

## Review

# INFORMAS (International Network for Food and Obesity/non-communicable diseases Research, Monitoring and Action Support): overview and key principles

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## Summary

Non-communicable diseases (NCDs) dominate disease burdens globally and poor nutrition increasingly contributes to this global burden. Comprehensive monitoring of food environments, and evaluation of the impact of public and private sector policies on food environments is needed to strengthen accountability systems to reduce NCDs. The International Network for Food and Obesity/NCDs Research, Monitoring and Action Support (INFORMAS) is a global network of public-interest organizations and researchers that aims to monitor, benchmark and support public and private sector actions to create healthy food environments and reduce obesity, NCDs and their related inequalities. The INFORMAS framework includes two 'process' modules, that monitor the policies and actions of the public and private sectors, seven 'impact' modules that monitor the key characteristics of food environments and three 'outcome' modules that monitor dietary quality, risk factors and NCD morbidity and mortality. Monitoring frameworks and indicators have been developed for 10 modules to provide consistency, but allowing for stepwise approaches ('minimal', 'expanded', 'optimal') to data collection and analysis. INFORMAS data will enable benchmarking of food environments between countries, and monitoring of progress over time within countries. Through monitoring and benchmarking, INFORMAS will strengthen the accountability systems needed to help reduce the burden of obesity, NCDs and their related inequalities.

**Keywords:** Benchmarking, food environments, INFORMAS, obesity prevention.

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‘World Health Organization data show that rates of obesity nearly doubled in every region of the world from 1980 to 2008. Worldwide, one in three adults has raised blood pressure. One in ten adults has diabetes. These are the diseases that tax health systems to the breaking point. These are the diseases that break the bank. These are the diseases that can cancel out the gains of modernization and development. These are the diseases that can set back poverty alleviation, pushing millions of people below the poverty line each year.’

Margaret Chan, Director-General of the World Health Organization (WHO), 2012 (1)

## Background

The United Nations (UN) High-Level Meeting on non-communicable diseases (NCDs) held in September 2011 highlighted the enormous global burden posed by poor diet, physical inactivity and its associated chronic health conditions such as obesity, type 2 diabetes cardiovascular diseases and cancers (2). The UN meeting called for urgent preventative action and prioritized the need for increased monitoring of NCDs and their risk factors to improve population health (2). The most recent estimates from the Global Burden of Disease studies have shown the continued rise of the global NCD burden between 1990 and 2010 (3), and the increased contribution of the nutrition-related risk factors to this burden. The combined global burden of poor diet and physical inactivity was estimated at about 10%, compared to tobacco at 6.3%, and ranged from 1.9% in Western Saharan Africa to 27.3% in Eastern Europe (3).

Global monitoring systems related to some of the key risk factors for NCDs (e.g. tobacco use (4)) have been in place for some time, while others are still under development. Recently, the 66<sup>th</sup> World Health Assembly adopted a global action plan and a global monitoring framework to prevent and control NCDs, including indicators and a set of global targets to reach an ambitious ‘25 by 25’ goal to reduce premature NCD-related mortality by 25% by 2025 (5). The focus of WHO’s monitoring activities is on health outcomes (NCD mortality and morbidity), NCD risk factors (including obesity) and national system responses (6). There are only two indicators related to food policies and environments (reduction of food marketing to children and saturated and trans-fats in the food supply) included in the WHO framework.

Food environments are defined in Table 1, and each of their dimensions – physical (availability, quality, and promotion), economic (cost), policy (‘rules’) and sociocultural (norms and beliefs) (7) – has a substantial impact on food choices (8,9). Current food environments are dominated by energy-dense, nutrient-poor processed food products which are widely available, relatively inexpensive and heavily pro-

**Table 1** Key definitions used within the INFORMAS monitoring framework

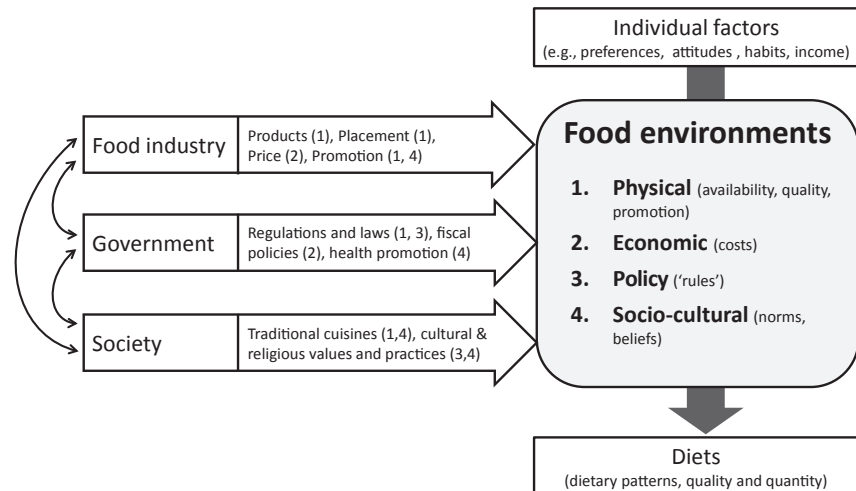
Food environments	The collective physical, economic, policy and sociocultural surroundings, opportunities and conditions that influence people’s food and beverage choices and nutritional status (adapted from (7,8,59)).
Healthy food environments	Environments in which the foods, beverages and meals that contribute to a population diet meeting national dietary guidelines are widely available, affordably priced and widely promoted
Food access	The concept of food access has five dimensions: availability, proximity, affordability, acceptability and accommodation (adapted from (60)).
Food sovereignty	The right of individuals to healthy and culturally appropriate food produced through socially just and ecologically sensitive methods. It entails peoples’ right to participate in decision-making and define their own food, agriculture, livestock and fisheries systems (61).
Minimal approach	The minimum data set of acceptable quality that needs to be collected/collated for each participating country, requiring minimal resources for collection.
Expanded approach	Additional data set to be collected/collated if there are additional resources and capacity available for data collection/collation.
Optimal approach	Desirable data set to be collected/collated within limits of resources, capacity and feasibility.
Benchmark	A standard or point of reference against which aspects of food environments may be assessed and compared.

moted (10). Unhealthy food environments seem to create a supply-side ‘push’ effect on unhealthy diets and energy overconsumption, which is the prevailing driver of population unhealthy weight gain (10–12). In order to reduce obesity and diet-related NCDs, there needs to be a central focus on creating ‘healthy food environments’ (defined in Table 1) which shift population diets, especially those of socially disadvantaged populations, towards diets that meet dietary guidelines (13–15).

There is wide consensus on the areas in which the various sectors of society need to take action to improve food environments (13,16,17), and many interventions targeting food environments are likely to be very effective and cost-effective at reducing obesity and NCDs (18–22). In spite of this, constructive action from governments and the food industry has been slow. The reason for this lack of progress has been clearly articulated in a recent series on Big Food in PLoS Medicine (23) and, in short, is due to the highly successful pressure that the commercial food industry is able to place on governments to prevent the implementation of policies and regulations to create healthy food environments (24,25).

Figure 1 depicts the food environments and its components, along with the broad influences of the main actors on

**Figure 1** Food environments and their four main components; the major influences of the food industry, governments and society on food environments (and their interactions); and the interaction between individual factors and food environments to shape diets.



them. The private food industry predominantly creates the food supply (to a large extent determining food availability, quality and price); promotes the consumption of its food products (predominantly processed foods and fast food); and contributes to social norms and beliefs about food. Governments, at international, national and subnational levels, through their policies, laws and regulations, provide the 'rules' within which the private sector must operate (26). Through fiscal policies, such as taxation and subsidies, governments can influence food prices and, through health promotion and social marketing, they can also influence sociocultural norms. Society, through its traditional, cultural and religious practices, predominantly establishes the cultural norms for food and cuisines. Individuals, with their personal factors such as habits, preferences, education and income, interact with the food environment to shape their diets. In addition, there are interactions between the food industry, governments and society – not only at the food environments interface, but also on many other levels, such as through policymaking, science funding, lobbying and agenda setting. There has been particular concern raised recently about the increasingly high level of influence that the private sector, with its enormous lobby power, has on governments, especially when regulations and fiscal policies are proposed (27). Industry bodies are often given a seat at the 'policy-development table' (e.g. government advisory committees, taskforces) even when deep conflicts of interest exist between what constitutes commercial benefits and what constitutes public health benefits.

Comprehensive monitoring of the characteristics of food environments related to obesity and NCDs, and the policies and actions of governments and the private sector influencing them, is, therefore, needed to complement the WHO's current NCD monitoring programme (28). This, along with other existing WHO food and nutrition databases (see box in the accompanying paper by Swinburn *et al.* in this supplement (29)), will ensure comprehensive monitoring

from 'upstream' policies to 'downstream' diet, risk factors and diseases. Monitoring and ensuring accountability for progress on reducing obesity and NCDs has been identified by WHO as key roles for the scientific community as part of civil society (30). The purpose of this paper is to provide an overview of a proposed monitoring system to benchmark food environments globally.

### International Network for Food and Obesity/NCDs Research, Monitoring and Action Support (INFORMAS)

INFORMAS is a global network of public-interest organizations and researchers that aims to monitor, benchmark and support public and private sector actions to create healthy food environments and reduce obesity, NCDs and their related inequalities. INFORMAS aims to do this by monitoring key aspects of food environments in a standardized manner over time and between countries. Through these activities, INFORMAS seeks to contribute to strengthening the accountability of governments and the private sector for the impact of their policies and actions on food environments, obesity and NCDs. INFORMAS will also support governments, international agencies (e.g. WHO and the Food and Agricultural Organization), the private sector and civil society organizations in their efforts to implement policies and actions to improve the healthiness of food environments. INFORMAS is convened under the auspices of the International Obesity Taskforce (IOTF), and it was launched at its inaugural meeting at the Rockefeller Center in Bellagio, Italy in November 2012.

### INFORMAS: objectives, outcomes and key principles

The logic model presenting the problem statement, inputs, activities, outputs, outcomes and data sources to document

**Box 1 Objectives of INFORMAS**

1. Develop a global network of public-interest organizations and researchers to monitor, benchmark and support efforts to create healthy food environments and reduce obesity, non-communicable diseases (NCDs) and their related inequalities.
2. Collect, collate and analyse data on public and private sector policies and actions, food environments, population diets, obesity and NCDs.
3. Compare and communicate the progress on improving food environments against good practice benchmarks between countries and over time.
4. Use the results to strengthen public health efforts, particularly by supporting the translation of relevant evidence into public and private sector actions.

**Box 2 Expected outcomes of INFORMAS**

1. Improved population health:
  - healthier food environments
  - healthier diets
  - reduced obesity and non-communicable diseases (NCDs)
  - reduced inequalities (environments, diets, obesity and NCDs)
2. Improved food systems:
  - more responsive to nutrition, health and equity
  - greater food sovereignty
3. Increased engagement of relevant actors:
  - increased engagement of civil society actors, including the scientific community, with governments and the private sector, towards common goals of healthier food environments
  - higher levels of accountability for the public and private sectors regarding food environments
  - more effective efforts of main actors to create healthy food environments and reduce obesity and NCDs

the accomplishments of INFORMAS is shown in Supporting Information Figure S1, and the specific objectives and expected outcomes of INFORMAS are shown in Boxes 1 and 2, respectively. A set of key principles has guided the development of INFORMAS and the proposed monitoring approach, and these are outlined in Box 3.

The principal strategies to achieve the proposed INFORMAS outcomes involve strengthening accountability systems as they relate to the two major actors that influence food environments: the public sector (principally

**Box 3 Principles guiding the development of INFORMAS and monitoring approaches**

- All monitoring activities are aimed at stimulating policy change and actions to improve food environments, population diets, and to reduce obesity, non-communicable diseases and their related inequalities.
- INFORMAS members (for data collection, data management, external communications) are from public-interest organizations, and INFORMAS will have appropriate mechanisms to avoid conflicts of interest, particularly with regard to relationships with the private sector and commercial influences.
- Strategic decision-making processes within INFORMAS will be collaborative, constructive and supportive.
- Data need to be as consistent as possible over time and between countries in order to enable valid comparisons. However, when difficulties arise in achieving both internal relevance (appropriateness for the country) and external comparability (for valid cross-country comparisons), the former is given priority.
- Where appropriate, a stepwise approach will be used in the data collection protocols so that countries can choose a level of monitoring to suit their available resources.
- A capacity building approach will be used such that INFORMAS provides a service to country-level participants, e.g. assistance with grant proposals, data analysis, paper writing.
- Strong feedback loops for translating data collected back to policymakers will be included in the communications activities, along with suggestions for practical, achievable steps to make improvements in food environments.

national-level governments but also local and international government bodies) and the private sector (principally the food industry, including multinational food and beverage manufacturers, food retailers, quick-service restaurants, agribusiness and industry trade associations, and also media, communications and marketing industries) (31). The public-interest non-government sector (including non-governmental organizations [NGOs], academia and consumers) has a role to play in benchmarking and holding the other actors to account (32,33).

**Scope of INFORMAS**

The central scope for INFORMAS is the monitoring (and benchmarking, where possible) of the major aspects of food

environments as they relate to obesity and diet-related NCDs. Smoking, physical inactivity and alcohol are also NCD risk factors but are not included in the current scope of INFORMAS. Similarly, there are many other health outcomes, such as micronutrient deficiencies, under-nutrition, stunting, osteoporosis, mental health and gastrointestinal diseases which are diet-related but not included. The findings from INFORMAS will bear some relation to those other risk factors and diet-related health outcomes, but they are not the central focus of INFORMAS. There are indications that breastfeeding may be protective against unhealthy weight gain (34,35) as well as other infant, childhood and adult health conditions (36–39), and it is therefore closely linked with INFORMAS. International benchmarking of progress on the breastfeeding rates and efforts to publically hold governments and infant formula companies to account for their actions have been underway for some time (40). This approach closely parallels the INFORMAS approach, and there is potential for close links between the work of the International Baby Food Action Network and INFORMAS.

There is a bi-directional relationship between food systems and environmental degradation (41,42). Food systems need to deliver on health, equity and sustainability outcomes, as well as economic outcomes. Within the current scope of INFORMAS, assessments and benchmarks will concentrate on health with indicators of equity being included where possible. In future, sustainability and other equity dimensions could be incorporated into measures of the healthiness of food environments, where appropriate.

### Proposed monitoring framework

The areas that INFORMAS will monitor have been classified as ‘process’, ‘impact’ and ‘outcome’ modules. Figure 2 shows the modular framework along with the specific research questions and current lead organizations for each of the modules. The *process* modules focus on monitoring the policies and actions of public and private sector organizations related to food environments and obesity/NCD prevention (29,31). The *impact* modules focus on monitoring

<b>ORGANISATIONS</b>	<b>PROCESSES</b>	<b>Public sector policies and actions</b>				<b>Private sector policies and actions</b>		
		How much progress have (international, national, state and local) governments made towards good practice in improving food environments and implementing obesity / NCDs prevention policies and actions? <i>(University of Auckland)</i>				How are private sector organisations affecting food environments and influencing obesity / NCDs prevention efforts? <i>(Deakin University)</i>		
<b>FOOD ENVIRONMENTS</b>	<b>IMPACTS</b>	<b>Food composition</b>	<b>Food labelling</b>	<b>Food promotion</b>	<b>Food provision</b>	<b>Food retail</b>	<b>Food prices</b>	<b>Food trade &amp; investment</b>
		What is the nutrient composition of foods and non-alcoholic beverages? <i>(The George Institute for Global Health)</i>	What health-related labelling is present for foods and non-alcoholic beverages? <i>(University of Oxford)</i>	What is the exposure and power of promotion of unhealthy foods and non-alcoholic beverages to different population groups? <i>(University of Wollongong)</i>	What is the nutritional quality of foods and non-alcoholic beverages provided in different settings (e.g., schools, hospitals, workplaces)? <i>(University of Toronto)</i>	What is the availability of healthy and unhealthy foods and non-alcoholic beverages in communities and within retail outlets? <i>(University of Auckland)</i>	What is the relative price and affordability of ‘less healthy’ compared with ‘healthy’ foods, meals & diets? <i>(Queensland University of Technology)</i>	What are the impacts of trade and investment agreements on the healthiness of food environments? <i>(Australian National University)</i>
<b>POPULATIONS</b>	<b>OUTCOMES</b>	<b>Population diet</b>		<b>Physiological &amp; metabolic risk factors</b>		<b>Health outcomes</b>		
		What is the quality of the diet of different populations? <i>(University of Sao Paulo)</i>		What are the burdens of obesity and other risk factors? <i>(WHO)</i>		What are the burdens of NCD morbidity and mortality? <i>(WHO)</i>		

**Figure 2** Overview of the INFORMAS modular framework including ‘process’, ‘impact’ and ‘outcome’ modules, each with its main research question and current lead organization. NCDs, non-communicable diseases; WHO, World Health Organization.



the characteristics of food environments, including the nutrient composition of available foods (43), food labelling (44), the extent and nature of food promotion (45), the provision of foods (46), the availability of foods in communities (47), prices and affordability of foods (48), and the risks to food environments within trade and investment agreements (49). There is scope for additional impact modules to be added in the future, such as food production (including agriculture) and food waste. Each impact module will also collect contextual data and specific information on the regulatory and policy environment related to the aspect under study. The *outcome* modules focus on monitoring population diet quality (50), risk factors (including behavioural, physiological and metabolic risk factors) and health outcomes. The latter two are core components of WHO’s Global NCD monitoring framework (6).

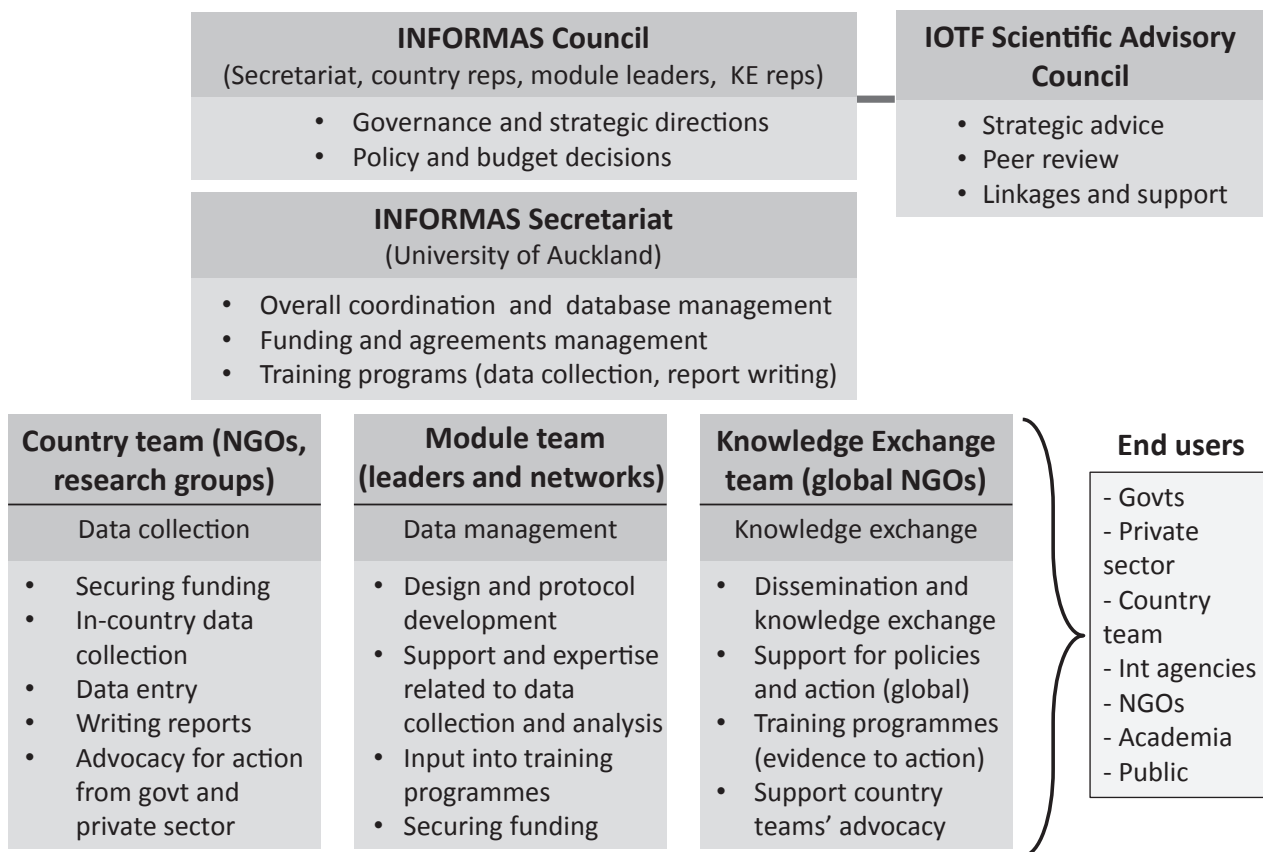
Each module is designed to answer an overall research question, with the potential for multiple related research questions (Figure 2) The lead organizations for each module will be responsible for developing standardized data collection and analysis protocols, pilot testing them

and for coordinating the data collection processes and overseeing data management related to the module.

**Proposed INFORMAS governance structure**

INFORMAS is composed of public-interest organizations and academic institutions, under the auspices of the IOTF. The governance and management structure of INFORMAS is shown in Fig. 3.

The INFORMAS Council (comprising representatives from the module teams, participating country teams, knowledge exchange team and secretariat) will provide strategic directions and will make the higher level budget and policy decisions. The IOTF Scientific Advisory Council, comprising approximately 30 researchers from 15 different countries across a range of disciplines related to obesity prevention, will provide strategic advice and peer review as required. The INFORMAS Secretariat, currently based at the University of Auckland, will provide overall coordination of INFORMAS activities, facilitate data management, manage financial activities and agreements, and oversee training on data collection, analysis



**Figure 3** Proposed governance, advisory and coordination structure for INFORMAS indicating roles for each participating group. Govts, governments; Int, international; IOTF, International Obesity Taskforce; KE, knowledge exchange; NGO, non-governmental organization; reps is representatives.

and translation. Country teams will be groups of public-interest organizations responsible for securing funding, collecting and entering the data, writing reports and papers, and advocating for and supporting action to reduce obesity and NCDs. The module teams will be responsible for the development and oversight of each of the modules. They will provide support for country teams and contribute to capacity building activities in countries. The knowledge exchange team will be led by the IOTF and consist of several global public-interest organizations with expertise in communications, knowledge exchange and training programmes to support countries achieve evidence-informed policies and actions.

### Data collection

Data collection related to INFORMAS will be undertaken, for the most part, at the country level by in-country, public-interest organizations and research groups. For each participating country, contextual factors, such as infrastructure, resources and capacity, population characteristics, lifestyle issues, political system and potential constraints for monitoring, will be taken into account when designing the data collection approach.

Data collection and analysis approaches will, as far as possible, incorporate a stepwise, including a 'minimal' approach in which data for all participating countries is collected, an 'expanded' approach in which additional data is collected as resources and capacity permit, and an 'optimal' approach that represents the most comprehensive data set for that module within limits of feasibility and resources (Table 1).

For each module, the prioritization of data collection activities will take into account the relative importance of the data for obesity/NCDs prevention (related to both the size of the problem and the potential changeability of that aspect of the food environment), the desired data granularity and the desired representativeness of the monitoring data. This approach allows countries to select a level of data collection to match their capacity. Training workshops and protocol manuals will be provided to the data collection teams in each country. Ongoing support for data collection teams will be provided by module leaders and other members of INFORMAS, as appropriate.

### Data access and management

It is expected that multiple interfaces for data input will be utilized (e.g. spread sheets, direct upload, mobile phone applications). A central database will be created in which 'cleaned' country-level data is stored. The design and management of the database will be overseen centrally, guided by the expert input of the module teams.

The over-arching principle regarding data collected for INFORMAS is to share the data as a public good through open access via the Internet. Country-level data will be owned by the country teams, and there will be agreements in place to share the data broadly for research and analysis purposes. Where relevant, databases will be made publically available after they have been cleaned and returned to research groups within individual countries for their own use and publication, thus allowing time for the country-level data to be published and disseminated prior to public release of the data.

### Phases of INFORMAS development and prioritization of monitoring activities

The overall vision for INFORMAS is to comprehensively monitor food environments related to obesity and NCDs across a range of countries globally on an ongoing basis. Phase 1 involved the initial development of the concept and the monitoring framework, the identification of module leaders, the week-long meeting in Bellagio and the publication of the foundation papers in this supplement. Phase 2 will involve the development of detailed protocols for each module, the development of databases and data systems, and the piloting of INFORMAS modules in a selection of countries of varying size and income level. Phase 3 will be the global phase of offering INFORMAS monitoring for countries to pick up and use. Since the task of measuring the multiple components of a country's food environment is a large one (especially for large countries), a variety of strategies have been developed to allow prioritization of the monitoring effort to match the human and financial capacity available. First, countries can select the most relevant modules for their context, and leave others that are deemed less critical. Second, the stepwise approach allows for the collection of lower cost, less sophisticated measures (minimal) through to more comprehensive and sophisticated measures (optimal). Third, the degree of representativeness can be chosen from a sentinel site approach, to a representative sample, to a complete sample. Fourth, the frequency of measurements over time can be spaced according to resources available. It is likely that the initial set up of the databases, development of the protocols and training for the first wave of measurements will require more funding than subsequent waves, and, in the long term, many modules may be allocated to student projects or they may become incorporated into the national monitoring systems within a country.

### Links with other monitoring and surveillance programmes

In order to maximize potential synergies and avoid overlap, INFORMAS will maintain close linkages with other

monitoring efforts. These include the WHO NCD Surveys, which uses the STEPwise approach to monitor the risk factors of NCDs (51); the WHO Global NCD Country Capacity Survey to measure individual countries' capacity to respond to and control NCDs (52); the WHO European Database on Nutrition, Obesity and Physical Activity (53), compiling information from European countries on the monitoring of food consumption, physical activity and policy implementations (among others); the WHO Global Health Observatory's assessment of the global burden of disease (54); and the Global Burden of Diseases, Injuries and Risk Factors (GBD) Study (55), systematically assessing global data illustrating the burden of diseases, injuries and selected risk factors.

INFORMAS has many parallels with the GBD programme. Over 20 years ago, the GBD was collating mortality and morbidity data to provide quantitative estimates and ranking of disease burdens. It has since evolved to: include preventable risk factors; monitor trends; become more fine grained (even down to local government area level); and develop ever more complex modelling and projections to guide policy. Just as the GBD Study has become a powerful and increasingly sophisticated way of defining the size of the problems, so INFORMAS aspires to be the more upstream solution-orientated equivalent for improving population nutrition. Ultimately, by combining and linking the INFORMAS and GBD data sets, more detailed epidemiological studies that link upstream determinants of health to disease outcomes may be possible. The impact of national-level policy actions could also be evaluated when INFORMAS has a sufficient track record of data available.

### Communication and knowledge exchange

The communication and knowledge exchange component of INFORMAS will consist of actively coordinated stakeholder engagement, e.g. through standardized reports and workshops, as well as less-actively managed communication, e.g. open access to INFORMAS data for public data mining. The audiences for INFORMAS results are decision-makers in government and the private sector, NGOs, academics, professionals, media and the public. The IOTF will lead a team of global NGOs such as Consumers International, the World Cancer Research Fund and the Heart Forum to manage the research communications, and related capacity building and action support. Potential strategies for knowledge exchange are outlined in the accompanying paper in the supplement by Brinsden *et al.* (56) and include:

- Interim results will be sent to governments and food companies to give them the chance to provide feedback prior to finalizing results.

- Final reports, including comparisons of country-level progress against global good-practice benchmarks, will be communicated directly to all stakeholders and to the media, and will be accessible through the INFORMAS web-based platform.

- Short 'evidence for policy' briefs will be developed for policymakers.

- 'Evidence to Action' workshops will be held for stakeholders to evaluate the results and their implications in more detail.

- Peer-reviewed papers will be published as open access in high impact journals.

- Presentations at scientific conferences

- E-networking for public-interest professionals

In addition, capacity building, training programmes for data collection and knowledge exchange, as well as support systems for academic centres and NGOs will be incorporated into INFORMAS activities. In order to engage countries, the intention of INFORMAS is to keep the burden of work in-country as minimal as possible, and emphasize the potential use of the data by the country.

### The role of INFORMAS within the global food system

Food systems are highly complex and span from local to global levels. INFORMAS aims to influence the components of the accountability cycle (33). The role of INFORMAS in monitoring ('Taking the account'), communicating ('Sharing the account'), supporting and evaluating changes ('Responding to the account') are clear. The major difficulty within the accountability cycle for improving food environments is in the component 'Holding to account' – what will one actor do if another actor fails to perform or does not comply? There are currently major power imbalances between the main actors which make it difficult for one sector to hold another to account. The strongest accountability structures are the laws and regulations within a country, giving governments clear levers to hold other parties to account. Civil society has only relatively weak powers to hold governments and the private sector to account, but INFORMAS aims to stimulate greater civil society engagement with the accountability structures for creating healthier food environments.

### Current supplement

The current supplement presents details of the proposed monitoring approaches and indicators for each of the INFORMAS process, impact and outcome modules, as well as the communication and knowledge exchange plans for INFORMAS. For each module, reviews of evidence for impacts on population diets are presented, previous



monitoring activities in the area are summarized, a proposed approach to monitoring is outlined, and measurement indicators are proposed. These papers provide the foundation documents for INFORMAS.

The Public Sector module, focused on monitoring government policies and actions, is being led by Boyd Swinburn at the University of Auckland, New Zealand. This module proposes a Government Healthy Food Environment Policy Index (Food-EPI) and a process to be driven by a group of independent, informed public health experts who rate the level of government implementation of seven priority policy domains (corresponding to the impact modules in the framework, Figure 2) and seven infrastructure support domains (29). The evidence-based ratings are made against a series of 'good practice' statements which, over time, will evolve into international best practice benchmarks. The Private Sector module, focused on measuring the policies and practices of the private sector (large trans-national food corporations as a priority), will be led by Gary Sacks at Deakin University, Australia (31). The assessment of the negative impacts that the food industry has (e.g. by undermining food policies proposed by government to address obesity and NCDs) will be more of a challenge in this module than the assessment of positive impacts.

The Food Composition module, led by Bruce Neal at The George Institute for Global Health, Australia, is already being applied in several countries and some of the INFORMAS approaches are being modelled on this successful component (43). The Food Labelling module (44), led by Mike Rayner at the University of Oxford, United Kingdom, proposes a taxonomy of label information based mainly on Codex classifications, and it can combine data collection with approaches used to monitor food composition. The Food Promotion module is being led by Bridget Kelly at the University of Wollongong, Australia, and parts of it have also already been applied in several countries (45). The measurement of the power and exposure of marketing strategies using new media (such as social media) will be a particular challenge for this module. Many countries concerned with childhood obesity have instituted healthy food guidelines for schools, and this is the priority setting for monitoring under the Food Provision module which is led by Mary L'Abbe at the University of Toronto, Canada (46). The Food Retail module has a community environment component (density of certain food outlets in the community) and a consumer (in-store) environment component, and is being led by Cliona Ni Mhurchu at the University of Auckland, New Zealand (47). The Food Prices module, which is being led by Amanda Lee at the Queensland University of Technology, Australia (48), ultimately aims to have comparable measures of prices and affordability of foods and diets across countries, although there is still developmental work needed to get it to this

stage. The Food Trade and Investment module is being led by Sharon Friel at the Australian National University, Australia (49), and it takes a risk assessment approach for assessing the effects of trade and investment agreements on food environments. This module has been placed in the 'impacts' part of the INFORMAS framework, although it has some overlaps with the Public Sector module. Several modules (price, retail, provision, promotion) have the potential for analyses by areas of high and low advantage to give an index of area-level inequalities.

The single module being coordinated by INFORMAS in the 'outcomes' part of the framework is one on diet quality, being led by Carlos Monteiro at the University of Sao Paulo, Brazil (50). Effective communication of the INFORMAS findings to stakeholders is essential and the proposed knowledge exchange strategy will be coordinated by Tim Lobstein at the IOTF (56). The supplement is completed with a commentary by Tim Lobstein *et al.* on the potential for INFORMAS to strengthen advocacy efforts (57), and a summary paper by Shiriki Kumanyika (58) which also provides a view into the potential future for INFORMAS.

## Conclusions

The burgeoning global epidemics of obesity and diet-related NCDs demand strong action, particularly 'upstream' in food environments that are driving unhealthy population dietary habits. The INFORMAS monitoring framework represents the first coordinated global effort to track the characteristics of food environments, and the policies and actions of governments and private sector organizations influencing food environments using objective, standardized and robust methodologies.

Through monitoring and benchmarking, INFORMAS will contribute to the strengthening of accountability systems regarding food environments. It is hoped that this can stimulate a much greater effort from governments to reduce obesity, NCDs and their related inequalities. It is also hoped that INFORMAS can support the delivery of a more appropriate balance between the legitimate efforts of food corporations to provide and market food products, and the societal imperative that they do it in a way that does not cause premature death, disability and health inequalities among the population.

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### Conflicts of interest

Bruce Neal is the Chair of the Australian Division of World Action on Salt and Health (2007–ongoing), was a Member of the Pepsico Global Scientific Advisory Board (2010–2012), was the Independent Adjudicator for the Australian Responsible Marketing to Children's Initiative (2009–2010) and holds funding from the Australian Food and Grocery Council as part of a National Health and Medical Research Council of Australia Partnership project (2010–2014). The other authors declare that they have no competing interests.

### Supporting information

Additional Supporting Information may be found in the online version of this article, <http://dx.doi.org/10.1111/obr.12087>

**Figure S1.** INFORMAS (International Network for Food and Obesity/non-communicable diseases Research, Monitoring and Action Support): logic model.

### References

- Chan M. Dr Margaret Chan, Director-General of the World Health Organization. Address to the Sixty-fifth World Health Assembly, Geneva, Switzerland, 21 May 2012. 2012. [WWW document]. URL [http://www.who.int/dg/speeches/2012/wha\\_20120521/en/index.html](http://www.who.int/dg/speeches/2012/wha_20120521/en/index.html) (accessed 28 August 2013).
- United Nations. Political Declaration of the High-level Meeting of the General Assembly on the Prevention and Control of Non-communicable Diseases. New York: United Nations, General Assembly; 2011.
- Lim SS, Vos T, Flaxman AD *et al.* A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet* 2013; **380**: 2224–2260.
- World Health Organization. WHO Report on the Global Tobacco Epidemic, 2011: warning about the dangers of tobacco. Geneva; 2011.
- World Health Organization. Follow-up to the Political Declaration of the High-level Meeting of the General Assembly on the Prevention and Control of Non-communicable Diseases. Draft Resolution. Sixty-sixth World Health Assembly, Agenda item 13. Geneva: World Health Organization; 2013.
- World Health Organization. Draft comprehensive global monitoring framework and targets for the prevention and control of noncommunicable diseases. Geneva: World Health Organization; 2013, 15 March 2013.
- Swinburn B, Egger G, Raza F. Dissecting obesogenic environments: the development and application of a framework for identifying and prioritizing environmental interventions for obesity. *Prev Med* 1999; **29**: 563–570.
- Story M, Kaphingst KM, Robinson-O'Brien R, Glanz K. Creating healthy food and eating environments: policy and environmental approaches. *Annu Rev Public Health* 2008; **29**: 253–272.
- World Health Organization. WHO Technical Report Series 916. Diet, nutrition and the prevention of chronic diseases. Geneva: Joint FAO/WHO expert consultation; 2003.
- Swinburn BA, Sacks G, Hall KD *et al.* The global obesity pandemic: shaped by global drivers and local environments. *Lancet* 2011; **378**: 804–814.
- Swinburn B, Sacks G, Ravussin E. Increased food energy supply is more than sufficient to explain the US epidemic of obesity. *Am J Clin Nutr* 2009; **90**: 1453–1456.
- Hall KD, Guo J, Dore M, Chow CC. The progressive increase of food waste in America and its environmental impact. *PLoS ONE* 2009; **4**: e7940.
- World Health Organization. Global strategy on diet, physical activity and health. Geneva: World Health Organization; 2004.
- World Health Organization. Set of recommendations on the marketing of foods and non-alcoholic beverages to children. Geneva: World Health Organization; 2010.
- Burlingame B, Dernini S (eds). Sustainable Diets and Biodiversity. Directions and Research for Policy Food and Agriculture Organization of the United Nations. Proceedings of the International Scientific Symposium Biodiversity and Sustainable Diets United Against Hunger, 3–5 November 2010. 2010. [WWW document]. URL <http://www.fao.org/docrep/016/i3004e/i3004e.pdf> (accessed 28 August 2013).
- Beaglehole R, Bonita R, Horton R *et al.* Priority actions for the non-communicable disease crisis. *Lancet* 2011; **377**: 1438–1447.
- World Cancer Research Fund/American Institute for Cancer Research. Food, Nutrition, Physical Activity, and the Prevention of Cancer: A Global Perspective, 2007. Washington, DC: American Institute for Cancer Research; 2007.
- Gortmaker SL, Swinburn BA, Levy D *et al.* Changing the future of obesity: science, policy, and action. *Lancet* 2011; **378**: 838–847.
- Cecchini M, Sassi F, Lauer JA, Lee YY, Guajardo-Barron V, Chisholm D. Tackling of unhealthy diets, physical inactivity, and obesity: health effects and cost-effectiveness. *Lancet* 2010; **376**: 1775–1784.
- Sacks G, Veerman JL, Moodie M, Swinburn B. 'Traffic-light' nutrition labelling and 'junk-food' tax: a modelled comparison of cost-effectiveness for obesity prevention. *Int J Obes* 2011; **35**: 1001–1009.

21. Haby MM, Vos T, Carter R *et al.* A new approach to assessing the health benefit from obesity interventions in children and adolescents: the assessing cost-effectiveness in obesity project. *Int J Obes* 2006; 30: 1463–1475.
22. Magnus A, Haby MM, Carter R, Swinburn B. The cost-effectiveness of removing television advertising of high-fat and/or high-sugar food and beverages to Australian children. *Int J Obes* 2009; 33: 1094–1102.
23. The PLoS Medicine Editors. PLoS Medicine series on Big Food: the food industry is ripe for scrutiny. *PLoS Med* 2012; 9: e1001246. doi:10.1371/journal.pmed.1001246.
24. Moodie R, Stuckler D, Monteiro C *et al.* Profits and pandemics: prevention of harmful effects of tobacco, alcohol, and ultra-processed food and drink industries. *Lancet* 2013; 381: 670–679.
25. Chan M. WHO Director-General addresses health promotion conference. Opening address at the 8th Global Conference on Health Promotion Helsinki 10 June 2013. 2013. [WWW document]. URL [http://www.who.int/dg/speeches/2013/health\\_promotion\\_20130610/en/index.html](http://www.who.int/dg/speeches/2013/health_promotion_20130610/en/index.html) (accessed 28 August 2013).
26. Sacks G, Swinburn B, Lawrence M. Obesity Policy Action framework and analysis grids for a comprehensive policy approach to reducing obesity. *Obes Rev* 2009; 10: 76–86.
27. Hastings G. Why corporate power is a public health priority. *BMJ* 2012; 345: e5124.
28. Friel S, Labonte R, Sanders D. Measuring progress on diet-related NCDs: the need to address the causes of the causes. *Lancet* 2013; 381: 903–904.
29. Swinburn B, Vandevijvere S, Kraak VI *et al.* Monitoring and benchmarking government policies and actions to improve the healthiness of food environments: a proposed Government Healthy Food Environment Policy Index. *Obes Rev* 2013; 14 (Suppl. 1): 135–149.
30. World Health Organization. Global status report on noncommunicable diseases 2010. 2011. [WWW document]. URL [http://www.who.int/nmh/publications/ncd\\_report2010/en/](http://www.who.int/nmh/publications/ncd_report2010/en/) (accessed 12 April 2012).
31. Sacks G, Swinburn B, Kraak VI *et al.* A proposed approach to assessing the extent to which the policies and actions of private sector organisations affect food environments and influence obesity/non-communicable diseases prevention efforts. *Obes Rev* 2013; 14 (Suppl. 1): 38–48.
32. World Health Organization. Global strategy on diet, physical activity and health: A framework to monitor and evaluate implementation. Geneva: World Health Organization; 2006.
33. Beaglehole R, Bonita R, Horton R. Independent global accountability for NCDs. *Lancet* 2013; 381: 602–605.
34. Gale C, Logan KM, Santhakumaran S, Parkinson JRC, Hyde MJ, Modi N. Effect of breastfeeding compared with formula feeding on infant body composition: a systematic review and meta-analysis. *Am J Clin Nutr* 2012; 95: 656–669.
35. Gubbels JS, Thijs C, Stafleu A, van Buuren S, Kremers SPJ. Association of breast-feeding and feeding on demand with child weight status up to 4 years. *Int J Pediatr Obes* 2011; 6: e515–e522.
36. Hauck FR, Thompson JMD, Tanabe KO, Moon RY, Vennemann MM. Breastfeeding and reduced risk of sudden infant death syndrome: a meta-analysis. *Pediatrics* 2011; 128: 103–110.
37. Lamberti LM, Fischer Walker CL, Noiman A, Victora C, Black RE. Breastfeeding and the risk for diarrhea morbidity and mortality. *BMC Public Health* 2011; 11(Suppl. 3): S15.
38. Brion M-JA, Lawlor DA, Matijasevich A *et al.* What are the causal effects of breastfeeding on IQ, obesity and blood pressure? Evidence from comparing high-income with middle-income cohorts. *Int J Epidemiol* 2011; 40: 670–680.
39. Owen CG, Whincup PH, Kaye SJ *et al.* Does initial breastfeeding lead to lower blood cholesterol in adult life? A quantitative review of the evidence. *Am J Clin Nutr* 2008; 88: 305–314.
40. International Baby Food Action Network (IBFAN). 2013. [WWW document]. URL <http://www.ibfan.org> (accessed 4 February 2013).
41. Garnett T. Where are the best opportunities for reducing greenhouse gas emissions in the food system (including the food chain)? *Food Policy* 2011; 36: S23–S32.
42. Garnett T. Food sustainability: problems, perspectives and solutions. *Proc Nutr Soc* 2013; 72: 29–39.
43. Neal B, Sacks G, Swinburn B *et al.* Monitoring the levels of important nutrients in the food supply. *Obes Rev* 2013; 14 (Suppl. 1): 49–58.
44. Rayner M, Wood AT, Lawrence M *et al.* Monitoring the health-related labelling of foods and non-alcoholic beverages in retail settings. *Obes Rev* 2013; 14 (Suppl. 1): 70–81.
45. Kelly B, King L, Baur L *et al.* Monitoring food and non-alcoholic beverage promotions to children. *Obes Rev* 2013; 14 (Suppl. 1): 59–69.
46. L'Abbe M, Schermel A, Minaker L *et al.* Monitoring foods and beverages provided and sold in public sector settings. *Obes Rev* 2013; 14 (Suppl. 1): 96–107.
47. Ni Mhurchu C, Vandevijvere S, Waterlander WE *et al.* Monitoring the availability of healthy and unhealthy foods and non-alcoholic beverages in community and consumer retail food environments globally. *Obes Rev* 2013; 14 (Suppl. 1): 108–119.
48. Lee A, Ni Mhurchu C, Sacks G *et al.* Monitoring the price and affordability of foods and diets globally. *Obes Rev* 2013; in press.
49. Friel S, Hattersley L, Snowdon W *et al.* Monitoring the impacts of trade agreements on food environments. *Obes Rev* 2013; 14 (Suppl. 1): 120–134.
50. Vandevijvere S, Monteiro C, Krebs-Smith SM *et al.* Monitoring and benchmarking population diet quality globally: a step-wise approach. *Obes Rev* 2013; 14 (Suppl. 1): 135–149.
51. World Health Organization. STEPwise approach to chronic disease risk factor surveillance (STEPS). World Health Organization; 2011. [WWW document]. URL <http://www.who.int/chp/steps/riskfactor/en/index.html> (accessed 28 August 2013).
52. World Health Organization. Assessing national capacity for the prevention and control of noncommunicable diseases: report of the 2010 global survey. Geneva: World Health Organization; 2012.
53. World Health Organization. Monitoring progress on improving nutrition and physical activity and preventing obesity in the European Union: WHO European database on nutrition, obesity and physical activity (NOPA). World Health Organization; 2008.
54. World Health Organization. Global Health Observatory (GHO): Mortality and Global Burden of Disease (GBD). Geneva: World Health Organization; 2008.
55. Institute for Health Metrics and Evaluation. The Global Burden of Disease Study 2010. Seattle, USA: Institute for Health Metrics and Evaluation; 2012.
56. Brinsden H, Lobstein T, Landon J *et al.* Monitoring policy and actions on food environments: rationale and outline of the INFORMAS policy engagement and communication strategies. *Obes Rev* 2013; 14 (Suppl. 1): 13–23.
57. Lobstein T, Brinsden H, Landon J, Kraak VI, Musicus A, Macmullan J. INFORMAS and advocacy for public health nutrition and obesity prevention. *Obes Rev* 2013; 14 (Suppl. 1): 150–156.

58. Kumanyika S. INFORMAS (International Network for Food and Obesity/non-communicable diseases Research, Monitoring and Action Support): summary and future directions. *Obes Rev* 2013; **14** (Suppl. 1): 157–164.

59. Glanz K, Sallis JF, Saelens BE, Frank LD. Healthy nutrition environments: concepts and measures. *Am J Health Promot* 2005; **19**: 330–333.

60. Penchansky R, Thomas JW. The concept of access: definition and relationship to consumer satisfaction. *Med Care* 1981; **19**: 127–140.

61. Patel R. What does food sovereignty look like? *J Peasant Stud* 2009; **36**: 663–673.