Chapter 11

The Nuxalk Food and Nutrition Program for Health revisited

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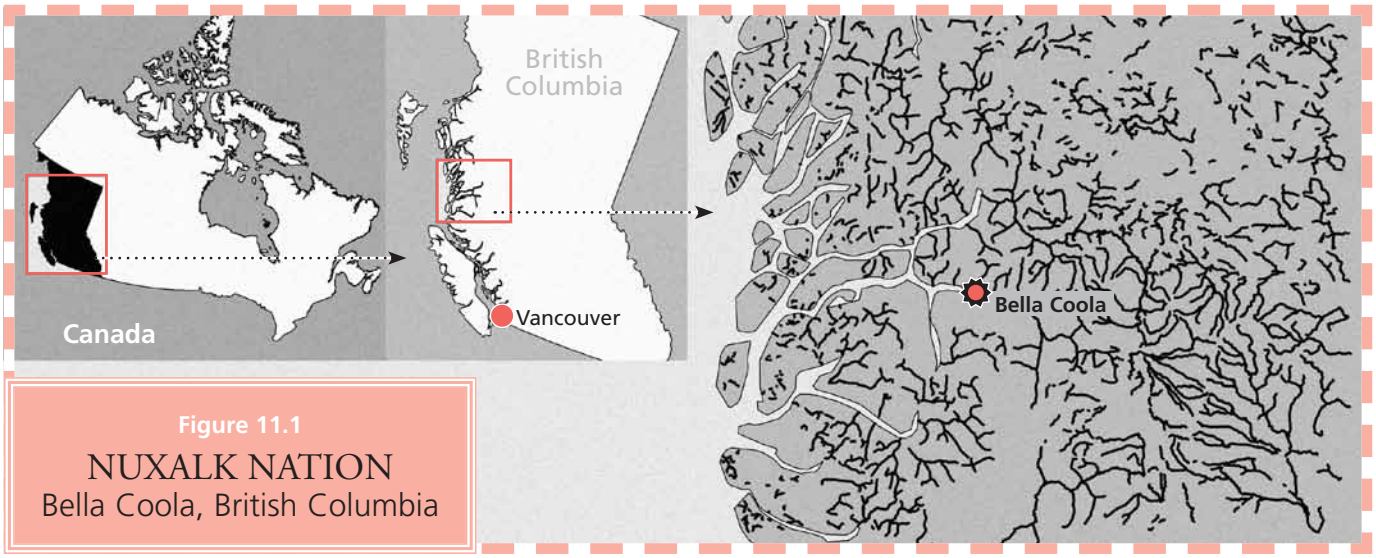

Figure 11.1
NUXALK NATION
Bella Coola, British Columbia

Data from ESRI Global GIS, 2006. Walter Hitschfield Geographic Information Centre, McGill University Library.

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"They came out in droves!"

Rose Hans, in recollection of the feasts for youth that were part of the Nuxalk Food and Nutrition Program, as remembered in 2006

Abstract

The original diet of the Nuxalk Nation incorporated a range of nutritious fish and seafood, game and various plant foods, including greens, berries and root vegetables. However, early research underlying the Nuxalk Food and Nutrition Program demonstrated a dramatic shift in diet during the twentieth century, with less use of traditional food and greater reliance on processed and less healthy food, combined with a more sedentary lifestyle. Documentation of the Nuxalk Nation's food system underlined the imperative of using community resources and local cultural foods as the platform for health education and promotion to improve food use and nutrition status.

The Nuxalk Food and Nutrition Program was conducted in the mid-1980s, with changes in food use and nutrition status determined through measurements taken before and after the interventions. This was the first programme of its kind in First Nations communities, and led to many similar initiatives in Canada. More than 350 activities were developed with input from community elders and leaders, and attracted thousands of individual participations from the population of about 500 on-reserve Nuxalk. Popular activities were feasts, food excursions and two widely distributed books on traditional food systems and recipes. Evaluation activities included interviews on food use and diet, and measurement of anthropometry and physiologic indicators of key micronutrients (vitamin A as carotene and retinol, folate and iron), dental health, and process indicators of programme success and participation.

Improved use of traditional food resources was shown, with increasing numbers of families using these foods, particularly fish, and increased amounts of food used per family. Dietary status improved with the increased use of fruit and vegetables and better intakes of vitamin A, folate and iron. Nutrition status regarding carotene, retinol and folate improved in all age and gender categories, and iron status improved among youth. Dental health, measured through examination of children's tooth decay, improved dramatically.

A follow-up consultation in 2006 examined long-term programme impacts, changes in traditional food availability due to environmental shifts, and concerns about increasing obesity and chronic disease within the Nuxalk Nation.

Introduction

The Nuxalk Food and Nutrition Program was conceived in the early 1980s and began officially in 1983. It was a collaborative research project involving the Nuxalk[1] Nation (including the community health centre, Band Council and regional leaders, elders and youth) and academic research partners. It represented one of the first comprehensive community-based projects to document Canada's Indigenous Peoples' traditional food systems and how these relate to health. Funded through grants from Health Canada, the project received ethics review and approval from the University of British Columbia, the main participating academic institution when the project began, and later from McGill University. The details of how the research was established, an inventory and nutrient analyses of traditional Nuxalk foods, and specific initiatives embraced within the overall programme are provided elsewhere (Kuhnlein, 1986; 1989; 1992; Lepofsky, Turner and Kuhnlein, 1985; Kuhnlein and Moody, 1989; Kuhnlein and Burgess, 1997; Turner *et al.*, 2009).

This programme represented best practices in community-based nutrition research, and has served as a model for many other initiatives in Canada and other parts of the world. In all aspects of the programme, community researchers and health promotion staff were primary participants and collaborators, undertaking interviews, assessments and promotion activities. Throughout the course of the programme, the researchers followed agreed research protocols, seeking informed consent for interviews and photographs, maintaining the confidentiality and anonymity of interview respondents, and ensuring that results from the project were first shared with and reviewed by Nuxalk Nation participants.

1 Pronounced "Noo-halk".

Context

The Nuxalk (formerly known as the Bella Coola) are a community of Indigenous People of the central coast of British Columbia, whose home territory is set within a network of deepwater inlets, channels, islands, river estuaries, floodplains and valleys, and rugged mountainous terrain. The Nuxalk language is classed in the Salishan language family. At the time of European contact in the late eighteenth century, the Nuxalk Nation included approximately 30 permanent villages extending along the Bella Coola River Valley and along the coasts of North and South Bentinck Arms, Dean Channel and Kwatna Inlet (Figure 11.1). By the early twentieth century, the numbers of Nuxalk people had dwindled significantly from their original (estimated) population of more than 2 000, largely owing to epidemic diseases brought by the European newcomers (Boyd, 1990). Those who remained came together at a village on the north side of the Bella Coola River, then moved to their present location at Bella Coola in 1936, after a major flood forced them to abandon their earlier village. In the 1980s, a new housing subdivision was established about 8 km east of Bella Coola, and many Nuxalk people now live there. At the time of the research reported here, reserve residents numbered approximately 800 people in 150 homes.

The Nuxalk territory is bounded by the territories of Indigenous Peoples from other language families: Wakashan peoples (Haisla and Hanaksiala, Heiltsuk and Kwakwaka'wakw) surrounding the Nuxalk lands and waters along the coast; and Athapaskan people (Ulkatcho Dakelh, or Carrier) on the inland side (Boyd, 1990). The Nuxalk are culturally similar to their Heiltsuk neighbours, having a complex social organization with hereditary leadership, strong ceremonial traditions and an oral history that reflects a deep relationship with and knowledge of the marine environment, rivers and associated habitats in which the Nuxalk people have dwelled since time immemorial (McIlwraith, 1948; Kennedy and Bouchard, 1990). Today, the Bella Coola Valley is also home to many non-native settlers.

The climate of the Nuxalk territory is typical of coastal British Columbia: high precipitation and relatively mild winters and summers, at least in the lowlands. The vegetation reflects this regime, as part of the coastal temperate rain forest. At lower elevations, the forests are dominated by western hemlock (*Tsuga heterophylla*), western red cedar (*Thuja plicata*), amabilis fir (*Abies amabilis*) and Sitka spruce (*Picea sitchensis*), all coniferous species. Some lodgepole pine (*Pinus contorta*) and Douglas fir (*Pseudotsuga menziesii*) occur in drier places. Black cottonwood (*Populus balsamifera* spp. *trichocarpa*) forms immense stands along the river valleys, and red alder (*Alnus rubra*) and Pacific crab apple (*Malus fusca*) are other common deciduous species. Higher-elevation forests, which receive more of their precipitation in the form of snow, include mountain hemlock (*Tsuga mertensiana*), yellow cedar (*Chamaecyparis nootkatensis*) and subalpine fir (*Abies lasiocarpa*). Industrial logging has removed much of the original old-growth forests, but there are still remnants of the giant trees that once covered the valleys and lower mountain slopes. The Bella Coola River and adjacent river valleys were formed through tremendous scouring of the original rock by glaciers; the geological history of the region is reflected in the steep-sided mountains, many of which are bare rock supporting little vegetation, with ice-capped peaks, waterfalls and streams tumbling down into the valleys. The diversity of the landscape leads to biological diversity; there is a wide range of different habitat types – coastal salt marshes and tidal flats, rocky shorelines, bogs, marshes, river estuaries, small prairies, gravel outwashes, rocky scree slopes, and deep-soiled forest habitats. Together with the rivers, lakes and ocean, these support the diversity of plants and game animals that have nurtured the people of the Nuxalk Nation, providing them with food, clothing, tools, shelter and medicines, generation after generation (Lepofsky, Turner and Kuhnlein, 1985). In particular, the Bella Coola and other rivers in Nuxalk territory have provided spawning and rearing habitats for all five species of anadromous Pacific salmon, a nutritious and staple food, while outer sea channels provide other fish and shellfish.

Similar to other Northwest coast peoples, the Nuxalk used to reside in permanent villages only over the winter, spending most of the year following a seasonal harvesting cycle, procuring springtime foods along the coast, estuaries and valley bottoms; travelling further up the valley and out towards the open ocean during the summer months, to harvest berries and hunt game; and harvesting root vegetables, game, fish and shellfish in the autumn. For each type of food, specialized processing – drying, smoking or other preservation – was required to prepare for winter storage. There was a general division of labour, with men hunting and fishing while women undertook the cutting and processing of meat and fish, and the harvesting and preparation of various plant foods – greens, berries and roots – which were an important part of the diet. All of these activities required special skills and knowledge that children and youth learned through participation, observation and instruction by working with adults, including elders.

In the first two years of this research with the Nuxalk in the early 1980s, 102 Nuxalk families (82 on-reserve and 20 off-reserve in urban centres such as Vancouver) were interviewed to identify traditional foods and the cultural patterns of food use (Kuhnlein, 1984). Another key undertaking was a series of elders' meetings organized by the research team to consult the elders about which traditional foods they considered important, which were still being used, and how these foods were traditionally harvested, processed and prepared for consumption. Changes in food use frequency were identified through another interview study (1982/1983), conducted with the grandmothers, mothers and daughters of families living on the Nuxalk reserve. In 1982, a food availability assessment was undertaken, and from 1980 to 1986 the nutritional values of traditional foods and diets were assessed, using standard practices for sample collection and nutrient analysis (Kuhnlein, 1986). Health status assessments were undertaken in 1983. This research set the stage for the food-based intervention activities conducted by the Nuxalk Food and Nutrition Program, which are summarized in this chapter, and the programme evaluation, which was conducted in 1986.

Food system and health change

Details of the food system and the health and nutrition status of the Nuxalk, as reported in baseline assessments for the Nuxalk Food and Nutrition Program, are summarized in Turner *et al.* (2009). There was ample evidence that families and individuals were using different foods and living different lifestyles from those of even a few generations previously (Kuhnlein, 1992). The study documented that 13 species of fish, eight species of shellfish, seal and seal lion were still being used. One of these fish was the ooligan (eulachon – *Thaleichthys pacificus*), a type of smelt used by the Nuxalk for countless generations, especially for the nutritious fat (grease) rendered from it through a sophisticated traditional process and used widely as a condiment (Kuhnlein *et al.*, 1982; Kuhnlein *et al.*, 1996).

The grandmother-mother-daughter interviews documented marked declines in Nuxalk traditional food use over the three generations (Kuhnlein, 1992; 1989). Not only was there a distinct drop in the diversity of traditional foods used, but a general decline in the frequency of use was also noted. Significantly, declining food use was linked to food availability and taste appreciation; when a food's frequency of use declined, taste appreciation also declined. Providing younger generations with opportunities to sample traditional foods and develop taste appreciation was therefore one of the strategies embodied in the programme.

In the 1980s, the Nuxalk were using only about 20 species of plant and animal foods from their traditional diet – a huge decline from the 70 or so traditional food species used earlier in the twentieth century. The continuing importance of salmon and ooligan was a main finding of earlier studies, which revealed that the Nuxalk were still eating significant amounts of salmon, ooligan grease and seafood – as much as they were able to get. They were also still hunting deer and some other animal foods at the time of the study. However, it has recently been noted (B. Tallio, personal communication, 2008) that the mule deer hunted in the 1950s and 1960s, along with the black-tailed deer, had declined to very low numbers by the 1980s; today, only black-tailed

deer are available. In addition, mountain goats, which were formerly very important for not only their meat and fat, but also their wool, skins, horns and bones, are no longer seen in the Bella Coola area. In the 1980s, some people were continuing to harvest traditional wild berries (29 original species were documented), especially huckleberries, blueberries, soapberries and salmonberries. However, many traditional plant foods – root vegetables such as springbank clover, Pacific silverweed, northern riceroot and woodfern (seven species documented) (Kuhnlein, Turner and Kluckner, 1982); greens such as cow parsnip and fireweed (12 species); and the inner bark of black cottonwood and other trees (three species) – were largely unused by the latter part of the twentieth century. Significantly, these healthy vegetable foods were being displaced by less healthy purchased, processed food in contemporary diets.

Investigating the reasons for this dramatic shift away from many local traditional foods was among the aims of the Nuxalk programme. The causal factors are very complex and relate to, among many other factors, an array of regulations; time constraints due to wage jobs, school requirements and other obligations; loss of ability to pass on knowledge about foods from older to younger generations; prevalence and easier availability of marketed foods; concerns about pollution, declining populations and productivity; and loss of easy access to traditional food (Kuhnlein, 1984; 1989; 1992; Nuxalk Food and Nutrition Program Staff, 1984; Turner and Turner, 2008).

In British Columbia, aboriginal people have lower health status than the general population. Recent provincial data show life expectancy of 7.5 years less for aboriginal people, with higher rates and younger ages for all causes of death, although there has been steady improvement over the years. Between 1980 and 2002, life expectancy rose, for men from 58 to 68 years, and for women from 66 to 76 years. There

Table 11.1 Health promotion activities undertaken by the Nuxalk Food and Nutrition Program, 1983 to 1986

Activity	*Numbers of events/participants*	*Notes*
Food events involving elders, adults and youth	47/391	Included fishing, fish cutting and preserving, berry picking, greens and root gathering, bark gathering, ooligan grease preparation, children's food summer camps
Feasts and other meals featuring healthy traditional foods with advice and direction of elders	19/1 456	Included salmon barbecues, wild berries, greens and roots, ooligan grease. Often directed to specific populations groups (e.g., feasts for youth were very popular)
Public awareness and adult education	21/370 Not counted: many attending public events; weekly flyers to all homes	Included Mom's Time Out, adult nutrition classes, displays at fairs, weekly flyers. Included use and preparation of both traditional and available market food of good quality
School class presentations promoting traditional foods, good nutrition, dental health and hygiene, healthy lifestyle habits	94/2 716	Delivered in the Nuxalk Nation nursery school, 2 elementary schools and the high school
Fitness classes (regular and light aerobics) and fun runs	190/1 708 Not counted: fun run participants	Conducted by programme staff and David Bogoch of Bogie's Fitness, Vancouver. Included sessions at schools and sessions for overweight adults, adults with arthritis, and the general public
Designing and installing a Nuxalk food demonstration garden in the health centre yard	Visitors were not counted	Included a range of traditional food plants, from salmonberries and highbush cranberries and soapberries, to riceroot and *puuy'aas* (Labrador tea), so that people could see what these plants look like
Publication of a Nuxalk food system handbook and a recipe book prepared by programme staff	Distributed to all homes on reserve, and to many school classes	Included an overview of traditional Nuxalk and healthy market foods, safe preparation methods, and recipes contributed by community residents. These popular books were reprinted several times

Sources: Adapted from Nuxalk Food and Nutrition Program Staff, 1984; and Kuhnlein and Moody, 1989.

has also been reduction in infant mortality, which in 2001 was 4.0 per 1 000 live births, compared with 3.7 in the general population (Kendall, 2002). At the time of programme activities, unemployment was more than 30 percent, and formal education rarely exceeded ninth grade; fishing and logging industries provided seasonal employment for men (Census of Canada, 1981). In 2005, the situation was similar, with 30 percent of aboriginal peoples (versus 12 percent of the overall provincial population) having no formal education certificate, diploma or degree. Moreover, 30 percent of aboriginal peoples were unemployed compared with 20 percent of the general population (BC Stats, 2006).

A health-related quality of life survey conducted in 2001/2002 recognized lower scores for quality of life for Bella Coola Valley aboriginal people than for non-aboriginal people. The most prominent diseases were hypertension, depression, hyperlipidaemia, diabetes, chronic back/neck pain and osteoarthritis, with many co-morbidities. In particular, there was more diabetes among aboriginal valley residents, and they reported the worst scores for quality of life (Thommasen and Zhang, 2006).

Background objectives

The overall objectives of the Nuxalk Food and Nutrition Program were to understand and document the Nuxalk traditional food system, and to use this information as a platform for stimulating community activities to improve nutrition and health. From the project's initial stages, workshops and interviews to gather information about food and nutrition served as a culturally appropriate means of raising the profile of traditional food, and provided opportunities for elders to teach younger community members about the tastes and ways of preparing traditional foods. Explicit food, nutrition and health promotion activities were built into the programme. Assessments before and after the three-year intervention were conducted in 1983 and 1986, to assess shifts in household food use and health status. Follow-up after 20 years was conducted through consultations on the reserve in 2006.

Intervention methods and activities

The programme's health promotion activities are summarized in Table 11.1. Two project assistants were based at the on-reserve Nuxalk health clinic to facilitate the programme, with supervision from the community health nurse, the community health representative and other health staff. Activities were broad-based, emphasizing traditional food and lifestyles and contrasting these with current diet and physical activity practices. Process indicators were maintained to track participation and impressions of success for each activity (Kuhnlein and Moody, 1989).

More than 350 activities were conducted during the programme period, with thousands of individual participations. Many individuals and families participated in many events, and the programme was regarded as highly successful, with requests from other coastal British Columbia communities to provide advice and guidance for initiating similar programmes in their areas. Feasts, either as pot-luck or prepared by programme staff, were very popular events. The *Nuxalk Food and Nutrition Handbook* and the Nuxalk recipe book (*Kanusiam A Sncnik* "Real good food") described techniques for handling and preparing traditional and market foods. These were distributed to all families, and reprinted several times for use in school classes; they are still used today. Although approximately 25 percent of Nuxalk residents did not choose to participate – in particular, older men were rarely seen at events other than feasts – most people were aware of the programme and participated in several activities. Activities with the highest community participation were feasts, nutrition and dental education in schools, fitness activities, and activities based on the nutrition and health evaluation assessments (Kuhnlein and Moody, 1989).

During the course of the programme, the community's inventory of traditional food processing equipment increased, including through the building of ooligan grease bins and fish smokehouses, and collective purchases (at reduced prices) of food dryers, pressure and water-bath canners, and jars and tins for canning food. Teaching resources added to the health centre included a barbeque pavilion, an equipped fitness room and a

Table 11.2 Changes in Nuxalk family food use before and during the health promotion intervention programme

	1981		*1985*		
Food type	***% families*** *(n = 73)*	***Average/family/year***[a]	***% families*** *(n = 98)*	***Average/family/year***[a]	***Difference 1981 to 1985***[a]
Steelhead	49	56.9 lb	77	156.3 lb	+ 99.4 lb*
Spring salmon	64	85.4 lb	90	349.2 lb	+263.8 lb*
Sockeye salmon	79	61.1 lb	90	195.8 lb	+134.7 lb*
Pink salmon	23	4.1 lb	25	58.8 lb	+54.7 lb*
Chum salmon	22	76.4 lb	48	143.3 lb	+66.9 lb*
Coho salmon	37	138.1 lb	76	187.0 lb	+48.9 lb*
Ooligans	75	122.4 lb	78	38.9 lb	–83.5 lb*
Cod	4	11.7 lb	47	23.0 lb	+11.3 lb*
Other fish/shellfish	11	15.1 lb	64	26.5 lb	+11.4 lb*
All fish roe	7	27.2 lb	76	72.5 lb	+45.3 lb*
Ooligan grease	46	62.5 qt	61	8.2 qt	–54.3 qt*
Game	30	76.3 lb	73	196.2 lb	+119.9 lb*
Wild berries	56	41.5 qt	87	49.1 qt	+7.6 qt
Wild greens	14	1.0 lb	64	17.3 lb	+16.3 lb*
Garden vegetables	38	533.9 lb	61	288.6 lb	–245.3 lb**
Garden fruits	*7*	*132.9 lb*	*82*	*167.0 lb*	+34.1 lb

1 lb = about 0.45 kg.
1 qt = just under 1 litre.
a Quantities only for families using the food.
* $p \leq 0.001$.
** $p \leq 0.01$.
Source: Adapted from Kuhnlein and Moody, 1989.

traditional plant food demonstration garden (Kuhnlein and Moody, 1989). Project staff also supported health clinic programmes for diabetes education, prenatal nutrition and fitness, and general healthy lifestyles.

Intervention measurements

In addition to the process indicators, which tracked activities and the participation they attracted, interviews were conducted in 1981 and 1985 to assess households' traditional food use and grocery store expenditures. These interviews were conducted by trained reserve-resident interviewers and completed by 65 to 70 percent of on-reserve families, with the woman in charge of the family's food usually being interviewed. At the time of these interviews, the prices for Agriculture Canada's "nutritious food basket", comprising 78 standard food items, were compiled for the one grocery market in the village. In an attempt to assess bias, participants were selected on the basis of their representativeness of food use in the entire Nuxalk community, as judged by Band Council members.

Quantitative measurements were collected from nutrition status assessments conducted in 1983 and 1986. These assessments included anthropometry measurements, dental health examinations, dietary evaluations by 24-hour recall, and blood tests for evaluating retinol, carotene, haemoglobin/ferritin and red cell folate levels. As a service to the community, vision and hearing evaluations were also completed during the assessment period, and referrals were made for eyeglasses and hearing aids when needed. The assessments were completed among males and females in three age groups: 13 to 19 years, 20 to 40 years, and more than 40 years. The entire community was invited to attend the assessments; 370 individuals participated in 1983, and

Table 11.3 Improvements in Nuxalk physiological status for retinol, carotene, folate and iron before and after the health promotion intervention programme, ages 13 to more than 60 years

Nutrient	*no.*	*Test 1 (before)*	*Test 2 (after)*	*Test 2–Test 1*	p*
Beta carotene (µg/dl)	102	38.1 ± 1.4	60.0 ± 1.7	21.9 ± 1.5	≤ 0.05
Retinol (µg/dl)	101	23.9 ± 0.6	41.2 ± 1.8	17.3 ± 1.8	≤ 0.05
Ferritin (ng/ml)	104	41.0 ± 3.3	46.4 ± 3.9	5.5 ± 3.5	NS
Red cell folate (ng/ml)	92	221.2 ± 11.5	267.8 ± 11.7	46.6 ± 13.2	≤ 0.05
Haemoglobin (g/dl)	104	13.7 ± 0.2	13.8 ± 0.2	0.1 ± 0.1	NS

* Paired t-test.
Source: Adapted from Kuhnlein and Burgess, 1997.

477 in 1986 (Kuhnlein and Moody, 1989). Throughout the programme, interviews were conducted by local Nuxalk staff; university research assistants contributed to the health assessments in 1981 and 1986.

Intervention results and discussion

A key finding was the change in Nuxalk family food use from 1981 to 1985, which was assessed through interviews to record the numbers of families using each food and the quantities used by each family (Table 11.2). While the grandmother-mother-daughter interview study clearly demonstrated that fish was a mainstay in Nuxalk diets during the twentieth century, use of plant foods had declined (Kuhnlein, 1989; 1992). One important finding was that the percentages of families using each food increased, often doubling, which demonstrated the programme's effectiveness in enhancing participation in traditional food harvesting and preparation. The significant increases in use of several species of fish and game were seen as improved use of these mainstay resources. The numbers of families using wild berries and greens, and garden fruit also increased. A notable exception was family use of the ooligan (*Thaleichthys pacificus*) and ooligan grease, which declined because of poor spawning conditions for the fish in 1985, although many families still had access to these resources during the period. More families produced garden vegetables in 1985 than in 1982, but the average weights produced declined significantly, primarily because potatoes were being grown by more people but on smaller plots (Kuhnlein and Moody, 1989).

The interviews also demonstrated that families were reducing their expenditures at the grocery store, from an average of CAD 104 a week to CAD 83 over the project period, while the cost of the nutritious food basket for a four-person family increased from CAD 105 to 125. Interview reports noted that the reduction in expenditures was directly due to increased use of home-harvested and -preserved food, as well as new knowledge of economical shopping practices (Kuhnlein and Moody, 1989).

The programme was evaluated before and after intervention activities, using nutrition assessments and venous blood tests for three micronutrients: vitamin A, folate and iron (Kuhnlein and Burgess, 1997). Table 11.3 summarizes the findings from these assessments. Adults of both genders had increased levels of carotene, retinol and folate in their blood. From paired comparisons (among those participating in both assessments), significant improvements were shown for carotene, retinol and folate in the community at large. Youth were at risk of iron (ferritin), carotene and folate shortages, but improved their status for these nutrients during the programme.

Dietary change was assessed from 24-hour recalls among women aged 20 to 40 years, conducted in 1981 and 1986. Table 11.4 shows changes in intakes of fruit, vegetables and selected nutrients. Significant increases are shown for the amounts of all fruits and vegetables and for the nutrient intakes of vitamin A, iron and folate. During this period, the percentages of women achieving less than 50 percent of the recommended intakes (for that time) of vitamin A, iron and folate

Table 11.4 Improvements in dietary intake for Nuxalk women aged 20 to 40 years before and after the health promotion intervention programme

Nutrient	*1981 mean ± SD (n = 31)*	*1986 mean ± SD (n = 62)*	p
Vitamin A (IU)	2 267 ± 1 810	5 599 ± 9 198	0.008
Iron (mg)	7.66 ± 4.01	10.36 ± 3.81	0.002
Vitamin E (µg)	2.35 ± 1.75	4.57 ± 3.09	0.000
Folate (µg)	78.03 ± 53.3	132.92 ± 101.64	0.001
Fruit (g)	123 ± 145	289 ±324	0.001
Vegetables (g)	93 ±110	143 ±116	0.050

Source: Adapted from Kuhnlein, 1987.

declined. Improvements in intakes of several other nutrients were also noted (Kuhnlein, 1987).

Dental health education was conducted by project assistants at prenatal classes and on-reserve schools; dental evaluations and referrals for dental treatment were made by the same Health Canada dental team in the pre- and post-test periods (1983 and 1986). Table 11.5 shows that all age groups of children, except two-year-olds, had fewer teeth recorded as "decayed, extracted, missing or filled". Improvements were also noted in the numbers of Nuxalk children and young adults aged 20 to 29 years who were free of periodontal disease (assessed as oral health category 1) during the course of the programme (not shown) (Kuhnlein, 1987).

Anthropometric assessments of both adults and children did not change significantly between 1983 and 1986. The same proportions of overweight and obesity existed, in both children and adults, and there was negligible underweight in all categories. The extents of chronic diseases were not assessed in either survey. Although there was modest concern about diabetes at the time, the programme did not emphasize weight loss or diabetes control, except by encouraging more physical activity.

In summary, impressive changes were made in the food use and health status of Nuxalk from 1981 to 1986. These were reflected in increased numbers of families using Nuxalk traditional foods, and larger amounts of most of these foods being used by each family. Dietary intakes of young Nuxalk women showed increased fruit and vegetable use, and better nutritional intakes of vitamin A, folate and iron. As expected from this better diet, all members of the community registered improved health status for vitamin A, folate and iron, which have numerous health benefits. Dental examinations revealed substantial improvements in dental health and hygiene.

Although the Nuxalk Food and Nutrition Program was prominent in the community during this period, it is not clear which activities from it and which from other health initiatives were responsible for these specific benefits. However, as the community health nurse and staff noted, the Nuxalk Food and Nutrition Program was the only one providing broad-based food or nutrition education or dental health activities in the community at the time. The community's positive response to programme activities, and the improvements documented over the period encouraged community leaders to maintain their commitment to enhancing the use of Nuxalk cultural food resources and traditional health activities while embracing other healthy foods and modern health programmes and services.

Revisiting the Nuxalk Food and Nutrition Program, 2006

The successes documented over the course of the original Nuxalk Food and Nutrition Program were impressive, and led to interest in knowing the longer-term effects that the programme had had on the community. Therefore, in July 2006 – 20 years after the original final assessment – the community's perspective on the programme's impact was investigated as part of the Centre for Indigenous Peoples' Nutrition and Environment (CINE) Global Health Program. Many of the original Nuxalk programme participants were visited, and qualitative open-ended interviews and discussions with community leaders were conducted. Many interviews were included in a film (KP Studios, 2008) examining the longer-term outcomes of the project. In 2006, many of the children, youth and young adults who had participated in the original programme had become parents or grandparents, and many of the elders had passed away.

Table 11.5 Improvements in dental health of Nuxalk children before and after the health promotion intervention programme

Age (years)	1983			1986			Difference
	n	DEF	DMF	n	DEF	DMF	DEF + DMF
2	7	1.4	–	7	3.7	–	+2.3
3	6	7.8	–	11	6.7	–	–1.1
4	10	7.6	–	14	5.9	–	–1.7
5	20	9.2	0.2	21	7.4	–	–2.0
6	10	9.5	0.9	13	6.7	1.2	–2.5
7	15	6.3	2.1	22	5.1	1.6	–1.7
8	21	7.7	4.2	15	4.7	1.9	–5.3
9	14	3.1	4.3	14	4.9	2.4	–0.1
10	20	3.1	5.2	17	2.5	4.2	–1.6
11	9	2.9	6.3	20	2.2	6.3	–0.7
12	14	0.2	10.3	15	0.1	5.6	–4.5
13	10	–	11.0	18	0.3	8.9	–1.8
14	11	–	13.4	8	–	13.1	–0.3
15	7	–	13.6	11	–	14.8	+1.2
16	5	–	18.6	5	–	11.6	–7.0
17	11	–	17.4	7	–	14.4	–3.0
18	5	–	15.0	7	–	17.7	+2.7
19	5	–	14.0	3	–	18.6	+4.6
Total	200			228			

DEF = average number of decayed, extracted or filled deciduous teeth.
DMF = average number of decayed, missing or filled permanent teeth.
Source: Adapted from Kuhnlein, 1987.

Those taking part in the 2006 survey were consulted about their views of the programme and the future for health and nutrition in general. Intervention activities were well remembered, and participants had fond recollections of the feasts that were held, especially for youth, to promote healthy traditional food. People also remembered the spring picnic, when a cottonwood tree was cut down so that elders and youth could harvest the succulent inner bark; many of the elders had not tasted this food for many years. The Moms-and-Tots sessions of instruction and training on traditional food, led by elders, were also remembered with pleasure, and many of the women highlighted the opportunities for learning from elders. Almost everyone still had and used the two handbooks that were published as part of the project (Nuxalk Food and Nutrition Program Staff, 1984; 1985), and plans were under way to republish these in an updated format. One handbook had been repeatedly reprinted over the years for use in local schools.

Most programme activities were remembered and continued to feature in people's lives through their activities and appreciation of traditional foods and the local environment. One indication of this interest was people's participation in a community plant identification and cultural awareness hike along Thorsen Creek, facilitated by traditional Healer Sam Moody and Community Health Representative Thelma Harvey. Participants wanted to know the names of plants, in both English and Nuxalk, and their cultural significance and potential applications as food or medicine. The importance of clean environments and fresh drinking-water was also reinforced, as the

group walked alongside the rushing waters of Thorsen Creek and witnessed some of the impacts of industrial logging in the Bella Coola Valley. Frustration and concern were expressed about the declining salmon stocks and disappearance of ooligan from the Bella Coola River (Moody, 2008).

Lessons learned and considerations for the future

The Nuxalk community retains an impressively strong interest in healthy food, including the harvesting and processing of traditional local foods, resulting from its whole-hearted response to the Nuxalk Food and Nutrition Program. Shortages and lack of access to some of these foods make it likely that fewer are now being used regularly, but the youth and young adults of 2006 showed great interest in them. Some of the foods known to elders in the 1980s, such as the inner bark of trees and traditional root vegetables, were virtually unknown to younger people in 2006, but most of the traditional foods documented in the original study were still familiar to many people. Foods that were still being used by the younger generations in Bella Coola included all five species of salmon, steelhead, trout, herring, ooligan, cod species, salmon eggs, crabs, clams, some berries (e.g., blackcaps, wild raspberries, salmonberries, soapberries), thimbleberry shoots, seaweed, Labrador tea, cow parsnip, deer, moose, duck and grouse. People have adapted these foods for modern recipes, such as sushi from Bella Coola fish and special sauces and preparations for marinating and barbecuing fish. In some cases, freezers have replaced smoking and canning for preserving fish and other traditional foods. The 2006 survey made it clear that there was much discussion of food, health and the cultural values of food – reflecting, at least in part, the original Nuxalk Food and Nutrition Program's support and promotion of traditional food.

Local community members and health staff designed and organized a number of activities that – although not directly related to the original project – can be considered as spin-off projects. These include building a community garden, which was planned in conjunction with the day care centre in the older part of the village and set up in the newer Four-Mile housing development. Fresh produce from this garden – peas, carrots, potatoes, beets, spinach and other vegetables – was used by participating organizations and families, and shared with elders and families in need. Another very productive on-reserve garden, set up as part of the current Prenatal Nutrition Program, included traditional medicinal plants. Other activities included food safety classes, the development of a community kitchen, outdoor education tours focusing on traditional foods and medicines, and grocery tours to help people assess the value of different foods in terms of nutrition and cost.

Fitness events and classes were organized, many of them inspired and led by elders. One woman in her late seventies started climbing up and down the 116 steps to the community water reservoir for exercise. Others soon joined her, until as many as 50 or 60 people a day were following her example. Some elders started to use pedometers to measure the distance they walked, and friendly competitions sprang up, with younger people following the elders' lead. A Nuxalk leader remarked that he regularly (almost daily) walked the 4 miles (6.4 km) from his home to the Band Council offices on the reserve: "It saves my life to do this exercise" (A. Pootlass, personal communication, 2008). This is a result of his learning the benefits of fitness in the Nuxalk programme.

Encouragement in the form of contests and prizes made the efforts even more fun. A community fitness centre with weights and exercise equipment became very popular with diabetic individuals and the community at large, and was also used for nutrition education events. In 2006, 23 people from Bella Coola, including two elders in their seventies, took part in the Sun Run, a 10-km run or walk in Vancouver, with more than 59 000 participants.

Nutrition and lifestyle education programmes directed at children and youth were particularly valuable. These community-based programmes stressed not only good nutrition and exercise, but also the mental, emotional and spiritual aspects of health and fitness. A comprehensive wellness plan incorporating all the components of healthy living was being planned in community-led health and nutrition initiatives.

Awareness of the importance of Indigenous Peoples' food for healthy living was recognized and acknowledged by virtually everyone interviewed in 2006 in the Nuxalk community.

Unfortunately, some of the intervention activities that had had initial success in increasing the awareness and use of traditional foods by Nuxalk community members were later eclipsed by negative environmental impacts on some of the traditional food species. Since the end of the original programme in 1986, salmon stocks throughout the west coast have dwindled notably; sockeye and spring salmon in particular are less plentiful than they were 20 years ago. The ooligan, which is of immense cultural importance to the Nuxalk and was a focus of the original project, has declined drastically over the past decade, as its coastal communities and springtime spawning runs on the Bella Coola River have disappeared. The decline of the ooligan has been alarming for the Nuxalk, and for other coastal Indigenous Peoples who relied on grease as an important part of their diets and nutrition. In June 2007, the Nuxalk hosted a mourning feast at which indigenous communities and fishery biologists on the British Columbia coast commemorated the lost ooligan runs (Senkowsky, 2007). Feasting is a long-standing cultural tradition for the Nuxalk and other First Nations in the region, and is used to recognize important occurrences, including memorials of those who have passed away. A feast was therefore a fitting way to mark the passing of the ooligan, and to discuss how it might be restored in the future. Abalone is another traditional food that is no longer available; commercial overharvesting of this valuable shellfish in the 1970s and 1980s resulted in a general collapse of populations, which have still not recovered, despite an ongoing moratorium against abalone harvesting by the Department of Fisheries and Oceans (IUCN, 2008).

The continuing decline of local food traditions also reflects a general, global trend among local and Indigenous Peoples, as more and more people around the world are consuming food that is produced, processed and marketed at a global scale (Nabhan, 2006; Turner and Turner, 2008). As do many other remote food stores, those of Bella Coola now provide a wide range of products from other parts of the world – such as mangoes and packaged cashews – and it is not surprising that people seek out and enjoy these.

In the 1980s interviews, diabetes was emerging as a health problem, but its immensity was not recognized at the time. Now, in the twenty-first century, the incidence of diabetes has grown to almost epidemic proportions among First Nations people, including the Nuxalk. An overall healthy lifestyle promotion programme focusing on children and youth will likely be the most successful strategy for addressing and reversing this situation.

Opportunities for promoting traditional food systems for Indigenous Peoples

Chapter 3 in this volume (Turner, Plotkin and Kuhnlein, 2013) draws attention to the complex environmental concerns that affect the traditional food systems and cultures of Indigenous Peoples around the globe. The Nuxalk and other communities of western Canada are certainly facing severe environmental challenges, including declining populations of some of their key traditional food resources: sockeye salmon, ooligan and abalone. Added to these challenges are concerns about pollution from local sewage outfalls at the Bella Coola River estuary; deforestation and loss of old growth from Nuxalk lands; and the introduction of invasive plant species that might out-compete indigenous species. Degradation of camping sites, impacts from widening roads and increasing traffic, and declines in productivity of berries are other environmental problems that people have noted.

An over-riding concern is global climate change, which is facing Indigenous Peoples and environments everywhere. People on the west coast of Canada have noted many changes in species distributions, seasonal rainfall and snowfall, and local weather patterns in general (Turner and Clifton, 2009). There are indications that the declines in salmon and ooligan may be related, at least in part, to climate regimes. In general, warmer water temperatures reduce the fitness, survival and reproductive success of salmon, facilitating potential long-term population declines (Ministry of Environment, 2002).

There are other challenges to the promotion and use of traditional food for the Nuxalk and other coastal First Nations. The rising costs of fuel and of operating boats and vehicles reduce the opportunities to travel for food procurement and other purposes. Many traditional Nuxalk territories have been privatized and are no longer easily accessible for food harvesting. There are also difficulties in linking children and youth to elders and knowledge holders and in providing appropriate opportunities for passing on important traditional knowledge about food and survival (Turner *et al.*, 2009).

Nuxalk and other First Nations recognize that these obstacles have to be faced and overcome, if they are to maintain their cultural integrity and the health and well-being of their communities (Kuhnlein, 1995; 2001a; 2001b; Parrish, Turner and Solberg, 2007; Senos *et al.*, 2006). There are many ideas for strengthening and supporting healthy traditional food systems (Chapter 14 – Kuhnlein, 2013). However, it is important to remember that a multiplicity of cumulative factors has caused the erosion of traditional food systems, so problems cannot be addressed by only one or two measures; instead, an array of different intervention strategies is needed, for use at different scales and with different audiences. It is important to continue the educational and intervention strategies that showed success in the original Nuxalk Food and Nutrition Program, especially those involving children and youth and hands-on experiential learning, such as harvesting expeditions, science camps and school projects.

The changing of lifestyles and healing of environments take patience and time, and must be evaluated carefully to demonstrate effectiveness and provide guidance to continuing efforts. It is crucially important that successes such as those from the Nuxalk Food and Nutrition Program be recognized and celebrated, to encourage further community development and action. It is only through patience, vigilance and positive, directed action that the transformations necessary for the continued well-being of the Nuxalk community can be realized (Thompson, 2004; Turner and Thompson, 2006; Turner *et al.*, 2009)

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