THE LEGACY OF THE NUXALK FOOD AND NUTRITION PROGRAM FOR THE FOOD SECURITY, HEALTH, AND WELL-BEING OF INDIGENOUS PEOPLES IN BRITISH COLUMBIA

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INTRODUCTION

Global population growth and the complexities of intensified economic, environmental, and social change have accelerated the globalization of food networks and supplies. The marketing of profitable industrial food products has been so successful that it has brought serious health consequences to people everywhere, resulting in changing health statistics so that non-communicable diseases such as cardiovascular diseases, diabetes, and cancer are now a more significant global health threat than are infectious diseases (WHO 2008). This change is known as the "nutrition transition." Indigenous peoples everywhere have experienced this nutrition and health transition (Cunningham 2009). Despite the wealth of traditional knowledge regarding how to eat well and lead healthy lives in rural ecosystems, the 370 million Indigenous people worldwide are among those most vulnerable to food insecurity, malnutrition, and chronic diseases (Cunningham 2009; Egeland and Harrison 2013). This vulnerability is directly linked to enduring marginalization, poverty, and discrimination, along with constant environmental threats to Indigenous peoples' land and cultural resource base, which limits their access to healthy foods and heightens the risk of loss of heritage and identity (Kuhnlein and Receveur 1996; Turner, Plotkin, and Kuhnlein 2013).

For Indigenous peoples globally, food systems that evolved within their cultures and local ecosystems, probably over thousands of years, are now being replaced with a mix of traditional foods and commercial foods bought in markets, including industrially processed foods. Health, which is recognized for its physical, emotional, mental, and spiritual aspects, including healing and protection from disease, is no longer entirely supported through the full range of biodiverse traditional foods and ecosystem services formerly used in the rural areas in which Indigenous peoples live (Kuhnlein and Burlingame 2013).

Among the Indigenous peoples of British Columbia, as in other parts of Canada (and, indeed, worldwide), research has documented that family diets are now overwhelmingly dominated by industrial food products, with local traditional foods playing a supplemental role (Egeland and Harrison 2013; Chan et al. 2011). As is the case for most Indigenous peoples (Kuhnlein et al. 2013), the traditional dietary component continues to be important nutritionally for protein and micronutrients, but the energy component from nutrient-poor carbohydrates and fats from commercial foods contributes excess dietary energy. This regular excess of nutrient-poor dietary energy combined with predominantly sedentary lifestyles has led to an increasing prevalence of obesity and the non-communicable chronic diseases attendant upon it (Kuhnlein and Receveur 1996).

BC First Nations continue to experience shorter life expectancy, higher mortality rates, and higher rates of infant mortality than do other residents of the province (Provincial Health Officer's Special Report 2012). Cardiovascular disease is a leading cause of death among First Nation adults (Health Canada 2009). Inadequate nutrition during pregnancy increases the risk of infant mortality and chronic disease later in life (Barker 2006; Abu-Saad and Fraser 2010). Poor nutrition throughout life is a contributing factor to the gaps in health data between Indigenous and non-Indigenous populations in British Columbia.

The resulting poor health of British Columbia's First Nations is well illustrated by the Nuxalk Nation of Bella Coola. While published health data usually do not reflect circumstances specific to small communities, a health-related quality-of-life survey conducted among British Columbia's Bella Coola Valley residents in 2001–02 recognized lower scores for quality of life for Bella Coola Valley Indigenous people. Twice as many First Nation residents reported having diabetes or inflammatory arthritis compared to other Bella Coola residents. Both conditions reflect compromised immune systems that relate to nutrition and lifestyle factors (Thommasen and Zhang 2006).

In this article, we describe the Nuxalk Food and Nutrition Program (NFNP), which began in the early 1980s with the purpose of improving the health of the Nuxalk Nation. The NFNP was a collaborative multi-year food and nutrition program whose broad goals were to work with elders to document past and current Nuxalk food systems, and to use these food systems for health promotion. It emphasized how to attain healthy diets and fitness, and it had no specific measurement for, or focus on, obesity or chronic disease. As advised by the chief, council, and health centre, the program stressed the many positive aspects of traditional foods and health, and this undoubtedly contributed to its popularity in the community. The Nuxalk Nation and the NFNP provide an example of how a community can use the local food system (consisting of both traditional and market foods) as a platform for health education and wellness promotion.

In 2006, the community was visited and asked about continuing health promotion activities based on the NFNP. In 2009, the Nuxalk Nation, with twenty other BC First Nations communities, participated in the First Nations Food, Nutrition and Environment Study (FNFNES), whose purpose was to collect data on recent dietary patterns, food security, and general health status (Chan et al. 2011). We show that, while the NFNP's overall attempt to promote nutrition and health by improving the intake of nutritious food was successful according to several methods of evaluation (Kuhnlein and Moody 1989), the recent interviews in the FNFNES show persistent food insecurity not only in the Nuxalk Nation but also in other Indigenous communities in British Columbia. The NFNP was conducted before the research focus on the concept of "food security" and, hence, its data do not include this parameter.

The NFNP was the first of its kind in Canada. It served as a model and stimulus for other First Nations to document their traditional food systems and, in so doing, to build awareness of how local traditional foods could improve overall dietary quality and health. We summarize the research and health promotion activities associated with the traditional food system in the Nuxalk Nation and describe recent efforts of other BC First Nations to promote the use of their local foods. We also describe the decline in traditional food availability and offer reasons for the Nuxalk Nation's reduced access to traditional food.

Our intention is to demonstrate the imperative of including studies and data on local traditional foods in Indigenous peoples' community health programs, which focus on holistic health and well-being. Despite the challenges faced to maintain family access to traditional foods, our

perspective is that the diet and health of many Indigenous peoples would benefit from being grounded in local cultures and ecosystems that can support foods and healthful diets that will improve food security and well-being.

FOOD SYSTEM RESEARCH WITH THE NUXALK NATION TO IMPROVE WELL-BEING

The home of the Nuxalk First Nation is located 450 kilometres northwest of Vancouver in central coastal British Columbia among deep saltwater inlets, river estuaries, and valleys, and it is surrounded by rugged mountains that are often capped with snow. Remote from urban centres and dependent on the local environment for food and subsistence until about 150 years ago, the Nuxalk lived in a varied environment with a range of animal and plant foods from the coastal rainforest and the sea. The community sits at the end of a one-hundred-kilometre inlet of the Pacific Ocean on North Bentinck Arm at the mouth of the Bella Coola River. The community is also at the western terminus of Highway 20, its nearest service centre being Williams Lake, which is 420 kilometres to the east. (See Figure 1 in the Introduction to this volume and the Nuxalk Nation website map at http://www.nuxalk.net/html/maps.htm.)

The Bella Coola Valley encompasses many different habitats and substantial biological diversity. The Bella Coola River and its tributaries, upland lakes, and the ocean into which it empties provide a rich supply of seafood, including all five species of anadromous Pacific salmon (Lepofsky, Turner, and Kuhnlein 1985). The terrestrial range, which extends from sea level for over three thousand metres, provides game, root foods, tree foods, greens, and a variety of wild fruits. Food availability was plentiful, with drying, smoking, and other processes used to preserve food for winter storage (Kuhnlein 1992). By the late twentieth century, due to increasing marine and land harvesting by non-Native industries, the availability of many common Nuxalk traditional foods declined greatly (Kuhnlein 1992).

Today, according to Canada's 2006 census, half of the Bella Coola Valley's population is Indigenous, compared to 4.8 percent for the rest of British Columbia (Statistics Canada 2007). There are over sixteen hundred registered Nuxalk band members, almost nine hundred of whom live in 260 homes on Nuxalk reserve lands. Despite employment in local services, fishing, and forestry, there is high unemployment, and

the household income is half the provincial median household income of $62,346 (Aboriginal Affairs and Northern Development Canada 2013).

In the 2009 FNFNES survey, only 25 percent of Nuxalk participants rated their health as "excellent or good" in contrast to 62 percent of all Canadians aged twelve years and older who responded to the Canadian Community Health Survey (Health Canada 2011). As an added stress in this already challenging environment, eating purchased healthy food is less affordable in Bella Coola than elsewhere in the province. The monthly cost of feeding a family of four in the Vancouver Coastal Health Region (including Bella Coola) is $944 in contrast to the provincial average of $868 (Dietitians of Canada, BC Region 2012); however, the actual food costs in Bella Coola are believed to be even greater due to the remoteness of the location (Elizabeth Howard, personal communication).

THE NUXALK FOOD AND NUTRITION PROGRAM, 1979–86

During the late 1970s, the first author began a professorial appointment at the University of British Columbia (UBC). Ethnonutrition, as a discipline, was still in its infancy, merging the nutrition and anthropological sciences, and it soon captured the attention of the champions of the newly formed Society of Ethnobiology. In this atmosphere, many colleagues rallied to Professor Kuhnlein's call to become associated with the renowned elders of the Nuxalk Nation in Bella Coola, and planning began for a health promotion program emphasizing Nuxalk traditional foods, nutrition, and culture. The NFNP was one of the first of its kind to address the principles of food security by simultaneously promoting traditional foods and low-cost nutritious market foods. Nuxalk traditional foods were recommended as the first choice for nutrition and cost. In this sense, it was far ahead of its time in encouraging the community to "Eat Local."

In early 1979, following consultation with the Union of BC Indian Chiefs and the Nuxalk Nation Chief and Council, the first author, in collaboration with Health Centre staff, initiated funded activities from Health Canada for the NFNP as a program of research and health promotion emphasizing nutrition and fitness. Health Canada funded the work as a "demonstration project" so that other Indigenous communities in Canada could benefit from the experiences and lessons learned. New analyses of the nutritional value of Nuxalk traditional foods, interviews, an ecological study on the accessibility of Nuxalk foods, the nutritional status of community members, and community wellness activities were conducted.

Charles Nelson of the Nuxalk Nation recalls:

I was only a boy when my late mother took me to the Nuxalk health clinic in 1983 where she volunteered me in some tests. Much has changed in our territory since the study was done. At that time there was a good amount of traditional food available, our people were considerably healthier, and there were still many people who carried traditional knowledge of plant and animal foods. I left Bella Coola for many years but have been home for the last five years and am now the health and wellness coordinator for the Nuxalk Nation.

The first activity was to research the processing and nutritional values of eulachon grease. This yielded impressive data on this excellent food, which had not been previously studied in the laboratory (Kuhnlein, Turner, and Kluckner 1982; Kuhnlein et al. 1996). Research assistants from UBC and the community conducted interviews in order to understand the nutritional quality of diets of Nuxalk adults living on- and off-reserve in urban areas in the province (Kuhnlein 1984), and they found that dietary quality on-reserve was enhanced when traditional foods were part of the meals. At the same time, a series of meetings with elders identified important traditional foods that were still being used and the ways they were being harvested, processed, and prepared for meals. These meetings and documentations set the stage for sampling key foods in order to analyze their nutritional properties – work that continued for several years and that revealed many unique data regarding Nuxalk foods (Chan et al. 1996; Kuhnlein 1989a, 1990; Kuhnlein et al. 1982; Kuhnlein, Turner, and Kluckner 1982; Kuhnlein and Turner 1986; Kuhnlein et al. 1996; Turner et al. 1992).

At the suggestion of the elders, an interview study of grandmothers, mothers, and daughters in the same families gauged the change in traditional food use by decade, from 1920 to 1980 (Kuhnlein 1989b, 1992). Not only did the frequency and total amount of traditional foods used decline but so, too, did the number of species regularly used. Interviews also showed that (1) the decline in traditional food use was clearly linked to the availability and accessibility of traditional foods near the community and (2) the reduced use of a particular food resulted in an overall reduction in the appreciation of its taste. The intergenerational interviews showed that, among Nuxalk families, the use of fish (especially the various salmon and eulachon) was maintained more consistently over

the decades than was the use of plant foods. This is probably because, during the mid-twentieth century, the influx of commercial foods provided variety to the diet and reduced the need for the more labour-intensive plant foods. Thus, individuals and families came to use different foods and to engage in different lifestyles than had been the case just a few generations previously. Women reported on some of the complex causes for the declining use of traditional foods, including government regulations restricting land and water access, time constraints due to employment, school requirements, the ease with which market food could be purchased, and the decline in the transmission of knowledge from elders (Kuhnlein 1984, 1989b, 1992; Nuxalk Food and Nutrition Program Staff 1984).

In various ways, including through meetings, flyers, and presentations, all research activities and results were regularly reported to the Chief and Council as well as to the community. With encouragement from elders, Chief and Council, and community leaders, decisions were taken to use the accumulating knowledge in order to educate children in the schools and at community events, and to create health promotion activities in conjunction with staff at the Health Centre.

In 1983, health status assessments were conducted, and a three-year health promotion program was initiated. This program emphasized the knowledge gained from community research on (1) the traditional food system and (2) the patterns of use of both traditional and market foods. During this time, community-based staff delivered more than 350 nutrition-promotion activities in schools and other community settings. Popular activities included food events with elders, adults, and youth; feasts and meal events highlighting local food; public awareness and publications distributed to each home in the community; school presentations, fitness classes, a community demonstration garden, and food preservation demonstrations. A popular handbook on traditional Nuxalk foods and a recipe book were prepared and distributed (Kuhnlein and Moody 1989).

Interviews were conducted to compare the extent of traditional food use on Nuxalk Nation lands in 1981 and at the completion of the demonstration program in 1986. It was found that, in 1986, more families were using traditional foods, particularly plant foods (berries, greens, and garden fruit), and that the annual amount of all traditional foods harvested per family had also increased (Kuhnlein and Moody 1989). This demonstrates the ability of the intervention activities to stimulate more traditional food harvesting and preparation. As well, expenditures

at the local grocery store were reduced by about 25 percent during the program, when the costs of the Health Canada "nutritious food basket" for a four-person family increased by about 20 percent. Those interviewed reported that this change was due to increasing use of home-harvested and home-preserved food as well as to their improved knowledge of good-food shopping practices (ibid.).

The 1983 health assessments brought attention to the need to improve status for vitamin A (retinol and carotene), iron (haemoglobin), and folic acid (red cell folate and serum folate). This need stimulated education activities emphasizing dietary patterns that would improve the intake of these particular nutrients. Dietary change during the program period showed improved intake of fruit and vegetables, vitamin A, iron, and folate as well as other nutrients (Kuhnlein 1987). As this occurred, there were increased levels of carotene, retinol, and folate in blood samples of adults, with teens displaying reduced risk from low iron, carotene, and folate. Dental health and hygiene for children also improved during the intervention program (ibid.).

ASSESSING THE EFFECTS OF THE NUXALK FOOD AND NUTRITION PROGRAM IN 2006

Twenty years after the final health assessment period, it was asked whether or not the impact of the original NFNP had been maintained (Turner et al. 2009; Turner et al. 2013). A team involved with the Global Health Program of the Centre for Indigenous Peoples' Nutrition and Environment (Kuhnlein, Erasmus, and Spigelski 2009; Kuhnlein et al. 2013) was invited to the community to interview community leaders. KP Studios (2008) made a film that contains many of these interviews and describes the long-term impact of the program. By 2006, many of the participants had become parents and grandparents, and several of the elders who had participated had died. Most people who had been in the community during the program remembered the activities and still used the handbooks and recipe books that had been prepared and distributed at that time (Nuxalk Food and Nutrition Program Staff 1984, 1985). In fact, plans were in place for reprinting these two popular publications (local schools used the handbook to teach youth about traditional foods). People were still discussing traditional foods and how to adapt them to modern recipes. Other activities (or spinoffs) originating with the NFNP in the 1980s were discussed and recorded. These included fitness activities, local community gardens, classes in

safe food preparation, how to shop for healthy food in the local market, and so on (Turner, Plotkin, and Kuhnlein 2013).

A plant awareness and identification walk along the local creek, led and moderated by a traditional healer and the community health representative, was a popular activity that attracted several community members during this period. The names of the plants were given in both Nuxalk and English, and their applications as traditional foods or medicines was indicated. There were also discussions about the importance of clean environments, especially waterways, and about how industrial logging and declining salmon and eulachon runs were affecting the community.

NUXALK TRADITIONAL FOOD USE REPORTED IN 2009

Because of the NFNP and its extensive published data on the traditional food system, and the known community interest in this topic, the Nuxalk Nation agreed to participate in the First Nations Food, Nutrition and Environment Study (FNFNES) (www.fnfnes.ca). The FNFNES, which is being implemented across Canada, has the broad goal of providing reliable regional information about the diet patterns, food security, environmental concerns, and food-related exposure to environmental hazards faced by First Nations people living on-reserve. BC data for the FNFNES was collected from one thousand households in twenty-one communities, and this included eighty-one interviews in the Nuxalk Nation (Chan et al. 2011). In each household, participants were asked about their use of two hundred species of traditional food from the BC region over the last year, about their intake of food and drink over the last twenty-four hours, and about their health, their household, and the affordability of their food.

A comparison of the results from the 2009 study with those of the 1980s study enables us to assess changes in Nuxalk food use and diets over a twenty-five-year period. In particular, increased family participation in traditional food use as a result of the 1980s program remained high in 2009 (Table 1). All households continued to report consuming fish (100 percent), and the majority of households reported the use of game, beach foods, and berries. Eighty percent of families also reported harvesting garden vegetables or fruit from a local garden, while fewer households reported harvesting wild greens and roots. Table 2 lists the food species reported to have been eaten during the year preceding the 2009 survey. Food items are listed by food groups.

TABLE 1
Traditional food use on the part of Nuxalk families in three time periods (% = percent of families interviewed)

Food	1981 N = 73 %	1985 N = 98 %	2009 N = 81 %
Spring salmon	64	90	97
Sockeye salmon	79	90	72
Pink salmon	23	25	31
Chum salmon	22	48	49
Eulachon	75	78	42
Eulachon grease	46	61	65
Game	30	73	85
Wild berries	56	87	80
Wild greens	14	64	42
Garden use	7	82	80

In 2009, several households reported participation in hunting (7 percent), fishing (27 percent), wild plant harvesting (25 percent), and seafood collection (17 percent). Many Nuxalk families obtained their traditional foods through a network of family and friends, and it was common for individuals to participate in either the harvesting or food preparation, although not necessarily in all stages leading from harvesting to eating. For example, a few individuals or families may own fishing equipment and bring the catch in while others, with their cutting stations, jars, or smoking equipment, may contribute to the processing (Elizabeth Howard, personal communication).

Charles Nelson of the Nuxalk Nation recalls:

During the Nuxalk Food and Nutrition Program there was a strong ooligan run that would go up the Bella Coola River in the spring of each year. I remember as a youth going to the river and being able to reach in with my hands and grab bunches of ooligans and put them in buckets. My legs would get soaked from the splashing cold water, but that didn't stop me. There hasn't been a strong ooligan run in Bella Coola since the mid-1990s. Today we hear of only about two hundred ooligans being caught, and these [are] for study purposes. The factors causing decimation of the ooligan include siltation of soil into the river that disturbs spawning, debris from logging in the mountains, and trawler fishermen catching ooligans in the ocean before they return to spawn, and global warming. For me, it is sad to see that there are no active ooligan-grease cooking boxes along the riverside anymore – we only see the remnants of old run-down cooking boxes and rotting broken sheds.

TABLE 2.
Traditional food use by Nuxalk households in 2009, presented by category, genus/species, and in descending order of use

Scientific name	English name	% of households eating traditional food*
FISH		100
Oncorhynchus tshawytscha	Spring salmon	98
Oncorhynchus kisutch	Coho salmon	98
Oncorhynchus nerka	Sockeye salmon	72
Oncorhynchus keta	Chum salmon	49
Oncorhynchus gorbuscha	Pink salmon	31
Oncorhynchus sp.	Salmon eggs	65
Oncorhynchus mykiss	Steelhead trout	9
Hippoglussus stenolepsis	Halibut	95
Clupea pallasi	Herring roe	68
Thaleichthys pacificus	Eulachon grease	65
Thaleichthys pacificus	Eulachon	42
Sebastes spp.	Rockfish	31
Ophiodon elongatus	Ling cod	21
Gadus macrocephalus	Pacific cod (Grey)	15
Anoplopoma fimbria	Black cod (Sablefish)	14
Platichtys stellatus	Starry flounder	5
BEACH FOODS		88
	Clams (any type)	70
Cancer spp.	Crab	77
Pandulus spp.	Prawn/Shrimp	36
Strongylocentrotus sp.	Sea urchin	19
Clinocardium nuttalli	Basket cockle	11
Octopus sp.	Octopus	6

Scientific name	English name	% of households eating traditional food*
Mytilus spp.	Mussels (large and small)	5
Parastichopus californicus	Sea cucumber	1
SEAWEED		81
Porphyra sp.	Laver	81
Order Laminariales	Kelp	20
Ulva sp.	Sea lettuce	1
SEA MAMMALS		4
Phoca sp.	Harbour seal	4
LAND MAMMALS		85
Alces alces	Moose	75
Odocoileus spp.	Deer	72
Oreamnos americanus	Mountain goat	9
Cervus elaphus	Elk	7
Rangifer tarandus	Caribou	5
Ursus americanus	Black bear	1
Sylvilagus sp.	Rabbit	1
WILD BIRDS		17
Anas platyrhynchos	Mallard	10
Branta spp.	Geese	7
Dendragapus obscurus or *Bonasa umbella*	Grouse (Blue, Ruffed)	5
Lagopus sp.	Ptarmigan	1
WILD BERRIES		80
Shepherdia canadensis	Soapberries	69
Rubus spectabilis	Salmonberries	56
Rubus idaeus	Raspberry	47
Vaccinium parvifolium	Red huckleberry	46

Scientific name	English name	% of households eating traditional food*
Ribes parviflorus	Thimbleberries	42
Vaccinium ovalifolium, V. uliginosum, V. alaskaense	Blueberries (oval leaf, bog, Alaska)	40
Fragaria vesca, F. virginiana	Wild Strawberry	36
Rubus discolor	Blackberry, large	33
Pyrus fusca	Crabapple	25
Rubus ursinus	Blackberry, trailing	16
Rubus leucodermis	Black caps (black raspberry)	15
Amelanchier alnifolia	Saskatoonberry	15
Ribes lacustre, R. laxiflorum, R. divaricatum	Gooseberry/currant	11
Rosa nutkana	Rosehips	9
Vaccinium membranaceum	Black huckleberry	5
Sambucus racemosa	Elderberry (red)	5
Juniperus sp.	Juniper berries	5
Gaultheria shallon	Salal berries	4
Arctostaphylos uva-ursi	Kinnikinnick	4
Viburnum edule	Highbush cranberry	1
Empetrum nigrum	Crowberry	1
ROOTS AND GREENS		42
Polypodium glycyrrhiza	Licorice fern root	4
Fritillaria camschatcensis	Riceroot	2
Trifolium wormskioldii	Springbank clover rhizomes	2
Dryopteris expansa	Spiny wood fern root	1
Pteridium aquilinum	Bracken fern root	1
Ledum groenlandicum	Labrador tea leaves	32

Scientific name	English name	% of households eating traditional food*
Urtica dioica	Stinging nettle leaves	9
Rubus parviflorus, R. spectabilis	Thimbleberry, salmonberry shoots	7
Heracleum lanatum	Cow-parsnip shoots	4
Equisetum telmatiea	Giant horsetail shoots	2
Epilobium angustifolium	Fireweed shoots	1
TREE FOODS		4
Picea sitchensis	Spruce	4
Pinus contorta sp.	Pine	1
Salix spp.	Willow	1
MUSHROOMS		30
Tricholoma magnivelare	Pine	28
Morchella sp.	Morel	6
Pleurotus ostreatus	Oyster	1

*Interviewees were first asked if they consumed any foods in the category. Most people reported consuming several species within each category.

In 2009, salmon was consumed about twice a week, while other foods were consumed less frequently. Women and men on average consumed forty-four kilograms per year and sixty-seven kilograms per year, respectively, as a sum of all traditional foods. A data comparison was attempted for a few key food species in 1981 (before the NFNP activities) and 2009 (FNFNES survey) to learn whether or not the average quantities used by Nuxalk families had changed over time (Table 3). The quantity of traditional foods used per family is a separate consideration from the percentage of households/families who reported eating these foods, as shown in Table 2 (Kuhnlein and Moody 1989). Dramatic declines in kilogram per year per family are seen for spring/chinook salmon, sockeye salmon, eulachon and eulachon grease, and summed data for all berries. Data for the few wild greens reported in 2009 did not show substantive change.

TABLE 3
Estimated amounts of Nuxalk traditional foods reported in 1981 and 2009 (kilogram per year per family)

Food	1981	2009
Spring salmon	38	13
Sockeye salmon	27	5
Eulachon	54	0.5
Eulachon grease	58	1.2
All wild berries	41	8
All wild greens	0.5	0.7

Due to differences in interview technologies, the 2009 family household consumption of traditional food in Table 3 is a rough estimate. In 1981, quantities were reported for the family by one adult; in 2009, quantities were only reported for the adult male or female interviewed. The family estimate in 2009 was tabulated as the sum of the amounts for two adults – a man and a woman. These amounts of traditional foods are very rough averages; however, they demonstrate the dramatic decline in the use of major Nuxalk traditional foods during the twenty-five-year period between the NFNP and the FNFNES. In 1981, family/household size averaged five individuals and the data are a conservative estimate of the amount of traditional foods consumed before the NFNP. Nevertheless, even if the 2009 data were doubled to assume a household of four adults, the dramatically lower quantities used per family for salmon, eulachon, eulachon grease, and wild berries in the latter time period are very clear.

While the number of families using traditional foods remained stable or increased (Table 1), and many retained periodic access to traditional foods (Table 2), families reported far less use of traditional foods in their diet. Traditional foods are highly desired; indeed, in 2009, 85 percent of Nuxalk families reported that they wanted more traditional foods in their diet. However, greater use was constrained as a result of limited income (e.g., lack of requisite equipment/transportation), personal knowledge (e.g., lack of knowledge about harvesting), and limited resource access and availability (e.g., many species were not available locally) due to government restrictions and industrial activities (e.g., forestry, farming, hydro) (FNFNES 2011).

The notable decline in salmon use directly contrasts with the grandmother-mother-daughter study mentioned earlier, in which use of

salmon was reported to be quite consistent from 1920 to 1980 (Kuhnlein 1992). Much of this decline can be attributed to resource collapse and local availability. During the 1980s, many species of river fish, including salmon and eulachon, were widely available. At the time, several plant food species, including cottonwood, hemlock, thimbleberry, salmonberry, and elderberry were abundant (Lepofsky, Turner, and Kuhnlein 1985); however, access to many wild greens and berries required travel and harvesting off the reserve lands, which contributed to lower frequency of use. Today, wild plant greens and roots are used far less than before, in part due to the perceived contamination of the nearby forests and tidal flats (the major harvesting areas) from sewage run-off from the town. This being the case, the skills to identify and to prepare plant greens and roots have also decreased (Charles Nelson, personal communication). This loss of traditional foods greatly increases the risk of malnutrition and food insecurity.

OTHER RECENT NUXALK TRADITIONAL FOOD INITIATIVES

Over the last ten years additional studies have been conducted on food systems in the Bella Coola Valley (Lewis 2012). The community of Bella Coola has been able to secure funding for restoration of species at risk and food security programs. Importantly, Nuxalk fisheries facilities have conducted studies on eulachon (Moody 2008) and on salmon and eulachon restoration efforts. These efforts have helped to enhance sockeye and eulachon availability, but the runs are still endangered (Elizabeth Howard, personal communication). As part of the Bella Coola Food Action Plan (Howard 2006), the Nuxalk Community Garden has been revitalized, as have activities to promote traditional food harvesting, preparation, and food preservation. There have been several efforts by local healers to promote the use of certain plants either for medicinal purposes or for food (Table 4). The Nuxalk Nation Council considers it important to keep this aspect of cultural knowledge alive.

Despite the positive results of the NFNP and other traditional food projects, there remains a high degree of food insecurity. In the 2009 survey, half of the households interviewed worried that they would run out of food before they could get/buy more, and 46 percent reported that food purchased did not last and that there was no money to buy more. According to the household food security measure used in the 2004 Canadian Community Health Survey, Cycle 2.2, Nutrition (Health Canada 2007), 49 percent of Nuxalk households were classified as food

insecure (FNFNES 2011). Today, the local food bank supports two hundred people monthly, 80 percent of whom are Nuxalk (Teresa McCausland, personal communication).

TABLE 4
Food and medicinal plants promoted by Nuxalk healers for healthy living

PLANT (COMMON NAME)	USE
Devil's club	Tea, medicinal
Labrador tea	Tea, medicinal
Alder bark	Medicinal
Willow bark	Medicinal
Indian hellebore	Medicinal
Salmonberry shoots	Food
Licorice fern root	Food
Wild crabapples	Food
Blueberries	Food
Huckleberries	Food
Salmonberries	Food
Saskatoonberries	Food
Thimbleberries	Food
Wild strawberries	Food
Black caps	Food
Stinging nettles	Food
Rosehips	Tea
Cedar bark	Weaving
Pine mushroom	Food, medicinal

THE LEGACY OF THE NUXALK FOOD AND NUTRITION PROGRAM IN OTHER BC COMMUNITIES

Since the initiation of the NFNP in the 1980s, several traditional food projects have been initiated among BC First Nations communities. In part, these projects were inspired by the NFNP. In addition, federal government publications on traditional foods of First Nations and Inuit

Charles Nelson of the Nuxalk Nation recalls:

The availability of salmon runs in our river and other traditional foods have changed drastically since the 1980s when the Nuxalk Food and Nutrition Program was active. At that time there were strong runs of spring, sockeye, chum, pink, and coho salmon, and there were no worries about having enough salmon. Before I left Bella Coola in 1997, I would fish with my uncle and could catch twenty spring salmon in one full river set; today we can catch maybe three or none at all. Today there are minimal sockeye returns in the Bella Coola River. In recent years, our people are receiving our sockeye from seine boats that have delivered it to Bella Coola for trade or sale, family or trade on Vancouver Island, and trade or sale from the Nass Valley. The chum and pink salmon runs have dwindled so drastically that we wonder each year if they will come back at all. The coho disappeared for a couple of years but they have returned again; the coho is the one salmon that remains consistent in our river and has become our staple for winter food. The sea urchin populations have also drastically declined. My uncle Jim Nelson Sr. has shared that it is difficult to collect enough sea urchin because their numbers are so low. This year's warm winter has also left them in the deeper water rather than climbing closer to the surface when the winters are colder.

communities (Health and Welfare Canada 1981a) were crucial in the dissemination of the nutritional value and benefits of traditional food systems. Honouring traditional knowledge, these materials describe regional traditional foods and provide relevant nutrient information along with steps that communities can take to develop their own approaches to improving nutrition.

Over the past twenty years, awareness of the importance of individual and community food security has grown to the point at which food security is a core program of public health services in British Columbia. A great emphasis has been placed on activities designed to increase knowledge (e.g., cooking programs) and to stretch household income (e.g., community kitchens and gardens). In the same time frame, Indigenous peoples have increased awareness about the need for healthy lands and waters to support healthy populations of animals and plants.

Food and nutrition initiatives among First Nations communities are diverse and are supported by a variety of federal and provincial funding sources. Since 1999, the Aboriginal Diabetes Initiative (ADI), through

TABLE 5

Examples of First Nations–led projects that promote healthy food and wellness

Supported by	Theme	Activity	Name	Objectives	Location	Start year
School District 52	Cultural education	Traditional food resource materials	Port Simpson Foods, *Keppered* [sic] *Fish* (Hartley Bay 1997); *Our Smoked Oolichans* (Hartley Bay 1996)	Port Simpson Foods documents the Tsimshian food system, including names, seasonal round, harvesting, and food preservation. Hartley Bay School created a series of picture books with step-by-step instructions, through use of photos and text, on how to salt and smoke salmon and eulachon.	Several examples exist: Port Simpson Curriculum Committee and School District 52 (1983); Hartley Bay (1996, 1997)	1983
BC First Nations	Nutrition education	Traditional food guides and recipes	Band Health Program	Documentation of traditional knowledge and translation of nutritional needs into food choices	Many examples exist, including: Nuxalk Food and Nutrition Program Staff (1984) St. Mary's Indian Band (2003)	1985
First Nations Health Council (2009)	Nutrition education	Community resource manual	Healthy food guidelines for First Nations communities	Support for community members involved in planning food choices at conferences or in community settings	Distributed to all BC First Nations	2009
Tsleil-Waututh First Nation	Food preparation skills	Professional chef's training	Tsleil-Waututh Nation Culinary Arts Program	Led by Andrew George (Wet'suwet'en), this program provides culinary skills that emphasize Aboriginal cooking.	North Vancouver	2011
BC First Nations	Food access and education	Community gardens		To improve nutrition through improved access to garden fruits and vegetables	Several examples exist throughout British Columbia	n.d.
NETWORK						
Coastal Guardian Watchmen Network	Food access and restoration	Monitor the health of traditional food resources	Guardian Watchmen Program	The guardians conduct regular monitoring of resources and maintain dialogue between communities.	Central Coast: Wuikinuxv Nation, Heiltsuk, Kitasoo/Xaixais, Nuxalk Nation, Gitga'at, Metlakatla, Old Massett, Skidegate, and Council of the Haida Nation	2005

First Nations and Inuit Health, Health Canada, has supported community health programs that promote healthier food choices (Health Canada 2013). Our review of BC programs in 2012 found that 116 ADI projects were providing support to 196 bands through many activities, including traditional food harvesting and preparation workshops (Pamela Morrison, First Nations and Inuit Health, personal communication). Table 5 provides examples of the kinds of projects, themes, and activities undertaken with and by First Nations organizations. We follow this with five case studies that describe how communities are facing the challenges of promoting health and food security through a wide range of activities that share traditional knowledge and work in order to revitalize traditional food systems. These case studies were written based on personal communications in February 2013, between the authors and Fiona Devereaux, a Vancouver Island Health Authority (VIHA) community nutritionist working with Southern Vancouver Island First Nations communities; Erin Roswell, a dietitian and conference coordinator for the Vancouver Island and Coastal Communities Indigenous Foods Network; Suzanne Johnson (co-author); Hannah Lewis at UBC Farm; and Jared Williams, the traditional foods program manager at Cowichan Tribes.

CASE STUDIES

Please note that these case studies were written in August 2013.

Salmon Restoration: Okanagan Nation Fishery

For the Syilx (Okanagan) People, access to traditional foods has become increasingly difficult. The construction of dams and the channelling of water systems in several locations throughout the Okanagan and Columbia River systems, along with other development, has led to the near extirpation of salmon. In the late 1990s, a record low return of Okanagan sockeye adult spawners prompted, under the direction of elders, the Okanagan Nation Alliance (ONA) to work to bring the sockeye back into Okanagan Lake (www.syilx.org). A three-year study to evaluate the reintroduction of sockeye salmon into Skaha Lake, which ended in 2003, led to ONA's acceptance of a twelve-year adaptive management approach to conservation. Currently in the sixth year of the twelve-year study, the Okanagan Nation has seen the successful return of sockeye salmon to the extent that, in the summer of 2012, there was a

significant food-fish distribution among member bands. This has come about through extensive work and the application of both Indigenous knowledge and current science. An extensive fisheries awareness and education program has been developed and includes the Salmonids in the Classroom Program as well as community gatherings for the purpose of conducting ceremonies and celebrations (Suzanne Johnson, personal communication).

Indigenous Garden Projects at University of British Columbia (UBC) Farm

Since 2005, indigenous garden initiatives supporting Aboriginal food security, research, and education have been operating at the UBC Farm site in partnership with multiple community and UBC organizations. The initiatives adhere to the principle that "food is medicine" and that improvements in health are achievable through the act of working with others on community food-based activities such as the production, processing, and sharing of food and traditional food knowledge. Two of these projects are the Vancouver Native Health Society (VNHS) Garden (http://www.vnhs.net/programs-services/garden-project) and the Institute for Aboriginal Health (IAH) Teaching and Research Garden (http://www.iah.ubc.ca/research/community-education-and-demonstration-research-garden).

The VNHS Garden initiative developed from the concern that many Aboriginal people are financially and physically constrained from gaining access to healthy market and traditional foods. The garden's mission is "to provide the support and opportunity for Aboriginal people living in east Vancouver to improve their health and capacity by experiencing the 'seed to table' aspect" (VNHS 2013). The VNHS has been working to reduce barriers to food security through transportation subsidies and by providing participants with a space to grow food for their families along with opportunities to build their food preparation skills and increase their access to traditional food. Traditional food practices such as preservation techniques (smoking salmon) and feasts to celebrate the harvesting round are a regular feature of garden project activities.

The IAH Garden grows both medicinal and food plants for use in medicine-making workshops and hosts a monthly community Feast Bowl meal open to the public, UBC students, staff, and faculty at the First Nations House of Learning Longhouse on the UBC campus. The IAH Garden is also involved in a number of research projects and edu-

cation programs, many of which target youth engagement, such as the Culturally Relevant Urban Wellness Program, which brings urban Aboriginal and recent immigrant youth to the site from March to October (Hannah Lewis, IAH Garden coordinator, personal communication).

Vancouver Island and Coastal Communities Indigenous Foods Network (VICCIFN)

The VICCIFN was created in 2008 after a traditional food contaminant research project[1] with Vancouver Island First Nations communities. There was a strong desire to continue and to expand connections between communities, individuals, and organizations interested in working together to recognize, protect, enhance, and celebrate the traditional food systems of the Northwest Coast (http://www.indigenousfoodsvi.ca). The network is open to anyone and includes culturally knowledgable food harvesters and gatherers and individuals working in education, health, fisheries, community development, government, and non-profit organizations. The network effectively supports and offers engagement opportunities through multiple formats, including a website, Facebook, and listserv (160 members); a yearly traditional foods conference hosted by Vancouver Island First Nations communities (approximately three hundred attendees per year); rotating regional meetings; and a traditional knowledge project known as Digital Harvest. The regional meetings and annual gatherings offer a forum for communities to celebrate traditional food system knowledge, discuss food-related issues, and advocate for First Nations resource co-management and harvesting rights.

The Digital Harvest project is an ongoing initiative that provides youth and elders a means for intergenerational knowledge sharing. This is done through peer workshops and interactive projects in which elders exchange traditional knowledge with youth who are then involved in producing multimedia products such as digital stories, which are shared with other youth and more broadly across communities. In 2010, twenty-three digital stories were created (http://mapping.uvic.ca/vicra/VICCIFN), and another sixteen have been completed so far this year (http://sites.viu.ca/ocphr/projects/prevention-and-preservation-digital-harvest-stories) (Fiona Devereaux and Erin Roswell, personal communication).

[1] "Traditional Seafoods of Vancouver Island First Nations: Balancing Health Benefits with Pollution Risks." Funded through Health Canada's National First Nations Environmental Contaminants Program, this project ran from 2006-2008. The project was led by Dr. Peter Ross (who was at DFO at this time) and his graduate student Tom Child (UVic). http://www.indigenousfoodsvi.ca/wp-content/uploads/2011/08/2008-final-report.pdf.

Feasting for Change: Reconnecting to Food, Land, and Culture

Feasting for Change (http://www.youtube.com/watch?v=KF7PNeSoGVo) is a south Vancouver Island traditional food system project led by Vancouver Island Health Authority nutritionists in collaboration with First Nations communities. Confronted by high rates of chronic disease and food insecurity, community and health representatives began holding traditional food feasts as a means of improving access and creating a space in which community members could learn more about using them. Since 2007, with financial assistance from Vancity and the Horner Foundation, Feasting for Change has connected with more than five thousand people at forty-one traditional knowledge-sharing events hosted by southern Vancouver Island First Nations communities. The project has also supported the creation of several resources available through VICCIFN's website (Fiona Devereaux, personal communication).

Aluxut Traditional Foods Project

The Aluxut Traditional Foods Project began in spring 2012 with the Cowichan Tribes in Duncan. Each month, between ten and forty community members gather at the Cowichan elders' building to share traditional knowledge about the identification, harvesting, and preparation of traditional foods and medicine. This project is supported by the Cowichan Tribes Cultural Education Department, the Ts'ewulhtun Health Centre, the Vancouver Island Health Authority, and the North American Indigenous Games legacy. The underlying goal of this project, like that of those described above, is to ultimately support an increased use of traditional foods in the diets of community members as a way of improving food security and nutrition through teachings about the "where, what, when, and whys" of traditional foods (Jared Williams, personal communication).

INDIGENOUS PEOPLES' FOOD SYSTEMS AND FOOD SECURITY IN BRITISH COLUMBIA

Being part of their cultural heritage and natural environments, Indigenous peoples' food systems offer a wealth of rich and diverse knowledge about foods that are healthy, safe, and sufficient. However, use of this knowledge for Indigenous peoples' food security and health is threatened by the twinned issues of poverty and environmental dispossession, which are compounded by the intense global marketing

Charles Nelson of the Nuxalk Nation recalls:

The other day I spoke with Louise Hilland, a Nuxalk woman, who was an assistant with the Nuxalk Food and Nutrition Program. I asked her what has changed since the program first started. She told me that she remembers diabetes not being a concern then because there was only a small handful that had diabetes. Her observation is that today there are many people in our community with diabetes, causing lost limbs and causing a lot of hospital care. Louise also shared that there has been a large increase in the number of people with heart problems since the time of her work with the program.

of inexpensive and poor-quality foods that displace traditional diets. The prevailing destruction of ecosystems for resource extraction (lumber, fishing, mining, etc.) and the crippling poverty of Indigenous communities within a global economic context of increasing food and fuel prices have meant that people do not have adequate physical, social, and economic access to either their cultural base of traditional foods or to quality store foods. The results in health status for Indigenous peoples echo around the planet: poor nutrition, an increase in obesity, and an increase in many forms of chronic disease among the poor (Egeland and Harrison 2013).

In the not too distant past, often as a result of non-Indigenous influences (including residential schools), traditional foods were devalued; for some, they came to be equated with living in poverty, the option when market foods were unaffordable. Recent media attention to mid-twentieth-century circumstances and scientific opinion highlights the issues of poverty, malnutrition, and food insecurity faced by First Nations peoples in Canada, including British Columbia (Mosby 2013).

The community appreciated the Nuxalk Food and Nutrition Program because it reinforced the many values of traditional foods and served as a welcome acknowledgment from the scientific community that First Nations could recover and hold on to their cultural knowledge around food and health. Similarly, nutrition education in schools and adult education about safe food preservation, food shopping, and fitness were passed on. Other Indigenous peoples in the area and beyond paid attention to the program, as did health professionals, educators, and officials. The first of its kind, the Nuxalk program became a hallmark with regard to how to improve health using local staff, local knowledge,

and local resources. Since then, even with constrained funding, many programs have been developed with First Nations to improve access to sufficient, safe, and nutritious traditional, gardened, and store foods.

Despite these advances, the many factors inhibiting First Nations from gaining access to traditional food are substantial. They include: a declining number of species and a declining number of individual animals and plants due to overharvesting, often by non-Natives; employment of adults during harvest seasons, which restricts their time for subsistence harvesting as well as for passing such knowledge on to the next generation; legislation and trespassing restrictions that adversely affect hunting, fishing, and plant gathering; concerns for contaminants in harvesting areas; the time, energy, and equipment requirements for gaining access to distant harvesting areas; the availability of cheap purchased food, which reduces the imperative for traditional food calories; and media and other contacts bringing new and diverse commercial foods to the community, thus affecting food preferences and taste appreciation, especially among youth.

Nutrition and health promotion activists within Indigenous communities have serious challenges with regard to improving food security. It is one thing to recognize that food security can exist only "when all people at all times have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life" (FAO 1996; CFS 2012), it is another to meet the many conditions faced by small rural Indigenous communities such as the Nuxalk Nation in Bella Coola. Knowing that the Nuxalk want continued access to their traditional food species, it is necessary not only to protect the natural environment but also to ensure economic and social access for local food harvesting. Financial access to healthy store food is critical, and the supply-and-demand criteria that create store inventory must also ensure that the foods available are optimally nutritious.

The legacy of the Nuxalk Food and Nutrition Program is the realization that, with sustained support, a small community can balance the best of both its local traditional foods and healthy foods purchased commercially. Ensuring that the principles of food security are met for First Nations can, in turn, affect the health of the entire Canadian population.

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