

Conceptual Framework for Food Security Indicators

Summary Report



BC Centre for Disease Control
Provincial Health Services Authority

Prepared for the BC Centre for Disease Control (BCCDC)

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List of abbreviations

BC	British Columbia
BCCDC	British Columbia Centre for Disease Control
CFAI	Community Food Action Initiative
CO ₂	Carbon dioxide
PHSA	Provincial Health Services Authority
PSR (Environmental health indicator framework)	Pressure – State – Response
RHA	Regional Health Authority
UN	United Nations
WHO	World Health Organization



Introduction

In 2016, the Population and Public Health Program (PPH) of the BC Centre for Disease Control (BCCDC), a part of Provincial Health Services Authority (PHSA), commissioned the identification and/or construction of an evidence-based conceptual framework to guide the revision of the current 2009 food security indicators for British Columbia (B.C.). These six indicators were developed in collaboration with the regional health authorities in 2009/2010 based on the *2006 Ministry of Health Food Security Model Core Program Paper* (See Appendix 1). During the 2013/14 revisions to the *Food Security Model Core Program Paper*, the advisory committee requested an update to the indicators so they better reflect the current literature, the updates to the *Core Program Paper* and the work of the health authorities. The BC Ministry of Health supports the update, and the work is being led by PPH at BCCDC.

From the outset of this project, the Provincial Manager, Food Security (BCCDC) and the consultant deemed it important to create a conceptual framework to structure the revision of, and development of new, food security indicators for measuring and monitoring food security and household food insecurity in B.C.

Purpose of framework

The conceptual framework for food security indicators can serve as a framing tool to support food security advancement within public health in B.C. Use of this conceptual framework enables program planners and policy makers to be clear about where and how they are attempting to assess, influence and monitor food security. The purpose of the framework is to:

1. Lay the foundation for the revision and development of a common set of key indicators
2. Provide a rationale for, and help to identify and select relevant indicators across a broad interpretation of food security
3. Identify how and where food security can be assessed and influenced
4. Illustrate causal relationships and interconnectedness between indicators

Furthermore, the framework offers a conceptual model that can help organize and identify key areas of focus for program evaluation.

Purpose of the food security indicators

The purpose of the BCCDC food security indicators that will populate this framework is to measure and monitor variations and trends in food security across the province using national, provincial, regional and local level data. The indicators are intended to inform policy and practice by demonstrating the current state of food security/household food insecurity in B.C., reflecting the impact of food security initiatives and highlighting where gaps exist and further work is needed to improve food security. The indicators can also contribute to program planning, internal performance management and evaluation. Some indicators may inform or be used as part of program evaluation and vice versa – information gathered from program evaluation can provide the data required to report on a specific indicator. The



indicators will reflect a high-level measurement of change. Indicators at this level are often quantitative but this project will explore both quantitative and qualitative measures.

As more evidence, data and resources are available, the framework can be further populated with indicators related to broader public health issues (e.g. climate change) and food security. As the framework is evidence-based, peer- and expert-reviewed and developed for use in public health, it will also be made available to organizations across B.C. to further populate and contribute to a comprehensive picture of food security in B.C.

The framework allows for the integration of existing information and important work completed to date on food security indicators. A change from how food security indicators are currently classified may contribute to the development of a common frame of reference that shifts the understanding of food security to incorporate considerations across the causal network of food security (e.g. causal determinants, health impacts and actions taken). It may also help to shift the interpretation to include emerging areas such as ecological health and climate change.

A brief review of the steps taken to develop the framework is summarized below. A background of the foundations within the framework – including descriptors – is then outlined, followed by the presentation of the proposed framework.

Steps to develop the food security indicator framework

The first phase of this project took place from January 2016 - March 2016 and included:

1. Literature scan to identify conceptual frameworks for the development of food security indicators
2. Key informant discussions
3. High level review of models of classification of food security issues/indicators
4. Construction of a proposed model/conceptual framework for the review and development of food security indicators based on analysis and synthesis of the literature and key informant discussions
5. Discussion with Provincial Manager, Food Security at BCCDC regarding proposed model, and subsequent modification proposed by the consultant

In phase two, following a consultation with BCCDC staff in August 2016, further modifications to the model were made between August – November 2016 by the consultant and the Provincial Manager, Food Security at BCCDC. The consultant wrote a report to summarize the first phase documents (noted above) and to include the input from the consultation with BCCDC staff. Once finalized this report, *Conceptual Framework for Development of Food Security Indicators: summary report*, will be on the BCCDC website. Phase one reports are available upon request from the Provincial Manager, Food Security at BCCDC.

In phase three, the consultant solicited internal and external feedback. First, the consultant hosted a webinar presentation for “internal” stakeholders (i.e. the Health Authority Food Security Committee) presenting the process and next steps. Eight key informant interviews were held by telephone with representatives from the regional health authorities; BCCDC; the Office of the Provincial Dietitian, Ministry of Health; and First Nations Health Authority. Six external consultations were held by telephone



with B.C. food security organizations, academics and government representatives. The feedback centered on expanding the definitions/descriptors to clarify the vertical axis (food security elements) of the framework, and on the overall purpose of the framework and the indicators. An iterative process between the Provincial Manager, Food Security, the consultant and the Health Authority Food Security Committee informed the final framework.

Feedback from the key informants also included the lack of Indigenous knowledge and perspectives in guiding the Framework development. The Provincial Manager, Food Security engaged the regional health authorities and the First Nations Health Authority in discussions on how to address this gap. The decision was to hire an Indigenous food security consultant to incorporate Indigenous knowledge and perspectives, and in turn Indigenous indicators, into the Framework and to revise the descriptors in Appendix 3. However, through a deliberative process, both the consultant and Provincial Manager, recognized this approach

raised systemic challenges of trying to frame Indigenous food sovereignty within a more narrowly defined and agriculture-centric framework. As such, the Framework's elements and sub-elements did not necessarily align with the principles of Indigenous food sovereignty or reflect Indigenous worldviews.

In order to take a more decolonized approach and for the Framework to reflect the depth and complexities of Indigenous food sovereignty, further dedicated work is required and must start with collaborative conversations with Indigenous Peoples and communities. In the meantime, the consultant has provided insight into how to move research forward in a decolonized way in the section on Indigenous methodologies. She has also written about the history, knowledge and current challenges of accessing traditional foods as well as presenting the principles of Indigenous food sovereignty. The purpose of these sections is to help demonstrate where there might be both overlap and contradictions between the current framework and resulting indicators versus one that is developed using the principles of Indigenous methodologies and Indigenous food sovereignty. These considerations are required for future work to develop a framework that reflects Indigenous practices, beliefs and history.

“Indigenous research needs to reflect Indigenous contexts and world views: that is, they must come from an Indigenous paradigm rather than an Indigenous perspective.” (p. 176)

Source: Wilson S. What is indigenous research methodology? *Canadian Journal of Native Education*. 2001;25(2):175.

Indigenous methodologies

Written by Dawn Morrison

In contrast to the abundance of highly localized Indigenous foods that were once harvested in the forests, fields and waterways of B.C., Indigenous Peoples' access to adequate amounts of culturally adapted foods has declined drastically throughout colonization. Addressing the disparity that exists in the gaps where Indigenous Peoples experience rates of food insecurity at three times the national averageⁱ will require the wider application and promotion of Indigenous methodologies and knowledge encoded within a complex system of bio-diversity and cultural heritage.

There is a need to redesign institutional frameworks to facilitate the generation of decolonizing research,ⁱⁱ action and policy proposals that can provide a wealth of historical points of reference for addressing food sovereignty, as well as: 1) serve to increase capacity of Indigenous Peoples to conduct research and education for and by themselves, 2) educate, inform and respond to cultural biases and assumptions and 3) assess the key conditions necessary to enter into a journey of understanding more deeply a non-linear, relational approach to supporting Indigenous food sovereignty. Indigenous food sovereignty thereby provides a framework for health and community development within the holistic health narrative that enabled Indigenous hunting, fishing and gathering societies to adapt some of the most sustainable adaptation strategies of humanity.ⁱⁱⁱ

Appreciative inquiry is one example of a methodology that can be applied to appreciating and inquiring into the characteristics of strength and resiliency to influence and support the transition towards a more regenerative life giving paradigm that underlies Indigenous worldviews.^{iv,v} Furthermore, a transformative approach to research aligns with the Indigenous understanding of the world that aligns with quantum science which affirms that we shape our world based on 'how' we observe.^{vi} In his book titled *Research is Ceremony*,^{vii} Wilson discusses how we enact our world through ritual and cultural protocol that help us find deeper meaning and understanding.^{viii} The process of decolonizing food systems research and relationships^{ix} can help us realize more fully the innovative strategies and solutions that lie dormant in the gaps of knowledge where Indigenous Peoples have been 'disappeared' in western science based agricultural research and resource development.^x

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- i Gionet L, Roshanafshar S. Select health indicators of First Nations people living off reserve, Métis and Inuit. Ottawa, ON: Statistics Canada; January 29, 2013 [November 27, 2015]. Available from: <https://www150.statcan.gc.ca/n1/pub/82-624-x/2013001/article/11763-eng.htm>
- ii Smith LT. *Decolonizing Methodologies: Research and Indigenous Peoples*. London, UK: Zed Books; 1999. 242.
- iii Lee R, Daly R. *Cambridge Encyclopedia of Hunters and Gatherers*. Cambridge, UK: Cambridge University Press; 2004. 534.
- iv Dahlberg, K. A transition from agriculture to regenerative food systems. *Futures*. 1994. 26(2):170-9. Available from: [http://dx.doi.org/10.1016/0016-3287\(94\)90106-6](http://dx.doi.org/10.1016/0016-3287(94)90106-6)
- v Sage C. The interconnected challenges for food security from a food regimes perspective: Energy, climate and malconsumption. *Journal of Rural Studies*. 2012; 29:71-80. Available from: https://www.academia.edu/4529904/Contesting_visions_for_future_food_security
- vi Meyer M. Holographic epistemology: Native common sense. *China Media Research*. 2013; 9(2):94-101. Available from: <https://education.illinois.edu/docs/default-source/default-document-library/herca256a3980b76a29a33dff4b008a8698.pdf?sfvrsn=0>
- vii Wilson S. *Research is ceremony: Indigenous research methods*. (2008). Winnipeg, MB: Fernwood Publishing; 2008. 144.
- viii Apfel-Marglin F. *Subversive Spiritualities: How Rituals Enact the World*. Oxford, UK: Oxford University Press; 2012. 264.
- ix Morrison D. Reflections and Realities. Expressions of food sovereignty in the 4th world. In *Indigenous food sovereignty concepts, cases and conversations*. Toronto, ON: Canadian Scholars Publishing; 2018. Manuscript submitted for publication 2019.
- x Shiva V. The 'Disappeared' Knowledge Systems. In *Monocultures of the Mind*. *Trumpeter*. 1993; 10:1–11. Available from: <http://trumpeter.athabascau.ca/index.php/trumpet/article/view/358/562>

Foundations for the proposed conceptual framework for food security indicators

Background

The scan of the literature did not identify any conceptual frameworks to guide the development of food security indicators. A number of health-related frameworks were found and reviewed through both the literature scan and the key informant discussions. The health-related frameworks, however, had numerous drawbacks for use in food security: they did not provide the capacity to make links between health, ecosystems and food systems through a causal chain or network (and in some cases did not include the ecosystem); many lacked the comprehensiveness required for food security; many were not conceptually clear and appeared difficult to implement in practice; and some were too focused on health care performance indicators.

Key informant discussions also did not reveal any appropriate conceptual frameworks for the development of food security indicators. Many organizations had formal processes for developing indicators, but few utilized an existing indicator framework. The exception was PHSA (Population Health Surveillance and Epidemiology, PPH), who used a Canadian Institute for Health Information indicator framework to develop health equity indicators. Most organizations developed indicators using strategic plans as a framework for categories. Key informant discussions did provide valuable information on the process of developing indicators and one suggested the delineation of different roles in indicator development (i.e. where stakeholders define what they want to measure and epidemiologists and/or academics define how to measure/what indicators to use).

Based on the literature scan, a modified environmental health indicator framework was deemed as the most appropriate theoretical foundation for a B.C. food security indicator conceptual model. The process of adapting the models illustrated above for use with B.C. food security indicators is outlined in *Conceptual Framework for Development of Food Security Indicators (July 2016)*. While no model can satisfy all contexts and needs, frameworks should be considered as tools that can be modified. Characteristics of a robust indicator framework are outlined in Figure 1.^{1,2}

Figure 1. Characteristics of a robust framework for indicator development

- Comprehensive in scope^{2,3}
- Conceptually clear (illustrates links between different dimensions of the model)^{2,3}
- Usable (the framework lends itself to a viable methodology for developing suitable indicators)²
- Balanced (framework accommodates issues with an environmental or health emphasis equally well;² covers various performance dimensions such as effectiveness, efficiency, quality and equity)³
- Able to integrate routinely collected data²
- Flexible²

Environmental health assessment scholars suggest that a combination of classification in terms of subject/ issue (in this case, food security) along with the environmental health causal network indicator categories is the most frequent form of indicator reporting. Thus, a matrix model was used to develop the proposed conceptual framework for B.C. food security indicators where environmental health causal network indicator categories (Table 1) are on the horizontal axis while food security elements (outlined below) are on the vertical axis. This framework is illustrated in Table 2 and will be further explored in the next section. To enhance understanding of the framework, descriptions of the two axes of the matrix are first examined.

Table 1. BCCDC causal network indicator category descriptors

<p>Determinant indicators: International</p> <ul style="list-style-type: none"> ■ Indicators describing the international social, demographic, political and economic context that impact food security internationally, nationally and in turn in B.C. ■ These indicators contribute to the question of “why” a situation has occurred.
<p>Determinant indicators: National and provincial</p> <ul style="list-style-type: none"> ■ Indicators describing the national and provincial social, demographic, political and economic context that impact food security in Canada and B.C. ■ These indicators contribute to the question of “why” a situation has occurred.
<p>Current state indicators</p> <ul style="list-style-type: none"> ■ Indicators describing current status of natural, physical and socio-economic environment. ■ These indicators contribute to the question of “what” situation has occurred.
<p>Impact indicators</p> <ul style="list-style-type: none"> ■ Indicators describing direct or indirect effects on the health of humans and/or the environment. ■ Impact indicators can include both “exposure” indicators and “effect” indicators.^{1, 12, 15} <ul style="list-style-type: none"> ■ Exposure indicators are any factors that may be associated with an outcome of interest. In this framework, it could describe positive, neutral or negative (risk) factors to human or environmental health when people or the natural environment are exposed to circumstances in their environs.¹⁶ For example, positive exposure could include: % population with proximity to traditional lands for gathering; % salmon exposed to adequate water temperature for spawning. Risks could include % of population exposed to hunger due to lack of income; % salmon population exposed to contaminants. ■ Effect indicators describe a wide range of human health and environmental effects that can result from exposures in their environs.¹⁶ (e.g. human morbidity; mortality rates in salmon). ■ These indicators contribute to the question of “so what” (i.e. what are the implications or what is the analysis of the situation that has occurred?).
<p>Response indicators</p> <ul style="list-style-type: none"> ■ Indicators describing interventions/strategies aimed at reducing or avoiding human or environmental health impacts. “Response” indicators may represent strategies directed toward any variable (i.e. determinants, impact, etc.). ■ These indicators contribute to the question of “now what” (i.e. what are the appropriate actions that could be taken).

Adapted from Stanners et al.;¹² WHO 1999;¹⁵ Yee et al.;¹⁶ Hambling et al.;¹ and Morris et al.¹⁷

Vertical axis: food security and its elements

Food security is a complex term without a single definition. The Population and Public Health Program at BCCDC outlines the goals of food security as: increase[ing] physical, social and economic access to nutritious, safe, personally and culturally acceptable food with a focus on increasing availability of healthy food produced in a sustainable manner and recognizing the elements of Indigenous food sovereignty.³ These food security goals encompass a broad scope of food security definitions, including the UN Food and Agriculture Organization definition,⁴ community food security⁵ and individual and household food insecurity.⁶

Food security is complex in both content (health, social equity, food sustainability, food safety) and governance (including the need to address food security through multi-sectoral, multi-disciplinary approaches, through a variety of means and in a variety of settings). Therefore, this framework required that food security be classified into elements that would capture this complexity. In order to choose the food security elements used in this framework, an examination of multiple models of food security was undertaken. The consultant reviewed twelve classifications of food security/food systems, as outlined in Appendix 2. The Provincial Manager, Food Security and the consultant further explored and evaluated these models to determine a classification that would both reflect the work occurring in B.C. as well as the literature. The elements chosen draw on many food security/food system models including the *2014 BC Ministry of Health Model Core Program Paper: Food Security* indicator categories: organizational commitment to food in security; community capacity; individual and household food security.⁷ Although efforts were made to include Indigenous food sovereignty in this process as noted on page 3, more work is needed to include Indigenous food sovereignty and Indigenous food security models/frameworks.

The three food security elements (and sub-elements) defined for use in the indicator framework are outline in Table 2, below:

Table 2. Elements and sub-elements

Elements	Sub-elements
1. Individual and household food insecurity	
2. Food systems	<ul style="list-style-type: none"> a. Resilient b. Health promoting c. Environmentally sustainable d. Safe
3. Capacity	<ul style="list-style-type: none"> a. Social cohesion & participation b. Skills & knowledge c. Resources

The terms used to describe the elements and sub-elements have many definitions, so the consultant and Provincial Manager, Food Security adopted or adapted definitions to develop descriptors (Appendix 3) used to explain the elements of this conceptual framework.

Sub-elements were initially developed by reviewing existing classifications of food security and/or food systems (Appendix 2). These classifications provided guidance for the main elements, and also for the sub-elements under food systems. However, while these classifications identified the element of capacity, they did not provide enough information to develop the sub-elements under capacity.

The descriptor of capacity in this framework reflects multiple food security and health promotion models which address the issue of capacity or process. These include: BC Ministry of Health's *Model Core Program Paper: Food Security* (community capacity),⁷ Ryerson Centre for Food Studies (agency),⁸ the Community Capital Framework and Community Food Systems (community capital)⁹ and Hancock (processes).¹⁰ After review of these terms, capacity was deemed most salient for the food security framework. Sub-elements under capacity were derived from the Public Health Agency of Canada's *Community Capacity Building Tool*,¹¹ which defines nine dimensions of community capacity. The consultant and Provincial Manager, Food Security chose six out of their nine dimensions of community capacity for inclusion in this framework as being most salient to food security work in B.C.; these are outlined in Table 2 and Appendix 3. Two were combined into one sub-element of resource mobilization: a) external supports (funding bodies), and b) obtaining resources. Another two were combined into the sub-element of social cohesion: a) linking with others, and b) sense of community. The framework has the flexibility to add other dimensions of community capacity in the future as more qualitative data becomes available and as approaches to capacity in food security shift.

Sub-elements were then modified in an iterative manner following consultation with the BCCDC Provincial Manager, Food Security, the Health Authority Food Security Committee and external interviewees.

Because more work needs to happen for the framework to be more inclusive of Indigenous food sovereignty and Indigenous food security, we have included some elements of Indigenous food sovereignty in the following section.

Indigenous food sovereignty

Written by Dawn Morrison

The province of B.C. is the home to 27 nations of the original Indigenous Peoples who continue to apply diverse traditional harvesting (hunting, fishing, farming and gathering) strategies into the 21st century. An estimated two thirds of all of Canada's biological diversity finds its origins in the 10 major eco-regions of B.C.ⁱ that overlay roughly with the eight major Indigenous language groups.ⁱⁱ The diverse landscapes, terrains and territories are home to an estimated 400-500 Indigenous plants and animals that are used for foods in medicines.ⁱⁱⁱ

Indigenous foods such as wild salmon, berries, medicines and native bee species play keystone roles in all aspects of the health and wellbeing of Indigenous Peoples – the physical, emotional, mental and spiritual. Indigenous Peoples' holistic understanding of health is keystone to finding sustainability solutions in the Indigenous food web as a whole. The study of agro-ecology affirms that the health of the food grown in agriculture is interdependent with the health of neighboring ecosystems where Indigenous Peoples hunt, fish, grow and gather.

Article 8 (j) of the *Convention on Biological Diversity of the United Nations*^{iv} also affirms that traditional ecological knowledge plays an important role in conserving biological diversity and cultural heritage for the benefit of all of humanity. While agro-ecology and permaculture attempt to reconcile agriculture with the health of Indigenous ecosystems, it fails to address issues of social policy and unresolved land claims that are a necessary component of Indigenous food sovereignty.

Indigenous hunters, fishers and gatherers are rich with traditional ecological knowledge, wisdom and values that have made major contributions to society. The broader ecological, cultural and temporal scope and scale of Indigenous land and food systems poses systemic challenges that cannot be reconciled in the existing western science based framework for agriculture research and development.

There is a rapidly expanding Indigenous food systems network of traditional harvesters who are part of a large cultural resurgence that is mobilizing to address the issues underlying food security in Indigenous communities. The network was born in large part, by the work of the Working Group on Indigenous Food Sovereignty (WGIFS) that was originally formed in 2006 in relationship to the BC Food Systems Network. The WGIFS has identified four key principles that provide a critical pathway to realizing more fully the ways to support food sovereignty in Indigenous communities.^v All key principles are supported by the United Nations Declaration on the Rights of Indigenous Peoples signed on to by the Canadian government.^{vi}

i Cannings R, Cannings S. British Columbia: A natural history. Vancouver, BC: Greystone Books; 2004. 352.

ii First Peoples' Heritage, Language and Culture Council. First Peoples Language Map [Internet]. British Columbia: First Peoples' Heritage, Language and Council; 2008. Available from <http://maps.fphlcc.ca/>

iii Turner N. Importance of biodiversity for First Peoples of British Columbia. Victoria, BC; Biodiversity BC; 2007. Available from: <http://www.biodiversitybc.org/assets/Default/BBC%20Importance%20of%20Biodiversity%20to%20First%20Peoples.pdf>

iv Convention on Biological Diversity. Article 8 (j) Traditional Knowledge, Innovations and Practices. Montreal, QC: Convention on Biological Diversity; date unknown. Available from: <https://www.cbd.int/traditional/>

v Morrison D. Reflections and Realities. Expressions of food sovereignty in the 4th world. In *Indigenous food sovereignty concepts, cases and conversations*. Toronto, ON: Canadian Scholars Publishing; 2018. Manuscript submitted for publication 2019.

vi United Nations General Assembly. United Nations Declaration on the Rights of Indigenous Peoples. New York City, NY: United Nations; 2008. Available from: https://www.un.org/esa/socdev/unpfii/documents/DRIPS_en.pdf

- 1. Sacred or divine sovereignty** – *Food is a gift from the Creator; and is a sacred part of the regenerative life giving system in nature. Indigenous food sovereignty is fundamentally achieved by observing earth based protocols and upholding our sacred responsibility to nurture healthy, reciprocal, and interdependent relationships with the land, plants, animals and people that provide us with our food.*
- 2. Participatory** – *IFS [Indigenous food sovereignty] is fundamentally based on “action”, or the day to day practice of maintaining traditional harvesting strategies. The living reality of Indigenous food sovereignty requires that both present and future generations continue to participate in traditional harvesting strategies and cultural practices at all of the individual, family, community and tribal levels.*
- 3. Self-determination** - *The ability to respond to our own basic needs for healthy, culturally appropriate Indigenous foods in sustainable tribal economies. The ability to make decisions over the amount and quality of food we hunt, fish, gather, grow, eat and share. Freedom from dependence on grocery stores or corporately controlled food production, distribution and consumption in industrialized economies.*
- 4. Policy** - *Indigenous food sovereignty is grounded in the earth based practices, paradigms, and protocols that underlie Indigenous cultures. However, Indigenous Peoples’ ability to respond to their own needs for adequate amounts of Indigenous foods in the forests, fields and waterways requires a new conceptual framework that extends beyond the reductionist mindset to the broader ecological, cultural and temporal scope and scale of Indigenous food systems.*

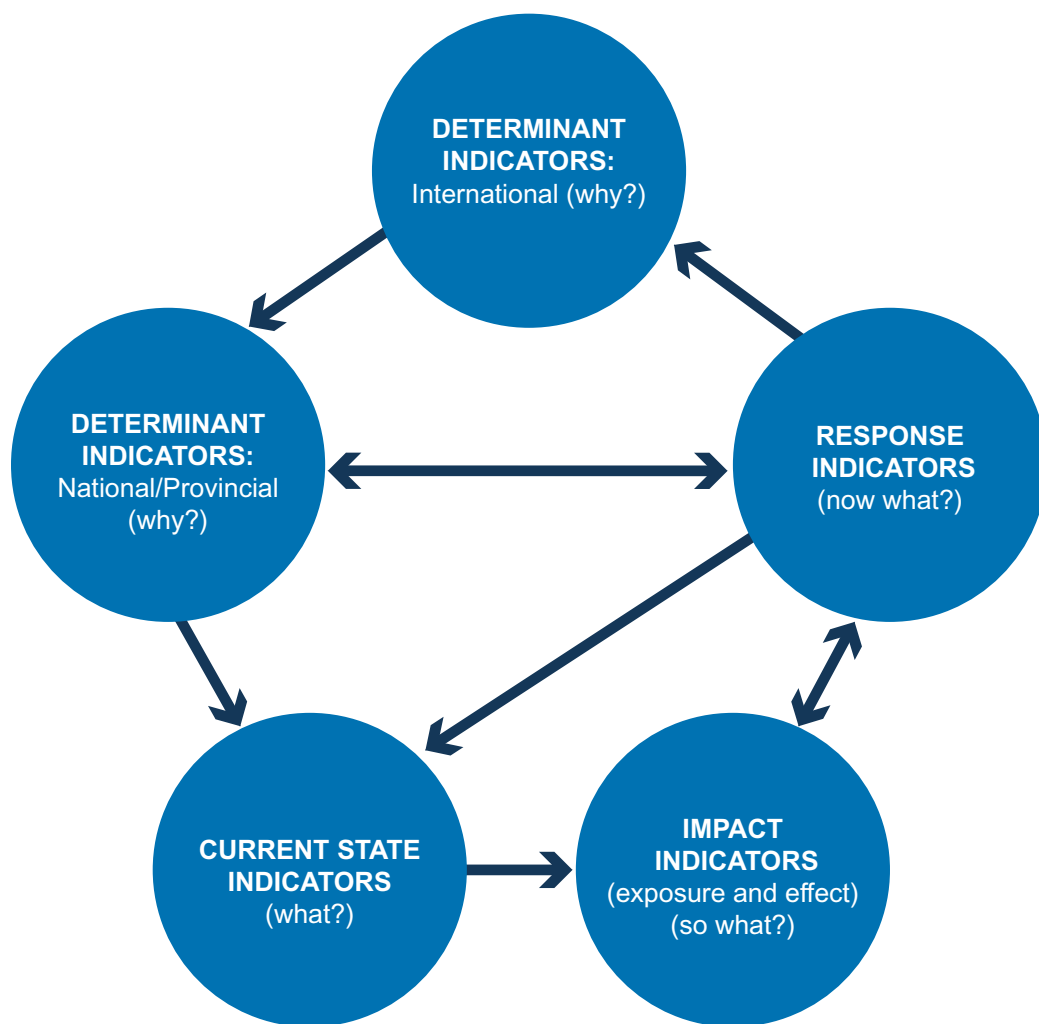
Source: *Indigenous Food Systems Network [Internet]. Chase, BC: Indigenous Food Sovereignty Network; date unknown. Available from: <http://www.indigenousfoodsystems.org/food-sovereignty>*

Horizontal axis: environmental health causal network indicators

Environmental health indicator frameworks form a key part of the theoretical foundation for the proposed conceptual framework for B.C. food security indicators. As noted above, detailed information about these frameworks can be found in *Food Security Indicator Framework: Literature Scan (August 2016)*. Widely used in environmental assessments, the root of the environmental health indicator frameworks is the Pressure – State – Response (PSR) model (based on work by the Organization for Economic Cooperation and Development and the Canadian government).^{1, 12-14} In general, “pressure” refers to a force that acts on the environment (e.g. production and use of fossil fuels) that cause a certain “state” in the environment (e.g. climate change), while “responses” refer to social responses in controlling the impact of the “pressure” (e.g. CO₂ emission targets).¹² This simple PSR model framework is considered unsuitable for describing human health linkages.² The literature reflects multiple derivations of expansions of the PSR framework which differ mainly to the degree that they subdivide the steps in the causal chain.¹² In phase one of the framework development process, the most commonly used environmental health indicator frameworks were reviewed and modified for use in the food security indicator framework. Descriptors of each category (used in the horizontal axis of the model) are outlined in Table 1. They have been adapted from the literature for use in B.C. from Stanners et al.;¹² WHO 1999;¹⁵ Yee et al.;¹⁶ Hambling et al.;¹ and Morris et al.¹⁷ Even for trained users of this model, determining the correct category where indicators fall can be challenging. For this reason, the consultant added a further designation to each category based on a model of reflection:¹⁸ “what” (current state); “so what” (impact indicators); and “now what” (response). The “model of reflection” has also been reflected in data management.¹⁹ Additionally, the descriptor “why” was added to the determinant indicators.

The causal chain framework, however, relies on linear, one-directional relationships and does not illustrate the complexity of interactions between the variables.^{12, 14} The evolving literature in this area illustrates a movement from causal chain models to causal network models, as linear and one-directional relationships in chain models do not illustrate the complexity of interactions between the variables. While Table 1 describes the categories for the causal network indicators as established by PPH, Figure 2 illustrates these categories using a network rather than a linear format. Note that not all possible relationships are denoted with arrows.

Figure 2. Schematic overview of PHSA causal network indicator categories



Adapted from Yee et al.¹⁶

Proposed conceptual framework for B.C. food security indicators

Food security elements and BCCDC causal network indicator categories (Table 1) are combined in a matrix to comprise the proposed conceptual framework for B.C. food security indicators. This framework is illustrated in Table 2. The framework illustrates the comprehensive and interconnected nature of food security, encompassing both human and environmental health, as well as aspects of food and socio-economic systems. The framework and future indicators can include any, or multiple, stages across the lifespan and can include indicators that reflect Indigenous Peoples' food sovereignty and/or food security. While public health (BCCDC, the health authorities and the Ministry of Health) will prioritize indicators that align with their mandates, the broad framework allows for different sectors to contribute indicator information.

The indicator categories (horizontal axis) are presented in a linear (causal chain) format in Table 2. Their relationship to one another is more complex, however, so Appendix 4 illustrates one of the food security elements as a causal network; this demonstrates the interrelationship and causal relationships between the indicator categories.

Descriptors of food security elements are outlined in Appendix 3. Development and ratification of a common set of descriptors is an essential part of the development of this framework, as a shared understanding of terms facilitates appropriate categorization of indicators. The descriptors may be further refined in the future.

Table 3. Proposed conceptual framework for food security indicators for British Columbia

Food Security Elements	Determinant Indicators: National/Provincial (Why?)	Current State Indicators (What?)	Impact Indicators (So what?)	Response Indicators ⁱ (Now what?)
1. Individual and household food insecurity	Indicators describing the national or provincial social, demographic, political and economic context that impact food security in B.C. and/or Canada.	Indicators describing current status of natural, built, policy and socio-economic environments.	Indicators describing direct or indirect effects on the health of humans and/or the environment.	Indicators describing intervention/strategies aimed at reducing or avoiding health impacts.
2. Food systems <ul style="list-style-type: none"> a. Resilient (people and structures) b. Health Promoting c. Environmentally sustainable (ecosystem health) d. Safe 				
3. Capacity <ul style="list-style-type: none"> a. Social cohesion and participation b. Skills and knowledge c. Resources 				

i The "Response" indicators can be in response to any variable (i.e. determinants, impact, etc.).

The following points should also be considered in populating the conceptual framework with indicators:

- The framework allows for integration of indicators which are currently being collected (e.g. individual and household food insecurity).
- Each indicator cell could include input, process and outcome indicators.
- Impact indicators can include both “exposure” indicators and “effect” indicators;^{1, 12, 15} they describe direct or indirect effects on the health of humans and/or the environment (see Table 1 for more detail).
- While “impact” indicators include mostly outcome indicators, outcome measures may occur across all categories.
- Qualitative indicatorsⁱ may be used for all categories in addition to quantitative data (e.g. identification of barriers to implementing a specific program).
- Other frameworks could be integrated within categories. For example, “how” categories from the population health promotion model¹⁷ could be considered under “response” (e.g. strengthen community action; healthy public policy).

ⁱ Qualitative indicators of development refer primarily to the use of qualitative methods such as individual and group interviews to select indicators and to generate the content for and pilot measures. Qualitative methods can be used alongside quantitative measures of quality of life to validate or interpret their results. They can also be used during their development to ensure that they are relevant and sensitive to important differences. A food security example would be barriers defined by citizens for advancing food security in their community.

Adapted from: Camfield L. Qualitative Indicators of Development. In: Michalos AC, editor. Encyclopedia of Quality of Life and Well-Being Research. Dordrecht: Springer Netherlands; 2014. p. 5250-5.²⁰

Conclusion

As noted above, classification of indicators into a matrix appears to be a shift from the manner in which food security indicators are currently categorized. This change may contribute to the development of a common frame of reference that shifts the understanding of food security to incorporate considerations across the causal network of food security (i.e. determinants, impacts and responses) as well as to include emerging areas such as ecological health, climate change and food sustainability. Use of this conceptual framework enables program planners and policy makers to be clear about where and how they are attempting to assess, influence and monitor food security.

Further refinement and modification of the framework is anticipated as this framework is put into practice through the development of indicators and their integration into the framework. Next steps include a literature review, prioritizing indicators, refinement of indicators and exploring data sources, pilot testing the indicators and finally collection of priority indicators. The process for food security indicator development will look to the PHSA process used to develop priority health equity indicators and injury prevention indicators. As noted above, a delineation of roles in indicator development may be considered, where food security experts from the health authorities define and prioritize what they want to measure and epidemiologists and/or academics define how to measure indicators and what indicators are plausible to use. Further work will also include collaborating with the BC Observatory for Population and Public Health and with the First Nations Health Authority.

Lastly, in order for the framework to reconcile with the food sovereignty and food security issues that are unique to Indigenous Peoples in B.C., more adequate consultation will be needed with Indigenous Peoples and communities. Consultations are needed to better understand the contexts and methodologies required in reconceptualizing the framework given the limitations of attempting to align this framework (which is based on the agricultural system) with Indigenous worldviews.

Appendices

Appendix 1: PHSA 2010 food security indicators

Category 1: Organizational commitment to food security indicator

A1: Presence of food policy that supports food security within health authorities.

Category 2: Community capacity indicator

A2: Proportion of communities that have ongoing food actions supported through the Community Food Action Initiative.

Category 3: Personal and household food security indicator

A3: Annual cost of a nutritious food basket in B.C., as a proportion of family income.

A4: Prevalence of nutrition related health conditions.

A5: Proportion of the B.C. population that eats fruits and vegetables five or more times per day.

A6: Proportion of the B.C. population that always had enough of the foods they wanted to eat in the last 12 months.

Category 4: Local food production and access

No indicator qualified for this category, due to lack of readily available data sources.

From: Provincial Health Services Authority: Population and Public Health. Implementing Food Security Indicators. Phase II: Food Security Indicators Project. Vancouver, BC, 2010.²¹

Appendix 2: Classification of indicators or categories within selected food security models

BC Ministry of Health Model Core Program Paper: Food Security, indicator categories: organizational commitment to food security; community capacity; individual and household food security.⁷

Canadian Agri-Food Policy Institute model: collaboration; innovation; food systems risk management; sustainability leadership; and enabling regulatory change.²²

Conference Board of Canada, Centre for Food in Canada: healthy food, food safety, industry prosperity, household food security, and environmental sustainability.²³

Continuum of Food Security: efficiency strategies; participatory/ transitional strategies; system redesign strategies.²⁴

Food Secure Canada (3 interlocking commitments): zero hunger; a sustainable food system; healthy and safe food.²⁵

Food Secure Canada, People's Food Policy Platform: Indigenous food sovereignty; food sovereignty in rural and remote communities; access to food in urban communities; agriculture, infrastructure and livelihoods; a sustainable fishery and reasonable livelihood for fishers; environment and agriculture; science and technology for food and agriculture; food trade and international aid; healthy and safe food for all; food democracy and governance.²⁶

Ontario Food and Nutrition Strategy: healthy food access; food literacy and skills; healthy food systems (i. food production and economic development; ii. food systems excellence and innovation; environmental protection).²⁷

Provincial Health Services Authority food security indicator categories: Organizational Commitment to Food Security; Community Capacity; Personal and Household Food Security.²⁸

Ryerson University, Centre for Studies in Food Security: The Five A's of Food Security: availability; accessibility; adequacy; acceptability; agency.⁸

"The Community Capital Framework" (from: Community Based Food System Assessment and Planning, Facilitator's Guidebook 2011, Virginia Cooperative Extension): natural capital; cultural capital; human capital; social capital; political capital; financial capital; built capital.⁹

The Thunder Bay + Area Community Food Security Report Card 2015: food access; forest and freshwater foods; food infrastructure; food procurement; food production; school food environments; urban agriculture.²⁹

Seven Pillars of Food Sovereignty: focuses on food for people; builds knowledge and skills; works with nature; values food providers; localizes food systems; puts control locally; food is sacred. From: International Forum for Food and the Indigenous Circle (People's Food Policy process) 2007.³⁰

Appendix 3: Descriptors for food security elements

The terms used to describe the elements and sub-elements in the framework have many definitions; as such, the authors either adopted or adapted definitions to explain the elements within the context of this conceptual framework.

1. Individual and household food insecurity

- *The primary cause of household food insecurity is due to the inadequate or insecure access to food due to financial constraint.*³¹ This descriptor comes from the Canadian interdisciplinary research initiative, PROOF (Food Insecurity Policy Research).
- Household food insecurity is the term used for data collection as part of the Canadian Community Health Survey (CCHS) – data is collected using the Household Food Security Survey Module. Household food insecurity is measured at three levels: marginally food insecure; moderately food insecure; severely food insecure.⁶ B.C. may collect data beyond CCHS, which may also reflect an individual's food insecurity status. Thus, this indicator element is termed “individual and household food insecurity”.

2. Food systems

- *A food system is understood as the production, harvesting, processing, distribution, consumption and waste management of food. This descriptor of the food system can occur at multiple geographical levels, including (but not limited to) provincial, bio-regionalⁱ and community levels. It can include social, economic and biophysical processes that influence the food system. This descriptor is adapted from a 2016 PHSA definition of food systems.*³²

The indicator sub-elements within this element include:

- i. *Resilient* - Resilient food systems facilitate the nourishment of the population through the availability of and access to food by communities and [bio-]regions (e.g. through farming, production, processing, access to fishing, hunting, gathering). A resilient food system is enhanced when strong economic viability exists for local, bio-regional and provincial food systems and for those who work in the various sectors of the food system. A resilient food system also has the dynamic capacity to continue to achieve food security despite disturbances and shocks.

The descriptor of resilience is adapted from Tendell et al.'s definition.³³ In this framework, resilient refers to people, structures and food supply systems. See the end of this section for an explanation of the relationship between sub-elements i. resilient, and iii. environmentally sustainable.*

- ii. *Health promoting* - Health promoting food systems facilitate the availability of healthy and nutritious food. Health promoting food systems refer to both naturally occurring food environments (e.g. wild fish), as well as those that are created by humans/society (e.g.

ⁱ Bioregions are generally defined as areas that share similar topography, plant and animal life, and human culture; they are not just geographical or political areas delineated by lines on a map but are conceptual as well. Bioregionalism adheres to the notion that human settlement and land use patterns must be viewed as integral, functional components of ecosystems rather than as separate, unrelated entities. From: Peter Berg, “Bioregionalism – a definition” in The Digger Archives, http://www.diggers.org/freecitynews/_disc1/00000017.htm, quoted in Mullinix, K, 2016.

access to grocery stores, healthy food, food delivery services, farmers markets/food markets, availability of gardens, etc.). Policy is a main lever for advancing a health promoting food environment.

This descriptor is modified from the definition of *Food Environments* by Rideout, Mah and Minaker.³⁴ While all of the other four elements also can promote human health, in this framework, this sub-element is specific to the consumption aspect of the food system (versus production, processing, etc.).

- iii. *Environmentally sustainable* - Environmentally sustainable food systems are those that minimize negative environmental impacts and contribute to food and nutrition security and to a healthy life for present and future generations; they are also protective and respectful of biodiversity, ecosystems and cultures.

This descriptor is adapted from the of Food and Agriculture Organization definition of “sustainable diets”.³⁵ In this framework environmentally sustainable refers to all aspects of the ecosystem (water and air quality, biodiversity, etc.). See the end of this section for an explanation of the relationship between sub-elements i. resilient, and iii. environmentally sustainable.*

- iv. *Safe* - A safe food supply (market food and traditional food) is protected from microbial, chemical and physical hazards or contamination that may occur during all stages of food production and handling: growing, harvesting, processing, transporting, preparing, distributing and storing.

This descriptor comes from BCCDC and the BC Ministry of Agriculture and Lands, 2007.³⁶

*According to Tendell et al., resilience and sustainability are complementary concepts, where sustainability is “broadly defined as the capacity to achieve today’s goals without compromising the future capacity to achieve them”, whereas resilience can be seen as the means to continue to achieve goals despite disturbances and shocks”(³³ p. 18). In this framework, resilient (sub-element “i”) refers to people, structures and food supply systems, whereas environmentally sustainable (sub-element “iii”) refers to the ecosystem. These two sub-elements are interconnected, as a resilient food system cannot exist without an environmentally sustainable food system. However, there are instances where trade-offs between the elements of resilient and environmentally sustainable food systems may need to be made. For example, research currently shows that while local food systems are important for many reasons including resilience, local foods can be, but are not always more sustainable.³⁷

- 3. **Capacity** - Food security capacity is a measure of the knowledge, skills, abilities, resources and commitment of communities and community members to address and influence food security challenges and opportunities in their communities and beyond.

This descriptor is a modification of the Canadian Cancer Society³⁸ general definition of “capacity building”. In this context, capacity is not limited to the community level – it can occur at the individual, community, bio-regional or provincial levels. This element differs slightly from the other two which are issue focused. Capacity is process-focused, and the impact on human and

environmental health is less straightforward and may utilize more process or output indicatorsⁱ and qualitative indicators.ⁱⁱ Community capacity can be seen as both a goal and as a means to achieve goals. “It is not a substitute for programme goals or objectives but it creates a separate set of objectives that run parallel to those of specific programmes”, referred to as a ‘parallel-track’,³⁹ (as cited in ⁴⁰ p. 267).

The proposed indicator sub-elements within this element include:

i. Social cohesion and participation

- a. Social cohesion can be described as the ongoing process of developing a community of shared values and equal opportunity based on a sense of trust, hope and reciprocity. Principles of inclusion, belonging, participation, recognition and legitimacy are central to social cohesion (adapted from ^{41,42}). The description includes the concept of “social connectedness”^{*}, which focuses more on individual relationships and connection to the community.

Social cohesion can be fostered through food security policies and programs which integrate their members, build trust with others and strengthen the community’s abilities to coordinate and cooperate for mutual benefit (adapted from ^{11,43}).

Indigenous People have a strong connection to the land and the environment. Access to the land and to traditional foods forms the basis of holistic health, social activity, social cohesion, overall connectedness and personal identity (adapted from: ^{44,45}).

^{*}Social connectedness is defined by the frequency of contact with others, personal relationships and engagement in the community.⁴⁶

- b. Participation is the active involvement of people in improving their own and their community’s health and well-being. Participating in a project means the target population, community members, and other stakeholders are involved in project activities, such as making decisions and evaluation.^{11(p. 4)}
- ii. Resources - includes finding time, funding, leadership, volunteers, information, facilities and other human resource supports both from inside and outside the community.¹¹ This also includes public health support and commitments.
- iii. Skills and knowledge - refers to both gaining and using skills and knowledge to promote food security.¹¹ Skills and knowledge can be considered at in two ways:
- a. Gaining and using skills and knowledge related to advocacy in advancing food-related (e.g. land, water, Indigenous food sovereignty, etc.) and income policies.
- a. Gaining and using skills and knowledge related to advancing food system and Indigenous food access (e.g. training for traditional ways of harvesting, sharing cultural knowledge, training for new farmers and development of skills to establish food processing hubs). This sub-element could also include individual cooking and gardening skills for the general population, but it is important to differentiate that food skills are not an appropriate response to income related food insecurity.

i Process indicators refer to indicators that measure whether planned activities took place (e.g. number of meetings). Output indicators add more details in relation to the product (“output”) of the activity, e.g. the number of people trained). Adapted from: World Health Organization. 2014

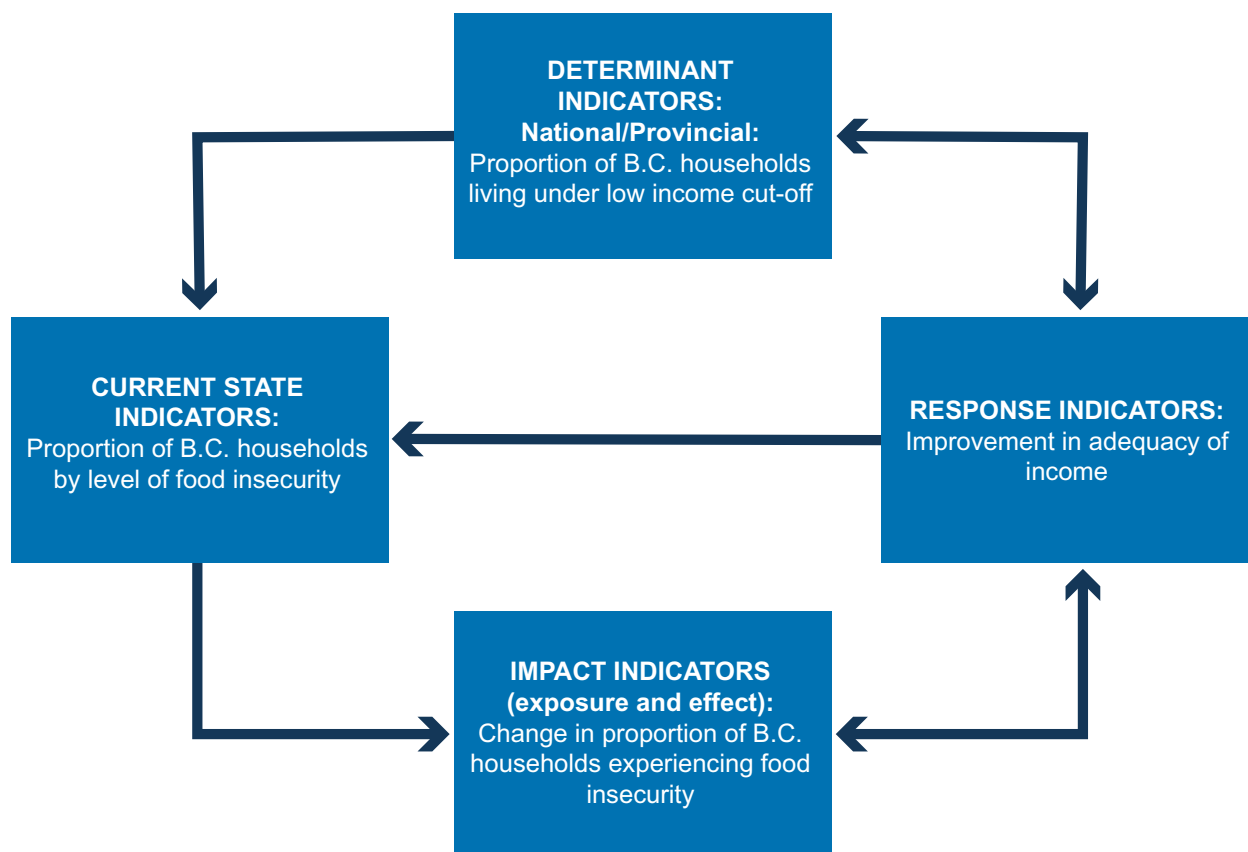
ii Qualitative indicators of development refer primarily to the use of qualitative methods such as individual and group interviews to select indicators and to generate the content for and pilot measures. Qualitative methods can be used alongside quantitative measures of quality of life to validate or interpret their results. They can also be used during their development to ensure that they are relevant and sensitive to important differences. A food security example would be barriers defined by citizens for advancing food security in their community. Adapted from: Camfield, 2014.

Appendix 4: Example of food security indicator causal network

Appendix 4 illustrates an example of the proposed food security indicator frameworks in a non-linear network manner rather than as a simple matrix (i.e. Table 2). This demonstrates the causal relationships and interconnectedness between indicators. For example, a “provincial determinant” of “proportion of B.C. households living under the low-income cut-off” could have a direct impact stimulating the response of “improvement of adequacy of income”, or it could act through a casual chain, impacting food insecurity, then triggering a response of an improvement of income adequacy. It can also be bi-directional (e.g. “improvement of adequacy of income” can decrease the “proportion of B.C. households living under the low income cut-off”).

Individual and Household Food Insecurity Causal Network

*Each category is monitored with indicators, including Response



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