, GRI and SASB had higher mean total scores, likely because these metrics are specifically designed for business ESG disclosures; and higher *activity* and *resolution* scores, under the assumption that the business will have more quantitative, performance/sales data than is publicly available.

We also found inconsistencies in the number and focus of metrics across food subsectors (table 2). The existence of specific indices for manufacturing (ATNI) and retail (ATNI UK) allow for targeted metrics to these subsectors. For instance, ATNI UK included metrics around driving healthier purchases through retail reward/membership mechanisms, product positioning and in-store promotional activities which are less relevant for the other domains. In contrast, very few metrics were observed specific to restaurant or catering. We also observed that while metrics for manufacturing and retail assessed the use of aggregate, FOP labels, metrics for restaurants only assessed nutritional information for target nutrients—suggesting inconsistencies in the requirements

and standards for labelling on packaged products vs menu items in these different subsectors.

DISCUSSION

Across eight major frameworks, we identified 529 ESG-Nutrition metrics (401 unique) related to four nutrition domains (product healthfulness, product distribution and equity, product marketing and labelling and nutrition-related governance). Nearly half of the metrics (43.5%) related to product marketing and labelling, while less than one-quarter related to actual product healthfulness (23.8%), and the remainder to nutrition-related governance (20.4%) and (the fewest) to product distribution and equity (12.3%). Most of the identified ESG-Nutrition metrics were developed for food manufacturers (40.1%) or food retailers (37.5%), with few for restaurants (16.6%) and catering (5.1%). No individual metric achieved the highest score across all six attributes evaluated, with a mean total score across all ESG-Nutrition metrics around 11. We identified substantial heterogeneity in the strength of the proposed metrics, with generally lowest strength for their *resolution*, *alignment* and *activity*, and greater strength for *verifiability* and *objectivity*. Trade-offs were observed between certain scoring attributes, such as *verifiability* versus *activity* (correlation: -0.65) and *verifiability* versus *resolution* (-0.34), but complementary of other scoring attributes, such as *activity* and *resolution* (0.40) and *alignment* and *objectivity* (0.21). Low intercorrelations for all remaining scoring attributes suggest that they represent independent measures of distinct characteristics of each metric. By domain, total scores did not vary considerably (ranging from 10.55 for the product distribution and equity domain to 11.04 for the product healthfulness domain). However, mean scores across individual attribute and within domains were highly heterogeneous. We identified considerable heterogeneity in the inclusion and strength of ESG-Nutrition across the eight frameworks, although distinct patterns emerged for attribute scoring within ATNI, ATNI UK, BIA-Obesity and WBA versus GRI, GRI PF and SASB frameworks. We also observed differences in the number and strength of available metrics across food business subsectors. Taken together, these new findings elucidate the strengths of available metrics within each domain for use by investors, as well as gaps within the existing landscape and opportunities for future research.

Despite the large quantity of ESG-Nutrition metrics, their strength and focus of those metrics raised concerns. The product marketing and labelling domain, rather than product healthfulness, comprised the greatest number of metrics across the most ESG frameworks. Product healthfulness as the primary driver of consumer outcomes should be the cornerstone of ESG-Nutrition.² However, we observed fewer than one in four metric focused on product healthfulness. These metrics had particularly low *materiality* scores due to a focus on single-isolated nutrients or simplistic food categories (eg, plant

vs animal based), rather than being anchored in a more holistic, externally validated NPS, such as within ATNI's framework.¹⁷ These findings indicate that ESG-Nutrition metrics need to include a much more comprehensive focus on the healthfulness of products that food sector businesses are selling.

One possible explanation for this finding is the multitude of international frameworks and codes for responsible marketing and labelling²¹⁻²³ which may drive the number and content of metrics for domains. Product marketing and labelling metrics also had the highest *alignment* score, suggesting that ESG metrics across the eight ESG frameworks were informed by available national and international standards. External, government endorsed nutrition-related and diet-related guidelines are available for a limited number of nutrients and foods of concern (eg, WHO global sodium benchmarks for food categories;²⁴ national food-based dietary guidelines²⁵) as well as for marketing and labelling (eg, WHO Europe Marketing of Unhealthy Products to Adolescents and Children,²⁶ Codex Alimentarius²³), but not many other relevant topics, including product distribution and equity or nutrition-related governance. While we acknowledge the potential of industry influence²⁷ and outdated or reductionist nutrition science on external, government-endorsed national or international standards and guidelines, these are superior to internally developed, industry-generated guidelines and standards. Our findings highlight the gaps in available external guidelines and codes, and the need to advocate for such international guidance to inform and facilitate standardisation of ESG-Nutrition metrics.

While issues of health equity have come to the forefront in academic, public health and political domains,²⁸⁻³¹ our work identified major limitations in ESG metrics assessing product distribution and equity. Fewest metrics evaluated this domain across all extracted ESG-Nutrition metrics; nearly all were categorical, rather than quantitative; most looked at commitments, rather than actual commercial outputs or performance; few were aligned with existing standards and codes and many required subjective assumptions around affordability, accessibility, healthfulness and priority target populations. The gaps in metrics that evaluate equitable distribution of healthy foods raises questions about whether innovation and private investment in the food system can contribute to reducing health inequities. Will premium food products and innovations, trendy among venture capitalists, but designed for, marketed to and only affordable and accessible to the elite of the population, 'trickle down' to improve public health of the rest of society? Is it possible to profitably invest in businesses creating products that are long-term, sustainable and science-based solutions to issues of nutrition security and health inequity in historically marginalised communities?

Our results indicate a need for innovative solutions for generating benchmarks to quantify equitable distribution of healthy foods in different geographic and social contexts. In the USA, for example, affordability benchmarks could be

derived from the USDA's Thrifty Food Plan, which defines the market price of a nutritious, cost-effective diet.³² Globally, efforts are being made to estimate the cost of energy sufficient, nutrient adequate and healthy diets based on retail prices and nutrient composition for 177 countries around the world.^{33 34} These dietary benchmarks then need to be translated into product-level affordability benchmarks. Similar innovation is needed to measure spatial (ie, geographic) and sociodemographic (ie, priority population) accessibility. Without high-quality metrics to assess equitable distribution of healthy foods, the private sector will not be held accountable for either contributing to or reducing health disparities.

Our findings of varying count and strengths of metrics across ESG frameworks aligns with the differing objectives, approaches and audiences of each of these frameworks (table 2, online supplemental table S1). While frameworks like ATNI, WBA and PUP are third-party indices, reactive to publicly available data and aimed at comprehensively indexing business impacts on nutrition, GRI and SASB are designed to guide businesses in voluntarily disclosing on financially material metrics across a broad spectrum of E, S and G risk factors. As such, interpreting the meaning of scores on these metrics from different ESG frameworks requires an understanding of these diverging framework's objectives and goals.

The dearth of metrics for restaurants and catering is another major gap, and reflects the focus of major private sector accountability and advocacy initiatives to date on manufacturers and, more recently, retail.^{12 13 16-18} Moving forward, greater efforts are required to evaluate restaurant and catering impacts on consumer nutrition and health, customised to the commercial operations of these subsectors.

Limitations of existing ESG-Nutrition metrics

Our research identified several limitations of existing ESG-Nutrition metrics, independent of the six scoring attributes. First, identified metrics do not explicitly state that they are adaptable as the science evolves and new technical frameworks, standards or guidelines are developed. Having this inherent flexibility and dynamism would allow for the metrics' continued relevance and materiality. Second, the majority of metrics did not specify the range of geographic markets and applicable brands/product lines to which the metric applied. Leaving the selection of geographic context or portfolio components up to the reporting entity's discretion can lead to biased reporting. Third, metrics often did not state the frequency with which metrics should be reported. Annual and consistent reporting over successive periods would allow for valid comparisons over time and insights into trends. Fourth, few metrics provide corresponding benchmark or target levels, making it challenging to contextualise performance, particularly for more quantitative metrics. Addressing these limitations would elevate the quality of insights provided for investment decisions.

Prior research and what this study adds

This research builds on and extends the findings of previous research in ESG, nutrition and private sector accountability. Prior work evaluating responsible investment strategies related to nutrition among Australian asset managers suggests that ESG integration was the most common strategy, but discusses that the heterogeneity in available ESG metrics used obviates consistent and transparent reporting and evaluation.³ An academic review of latest trends in investing for improved nutrition and obesity prevention identified relevant ESG frameworks for this topic (the majority of which were included in this analysis), but did not analyse the quality or strength of existing efforts.¹⁶ A comprehensive report on *Fixing the Business of Food* likewise identifies a range of available ESG frameworks, providing a count of available ESG-Nutrition metrics for specific domains and categorising them based on their resolution and derivation.³⁵ However, to the best of our knowledge, no academic, non-profit or private sector effort has been made to critically assess the quality of available ESG-Nutrition metrics.

Our analysis adds to the evidence base by providing the first comprehensive strength assessment of existing ESG-Nutrition metrics, including a thorough discussion of the strengths of available metrics and gaps requiring further research and policy actions. Furthermore, our research provides a novel set of scoring attributes for evaluating the strength of ESG metrics, regardless of thematic focus; quantifies the intercorrelation and thereby degree of independence, of scoring attributes of available ESG-Nutrition metrics and assesses metric strength by thematic domain as well as by ESG framework.

ESG metrics in the context of the industry accountability debate

While the establishment of robust ESG-Nutrition metrics can help guide impact measurement and management for private financiers interested in a public health nutrition thesis, there is limited evidence as to whether such initiatives will translate to greater industry accountability, and thereby more favourable public health nutrition outcomes. Industry involvement in public health, including voluntary, business-driven approaches, has been met with significant scepticism and criticism.^{36–39} An evaluation of the Food Network of the Public Health Responsibility Deal in England—which helped major industry players develop pledges around out-of-home calorie labelling; trans fats, sodium and calorie reduction; and fruit and vegetable promotion—suggests that such an approach legitimised industry direct influence of public health strategies that affect their products, and thus had limited utility as a public health policy tool.³⁷ However, the chief weakness of the approach discussed by researchers was that the Deal had no sanctions to drive compliance such as monitoring requirements. In addition, ATNI's metric-driven indices have shown limited success in improving the healthfulness of companies' portfolios. ATNI's 2022 US Index Report revealed that

despite governance efforts, pledges and introduction of healthier varieties in some product categories, the combined product portfolios of the 11 largest food and beverage manufacturers in the USA (accounting for ~30% of all US food and beverages sales) have not become healthier since 2018.⁴⁰ Ultimately, further research is required to determine whether investing strategies involving ESG metrics can be an effective lever to drive industry accountability, or if alternative, more drastic government intervention is required.

Future directions

Our findings provide tools and insights relevant for business, investing and policymaking within the food sector. While ESG reporting has been largely unregulated, with disclosures predominantly voluntary to date, the European Union's Corporate Sustainability Reporting Directive (CSRD) is leading the way with mandated reporting requirements for all large companies (>250 employees and €40 million turnover) on sustainability/ESG-related factors,⁴¹ including impacts on planetary health and societal well-being, with other countries soon to follow suit. The International Sustainability Standards Board (ISSB) has also recently been launched, consolidating major reporting frameworks across ESG (including SASB) to work towards a prototype for mandatory, standardised and global ESG disclosure requirements. The novel scoring attributes developed for this analysis can be used for evaluating the quality of ESG metrics broadly, regardless of the metrics' thematic focus, with great relevance to CDSR, ISSB and others. In addition, given the burden of suboptimal nutrition and associated business risks, as well as heterogeneous, but generally mediocre quality of available ESG-Nutrition metrics we observed, we see the urgency of elevating the importance of nutrition among standard-setting bodies and developing strong ESG-Nutrition metrics for validation and inclusion in mandatory reporting frameworks.

Several future directions can be taken to advance the science of ESG-Nutrition metrics. First, we recommend that a valid and objective NPS to define the healthfulness of food should be used as a foundation across all four ESG-Nutrition domains. One prominent candidate could be Food Compass, with novel attributes aligned with the latest science and with demonstrated face, convergent, discriminatory and predictive validity.^{42 43} Second, quantitative definitions of affordability and accessibility (both spatial and social) are required to evaluate the equitable distribution of healthful foods. The lack of relevant and/or updated frameworks or codes for food-based sales targets, affordability and accessibility and nutrition-related governance is a call to action for greater international public health guidance on these critical topics. Such action would obviate business's biases or commercial priorities predominating over what could otherwise be objectively determined, third-party impartial definitions. Third, qualitative research is required to understand investor priorities on these domains, as well as literature review

to understand the most critical aspects of marketing and labelling for affecting consumer behaviour change and governance practices for affecting business behaviour change. In consultation with institutional investors, ATNI released a set of Investor Expectations on Nutrition, Diets and Health in July 2020, including delineated actions for investors to engage with manufacturers and retailers around governance, strategy, lobbying and transparency for addressing global nutrition challenges.⁴⁴ Such engagement is an example of a promising step forward to developing priority ESG-Nutrition metrics, relevant for investor use. Fourth, significant effort is required to create relevant and specific restaurant and catering ESG-Nutrition metrics given the void of available metrics for these subsectors. Fifth, quantitative analyses should assess the association between ESG-Nutrition metric performance and financial performance to objectively evaluate the dual materiality of each metric for financial and social returns. Taken together, these actions would advance a standardised, material and comprehensive ESG-Nutrition agenda.

Strengths and limitations

Our investigation has several important strengths. We assessed ESG-Nutrition metrics extracted from the most updated, recognised ESG frameworks including both non-governmental ESG reporting standards and food sector-specific accountability indices. Our metric strength assessment was conducted in duplicate by two investigators, and any discrepancies in scoring were discussed until consensus was reached, ensuring a reliable and unbiased assessment of metric strength. We assessed existing ESG-Nutrition metrics using both quantitative and qualitative techniques, providing distinct yet complementary insights into the current ESG-Nutrition metric landscape. We evaluated the degree of independence of each scoring attribute by calculating their intercorrelation. We assessed metric scoring strength by thematic ESG-Nutrition domain and by ESG framework to understand heterogeneity by these important factors. Finally, we discuss both strengths and shortfalls of assessed ESG metrics, and provide actionable recommendations for future directions.

Potential limitations should also be considered. While we included the most recognised, prescriptive and publicly available ESG frameworks for metric extraction, the list of ESG frameworks included was not exhaustive. We constructed a set of six scoring attributes *de novo* given there was not an established or validated set of ESG metric scoring criteria available in the literature. In addition, our investigation assessed the strength of each ESG metric in isolation, but not how each has been applied in combination in the real world or with any insights about user experience. Future efforts should engage directly with investors and businesses to understand the most commonly used ESG frameworks and/or metrics, metric attributes of greatest importance, the optimal number of metrics to use and perceived challenges and

opportunities in the ESG-Nutrition landscape. Without these insights or a stronger evidence base, we were not equipped to propose a scientifically derived, optimal mix of metrics for comprehensively evaluating industry impacts on nutrition, beyond our own commentary and expert opinion. It was challenging to objectively score the materiality of metrics, for example, as certain activities may be more impactful to nutrition and health in certain contexts but may not comprehensively assess the range of relevant commercial activities of the business. Finally, we did not assign weighting for the total score or for the relative importance of each domain, given limited evidence to justify differential weighing of each scoring attribute or domain in relation to each other. We acknowledge that future research should attempt to define weighting based on a combination of investors' priorities and the scientific importance of that criteria to a metrics overall strength as well as that domain to nutrition impact.

CONCLUSIONS

This new research identifies numerous proposed ESG-Nutrition metrics, but with substantial heterogeneity in relevant domains and strength of each metric. While metrics were generally based on verifiable data, they were not always objective or material indicators of business impacts on nutrition and health. Further, few metrics provided strong quantitative measures of commercial outputs or aligned to existing frameworks, codes and standards. Greater efforts are required to improve the quality of metrics across frameworks, establish standardised reporting and align these with investor priorities.

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