Evaluation of the Nuxalk Food and Nutrition Program:
Traditional Food Use by a Native Indian Group in Canada

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INTRODUCTION

Native Indian people of North America have always been known for their ability to live well and to develop a high standard of culture with local resources, but today they are among the least advantaged peoples for health risk and other standard measures of the quality of life. Modern health care agencies routinely diagnose intractable problems of recurrent infection, infant morbidity and mortality, dental caries and tooth loss, obesity, diabetes, alcoholism, and impaired mental health (1, 2). All of these conditions are affected, directly or indirectly, by the food system and its dietary quality.

Although it is rare to find published reports of a lack of "food" (energy, protein, carbohydrate, or fat) for a Native group in the United States or Canada, there are several studies that clearly document insufficient quantities of essential nutrients, particularly micronutrients (e.g., iron, vitamin A, folate, vitamin D, and others) (3-7). Foods containing the energy nutrients are generally available to Indians of all income levels, to such an extent that obesity and dental caries are pressing nutritional problems. However, the best sources of most micronutrients are among the more expensive items in contemporary food markets in Indian areas, because these areas are often remote in terms of commercial transportation networks. Thus, these foods (fresh fruits, vegetables, dairy items, unprocessed meats) are infrequently purchased by these with low incomes.

In considering health status, food market access, income, education, housing, and other "material goods," Native Indian groups might be viewed as developing

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societies in the midst of highly visible national levels of achievement for all of these parameters. Societal contrasts in apparent material wealth (e.g., housing, income) have been sought to contribute to Indian problems of mental health (crime, suicide, etc.) and a lagging cultural morale, particularly in young people (6-11).

It is in this context that many Native Indian leaders and public health officials have sought to develop new concepts of nutrition and health promotion for Indian people which would encompass traditional values and practices (12). In particular, the traditional foods of native people living in rural areas have been recognized as being important sources of nutrients which, if available and cost-effective to acquire, could be promoted to improve nutritional status.

THE NUXALK OF BELLA COOLA

The Nuxalk Nation is located in a west coast forest environment (33) on the central west coast of British Columbia, Canada. The Bella Coola Valley is a classically beautiful, riverine setting approximately 40 kilometers long, 4 kilometers wide, and bordered by 2000 meter glaciated peaks. The Nuxalk reserve lands, established under federal legislation in the 1890s, encompass approximately 25 square kilometers at the mouth of the Bella Coola River on the eastern end of Porke Channel, a sea loard. Although the Nuxalk were "discovered" by Captain Cook and Sir Alexander Mackenzie living in several neighboring villages (total population estimated "in the thousands") in the late 1700s, they were collectively resettled by government action in the town of Bella Coola in the late 1800s, following debilitating outbreaks of smallpox and other diseases introduced by European contact (14, 35). Bella Coola is the major settlement of Nuxalk people today, where approximately 600 Native people live in 150 homes. The Bella Coola Valley has a
current population of approximately 2300, with the ma-
Jority being of European descent. The Bella Coola Valley has two elementary schools, a small high school, a credit
union, a small library, a 10-bed hospital administered by
the United Church of Christ, two grocery outlets, an all-
night market, and various federal and provincial services.
Reserve residents are primarily governed by the chiefs
councils. Generally recognized health problems of the
Nuxalk parallel those for other isolated and semi-
isolated native communities for the province: obesity,
dental caries, alcoholism, diabetes, high blood pressure,
and mental health problems (10, 17). The native community
has high unemployment (over 50%), and formal educa-
tion rarely exceeds the grade 8 level. The fishing and logging
industries provide seasonal employment for many (18).

The food system traditional to the Nuxalk culture em-
phasizes fish, particularly salmon, other seafoods, game,
berries, roots, greens, the inner bark of trees, and fats
of marine origin. These have been described in detail
elsewhere (19-24).

Several factors have been reported as contributing to a
reduced per capita use of traditional foods in the Nuxalk
diet since European contact. These include legislation
restricting traditional food resource use; demographic
decrease; availability of marketed foods; enhanced use of
marketed foods as a result of education, media promo-
tion, and social contacts; the attendant concerns of em-
ployment (time, money, etc.); and the interruption of
knowledge transfer to younger generations (25).

THE NUXALK FOOD AND
NUTRITION PROGRAM

The initial concepts of the Nuxalk Food and Nutrition
Program were developed in 1989 in discussions with the
Nuxalk chief, council and elders, and personnel in the
Medicinal Services Division of Health and Welfare Canada
and the Nuxalk Health Clinic. The central focus of the
program was the reduction of the use of these traditional foods: to
encourage their expanded use, and to improve the overall
nutritional health of the Nuxalk people. Funding for the
Nuxalk Food and Nutrition Program was obtained for
three years, from 1985 to 1986, from Health and
Welfare Canada. Community household food use inter-
views, which included 24-hour recalls of food eaten by
women homemaker, were conducted in 1981 (19). This
provided a nutrition focus for nutritional status improve-
ment, a needs assessment for the program proposal, and
basic baseline data for program evaluation. Nutri-
tional status evaluations were done on the entire com-
nunity in May 1985 and May 1986. Measurements in-
cluded dental status, blood values for iron (ferritin,
hemoglobin, hematocrit), folic acid (serum and erythrocyte),
serum carotene and retinol, gamma glutamyl transferase,
high density lipoproteins and cholesterol, 94-hour recall of
individual food intake, and food and community
interviews which paralleled those completed in 1984 were
repeated in the late summer of 1985. Thus, evaluation of
the education program which was conducted from late
May 1984 to March 1985 was parallel to scientific assess-
ment of the change in the use of traditional Nuxalk foods from
1981 to 1985, as well as the change in individual nutri-
tional status from 1985 to 1986. Some aspects of the 1981
and 1983 evaluations have been reported elsewhere (19, 20).
It is the purpose of this report to document the nutrition and health promotion
intervention program, and to report the changes that occurred in the use of traditional Nuxalk foods from 1981 to
1985. These changes serve as an evaluation of the
Nuxalk Food and Nutrition Program.

NUXALK EDUCATIONAL STRATEGIES

This research program on nutrition education for Native
people had specific goals for improving food use and
health, but the techniques to be employed were not
specified at the outset, except that primary emphasis
would be given to foods traditional to the Nuxalk culture.

As the program evolved, community leaders in the health
center, the council, and among the elders gave guidance on
how to modify food use, traditional food use and community
participation. The primary orientation of the program
was the improvement of local health by increasing the
community base of knowledge and use of the foods in the
Nuxalk traditional food system. Secondary emphasis
was given to general health promotion and the use of
marketed foods to optimize the daily diet.

The Nuxalk elders provided information sessions to
describe the different species of fish, animal and plant
foods of the area, and how these foods were traditionally
harvested, preserved, prepared, and used by families.

There were two part-time nutrition aides, both Nuxalk
women, who learned the traditional food-use techniques
from the elders. They then acted as instructors to the Nuxalk
community under the administrative guidance of
the nurse and the health representative. A record was
kept on each teaching event, the level of participation,
and the suggestions made for improving the quality of
the event for the next occasion.

Educational activities involving traditional Nuxalk foods
were carried out in several settings, and included tech-
iques for harvesting, preserving, and preparing the
foods. Weekly flyers advertising these events were dis-
tributed to each home. Activities were held at the harvest
site, the health center, the schools, or at a particular
preservation spot, such as a smokehouse, a boskino
area, etc. Usually, at least one elder was present to
supervise each traditional food event.
During the course of the three-year program, the community increased its "inventory" of traditional food processing equipment so that the personnel helped families to construct ollagan (small, fat-rich fish used to prepare a fish oil [20]) bins and cooling boxes, build smoke-houses, and identify berry harvesting areas. Pressure cookers were also purchased collectively at reduced price, and instruction was given in their use for preserving fish. Permanent resources added to the health center for teaching purposes included a barbeque pavilion, a food dryer, a home freezer, a pressure canner and a water-bath canner; a fitness room; and a 15 x 15 demonstra-tion garden of traditional food plants. The food plant garden was constructed and labeled with the assistance of the elders and an ethnobotanist. Each of these resources was used by several community groups.

Feasts, either pot-luck or prepared by program staff, were popular events during the program, and traditional Nunulik foods were the most popular attraction. Feasts were held for special events (to honour an elder, to celebrate Father's Day, etc.), as well as to stimulate interest and participation (popular summer-day "tramps-only-barbeques", for example).

Two resource publications were prepared, printed and distributed to each Nunulik family. The first, the Nunulik Food and Nutrition Handbook (27), described techniques for handling each of the 75 species of traditional Nunulik foods to be found in the area, and included general information on nutrition and physical fitness. This 120-page softcover handbook was designed for use by schools and continuing education instructors, as well as by families. The Nunulik Recipes Book, Kunnugap A Nunulik ("Real Good Food"), was prepared by the nutrition aides in response to popular demand. They were assisted in this task by many Nunulik women who contributed recipes.

An adult education program for mothers and children called "Mom's Time Out" also proved to be popular. Meetings were held once a month during the final year of the program. Activities centered around the use of traditional foods, grocery shopping, and nutrition. Games, food prizes, and social interaction were the themes of these afternoon workshops.

A special program on dental nutrition education, daily tooth brushing, and weekly fluoride rinses was conducted in the two elementary schools in Bella Coola. The nutrition aides provided weekly lessons and assisted the teacher of classes (kindergarten through grade eight) to monitor the children's progress. The weekly fluoride rinses were conducted from September 1985 until May 1986; however, other classroom educational activities were conducted throughout the entire course of the program.

Aerobic fitness classes were conducted at various sites in the community by two interested Nunulik nutrition aides. They were trained by a fitness instructor from Vancouver. Thirty to sixty-minute classes were held at three levels of intensity regular, light or moderate for overweight clients. In addition, twelve special fitness events and four distance "fun-runs" were conducted for the residents of Bella Coola.

The nutrition and health assessment programs evaluated the physical health of community members, and provided an avenue for informal discussions on health and nutrition. Other features of the program which were included in order to increase participation and the relationship between diet and health included: an explanation of the consent forms for blood nutrient analysis, a bicycle ergometer fitness test, a diet record evaluation, and serving traditional foods and tea as a thank-you to participants.

Community participation in the 375 activities of the Nunulik Food and Nutrition program from 1983 to 1985 is shown in Table 1. It was estimated that about 35% of the population did not participate regularly in program events. Older adult men were particularly difficult to engage in program activities, other than the feasts. Most people participated in at least one event. Feasts, nutrition and dental education in schools, fitness, and the nutrition and health assessments were the events with the highest community participation during the three-year program.

METHODS

Traditional food-use and weekly food expenditures were used to evaluate the success of the Nunulik Food and Nutrition Program. Food-use interviews were conducted by trained Nunulik interviewers July through September in both 1981 and 1985. Each house in the community was visited. In both interviews, the questions concerned food purchasing, use of home food processing equipment, and, in particular, the quantities of traditional Nunulik foods which were harvested, preserved, and used by each family for the preceding twelve-month period. The interviews also included a 24-hour recall of individual food intake of each family member present at the time, and, in 1985, as additional series of questions on program participation (not reported here).

There were two Nunulik interviewers, one of whom worked during both periods. They were trained in techniques of interviewing by the authors, and they practiced the food-use questions until the techniques were consistent. A simple numerical measure was used for ease in recording traditional food use. For example, "How many cases of flat tea of sorrel you did you use this year?"; "How many sticks of ollagan with 25 ollagans/stick did you smoke this year?"; "How many quart of raspberries did you jar, jam, or froze this summer?", etc. Interviewers were asked to report the amount of food used, fresh or preserved after harvesting during the preceding
<table>
<thead>
<tr>
<th>Activity</th>
<th>Number of Events (Total 375)</th>
<th>Total Participation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food events - community</td>
<td>29</td>
<td>29</td>
</tr>
<tr>
<td>Berry picking</td>
<td>19</td>
<td>139</td>
</tr>
<tr>
<td>Green and root gathering</td>
<td>4</td>
<td>27</td>
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<tr>
<td>Fish preserving</td>
<td>5</td>
<td>56</td>
</tr>
<tr>
<td>Children's food camps</td>
<td>5</td>
<td>64</td>
</tr>
<tr>
<td>Ooligan fishing and grease making</td>
<td>1</td>
<td>18</td>
</tr>
<tr>
<td>Feasts</td>
<td>19</td>
<td>1456</td>
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<tr>
<td>Public awareness and adult education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Morrie's Time-Out</td>
<td>8</td>
<td>232</td>
</tr>
<tr>
<td>Nutrition education classes</td>
<td>10</td>
<td>138</td>
</tr>
<tr>
<td>Handbook, recipe book</td>
<td>2</td>
<td>Each home</td>
</tr>
<tr>
<td>Flyers (approximately 150)</td>
<td>3</td>
<td>Not counted</td>
</tr>
<tr>
<td>Booths at fairs, circus, displays</td>
<td></td>
<td></td>
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<tr>
<td>School programs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nutrition education, grades 3-6; Two schools, 6:00</td>
<td>47</td>
<td>581</td>
</tr>
<tr>
<td>High school</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ooligan grease making classes</td>
<td>2</td>
<td>32</td>
</tr>
<tr>
<td>Introductory course nutrition</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Fish-un classes</td>
<td>2</td>
<td>39</td>
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<tr>
<td>Dansil and nutrition education</td>
<td>42</td>
<td>2059</td>
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<tr>
<td>Fitness Events</td>
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<tr>
<td>Light exercise classes</td>
<td>72</td>
<td>432</td>
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<tr>
<td>Regular exercise classes</td>
<td>69</td>
<td>700</td>
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<td>Overweight/fitness classes</td>
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<td>145</td>
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<tr>
<td>Special fitness events</td>
<td>12</td>
<td>28</td>
</tr>
<tr>
<td>Fun-run</td>
<td>4</td>
<td>Not counted</td>
</tr>
<tr>
<td>Schools - regular fitness</td>
<td>4</td>
<td>43</td>
</tr>
<tr>
<td>Nutrition and Health Assessments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>May 1983</td>
<td>1</td>
<td>370</td>
</tr>
<tr>
<td>March 1986 (fitness only)</td>
<td>1</td>
<td>33</td>
</tr>
<tr>
<td>May 1986</td>
<td>1</td>
<td>477</td>
</tr>
</tbody>
</table>

*Computed from attendance records kept for each event.

twelve-month period. These quantities were then converted to edible portion measures for computer analysis. All the Bella Coola data were coded and entered in files on an Assembler 6H computer and statistically analyzed using SAS routines.

Seventy-three families completed interviews in 1981 and ninety-eight families completed them in 1985. In both cases, this was 65.72% of the families registered in the community. Several families were added to the band registration list in 1984, as a result of new registration of Indian women living alone or with non-Indian men.

In both interview periods, the percentage of families agreeing to participate was judged representative of the entire Nuxalk community, as assessed by methods described earlier (10).

From 1981 through 1985, the cost of food in Bella Coola was determined in the only grocery market, the Co-op, in accordance with the methodology devised by Agriculture Canada for its "nutrients of family basket" publication (20). Agriculture Canada priced seventy-eight standard food items on the last Wednesday of the month in various Canadian cities. The Bella Coola prices of the basket of foods closely paralleled those published for Yellowknife in the Northwest Territories, a remote city known for high food costs. It was thus possible to compare Nuxalk family grocery expenditures, as reported in the interviews in 1981 and 1985, with the cost of a standarized "nutritious market basket" of foods.

RESULTS AND DISCUSSION

Table 2 lists the amount of Nuxalk family traditional foods used for the preceding twelve-month period, as reported in 1981 and 1983. The results show that more families in 1985 reported using the Nuxalk foods than in 1981, and that for most items there was a significant increase in the mean quantities of the traditional foods used. The greatest increases were seen in the use of fish species. A notable exception was with the use of ooligan (Thalassipe tetraonura) and the rendered oil from this fish, called "ooligan grease" (20). Nineteen eighty-five was a poor year for ooligan spawning, due to food conditions and silt in the river. Although many more families reported using ooligan grease (64 families in 1985 versus 45 families in 1981), it was available in limited quantities and thus a smaller amount was used per family in 1985.

More families used game, wild berries, wild greens, and garden fruit and vegetables. However, the quantity of garden vegetables estimated for each family in 1985 was less, primarily because fewer potatoes were grown.

While these results seem very clear, some qualifying comments on the amount of food used are necessary in the interpretation of Table 2, primarily due to the yearly fluctuations in the availability of fish, game and wild plant foods. The decline in the ooligan run in 1985 is a case in point. While human error in reporting must also be taken into account, the interviewers had no evidence of over-reporting in 1985 or under-reporting in 1981. In addition, it was obvious to the entire community that intensive food harvesting and processing was being practiced during the summer of 1985.

The total amount of fish and game used by Nuxalk families is high. Daily dietary records show that the quantity of fish consumed by an individual adult is rarely less than eight ounces. Fish, potatoes, and sweetened tea are the main components of Nuxalk meals, with
Table 2. Nuxalk Family Food Use, 1981 and 1985

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<thead>
<tr>
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<tbody>
<tr>
<td></td>
<td>Percent</td>
<td>Average</td>
<td>Percent</td>
<td>Average</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Families</td>
<td>Using</td>
<td></td>
<td>Consuming</td>
<td></td>
</tr>
<tr>
<td>(n = 72)</td>
<td></td>
<td>(n = 78)</td>
<td></td>
<td>Family/Year</td>
<td></td>
</tr>
<tr>
<td>Steelhead</td>
<td>49</td>
<td>56.9 lb</td>
<td>77</td>
<td>156.3 lb</td>
<td>+ 99.4 lb**</td>
</tr>
<tr>
<td>Sling salmon</td>
<td>64</td>
<td>85.4 lb</td>
<td>86</td>
<td>256.3 lb**</td>
<td>+ 290.9 lb**</td>
</tr>
<tr>
<td>Sockeye salmon</td>
<td>79</td>
<td>61.1 lb</td>
<td>70</td>
<td>196.6 lb**</td>
<td>+ 135.5 lb**</td>
</tr>
<tr>
<td>Pink salmon</td>
<td>23</td>
<td>4.1 lb</td>
<td>25</td>
<td>56.8 lb</td>
<td>+ 52.7 lb**</td>
</tr>
<tr>
<td>Dzuu salmon</td>
<td>22</td>
<td>76.4 lb</td>
<td>48</td>
<td>143.3 lb**</td>
<td>+ 66.9 lb**</td>
</tr>
<tr>
<td>Coho salmon</td>
<td>37</td>
<td>138.1 lb</td>
<td>76</td>
<td>187.0 lb</td>
<td>+ 48.9 lb**</td>
</tr>
<tr>
<td>Ooligans</td>
<td>76</td>
<td>122.4 lb</td>
<td>76</td>
<td>38.9 lb</td>
<td>- 83.5 lb**</td>
</tr>
<tr>
<td>Cod</td>
<td>4</td>
<td>11.7 lb</td>
<td>47</td>
<td>23.0 lb</td>
<td>+ 11.3 lb**</td>
</tr>
<tr>
<td>Other fish/shellfish</td>
<td>11</td>
<td>15.7 lb</td>
<td>64</td>
<td>28.5 lb</td>
<td>+ 14.9 lb**</td>
</tr>
<tr>
<td>All fish</td>
<td>7</td>
<td>27.2 lb</td>
<td>76</td>
<td>72.5 lb</td>
<td>+ 45.3 lb**</td>
</tr>
<tr>
<td>Ooligan &quot;gnawu&quot;</td>
<td>46</td>
<td>62.5 qtl</td>
<td>61</td>
<td>8.2 qt</td>
<td>- 54.3 qt**</td>
</tr>
<tr>
<td>Game</td>
<td>30</td>
<td>76.3 lb</td>
<td>73</td>
<td>156.2 lb</td>
<td>+ 119.9 lb**</td>
</tr>
<tr>
<td>Wild berries</td>
<td>96</td>
<td>41.8 qtl</td>
<td>67</td>
<td>48.1 qt</td>
<td>+ 7.7 lb N.S.</td>
</tr>
<tr>
<td>Wild greens</td>
<td>14</td>
<td>1.0 lb</td>
<td>64</td>
<td>17.3 lb</td>
<td>+ 16.3 lb**</td>
</tr>
<tr>
<td>Garden vegetables</td>
<td>38</td>
<td>833.9 lb</td>
<td>61</td>
<td>265.8 lb</td>
<td>- 203.2 lb**</td>
</tr>
<tr>
<td>Garden fruit</td>
<td>7</td>
<td>129.9 lb</td>
<td>62</td>
<td>167.0 lb</td>
<td>+ 6.1 lb N.S.</td>
</tr>
</tbody>
</table>

p < .01
**p < .001

Fish obviously contributing the majority of nutrients. The Nuxalk also have frequent visits from members of their extended families who come to the reserve on weekends and holidays. Preserved fish (smoked, dried, canned, frozen) is a highly-appreciated, frequent gift to these visitors.

The reported Nuxalk family grocery expenditures in 1981 and 1985 are given in Table 3. Based on an average family size of four persons, $104.31 was spent in 1981 and $123.07 in 1985. This represents a reduction of 20% in expenditures. Also given in Table 3 is the Nuxalk cost of the Canadian "nutritious food basket" of seventy-eight foods during this period. The "basket" prices gradually rose from $185.62 in July 1981 to $123.70 in August 1985, representing a 31% increase in food prices over this period. Thus, combining the Nuxalk family reduced total expenditures at the Co-op with the nationwide inflation in the price of the food basket, Nuxalk families spent a total of 40% of what they might have spent if expenditures and inflation had followed their natural courses. This reduction in food expenditures was reported by several Nuxalk families to be directly related to an increased use of home harvested and preserved foods, as well as to the more economical shopping practices learned through the Nuxalk Food and Nutrition Program.

CONCLUSIONS

It was concluded that the Nuxalk Food and Nutrition Program was successful in gaining participation of community members in its activities. There was evidence of significant changes in food use, presumably as a result of the extensive community education program. Traditional food use was significantly higher in 1985 than in 1981, with the exception of ooligan and ooligan grease. While the Nuxalk increased their use of traditional Nuxalk foods, their per family food expenditures on marketed foods declined.

Many requests for programming information have been received from the health representatives of coastal Indian groups, so this may also benefit from the Nuxalk experience. Although the changes in nutritional status resulting from this program have yet to be fully reported, it is clear that the "local perception is that the Nuxalk Food and Nutrition Program was a successful one, and adaptable to other native communities. Group living in


<table>
<thead>
<tr>
<th>Year</th>
<th>Nuxalk Average Family</th>
<th>$</th>
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</thead>
<tbody>
<tr>
<td>1981, July-September</td>
<td>104.31</td>
<td></td>
</tr>
<tr>
<td>1985, July-September</td>
<td>82.90</td>
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<table>
<thead>
<tr>
<th>Year</th>
<th>Market Basket</th>
</tr>
</thead>
<tbody>
<tr>
<td>1981, July</td>
<td>105.62</td>
</tr>
<tr>
<td>1985, July</td>
<td>111.32</td>
</tr>
<tr>
<td>1983, July</td>
<td>116.58</td>
</tr>
<tr>
<td>1984, September</td>
<td>119.25</td>
</tr>
<tr>
<td>1985, August</td>
<td>125.76</td>
</tr>
</tbody>
</table>

*Computed for a family of four persons.

**Prices determined for the Agriculture Canada Market Basket of seventy-eight foods for a standard four-person family. Prices were recorded in Bella Coola.
References


