

Nutrition Education For Military Personnel: Program, Evaluation,  
Knowledge, Opinions, Nutrient Intake

by

Norah Helen Bennett

A thesis  
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in partial fulfillment of the  
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in  
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## ABSTRACT

This study was conducted at two Canadian Forces (CF) bases on military personnel and CF cooks to assess nutrition knowledge, nutrient intakes and opinions about nutrition education as well as to develop, test and evaluate a nutrition education program.

Twenty-two cooks and 150 of 183 diners completed questionnaires concerning opinions about nutrition education. The 35 men and 19 women who volunteered to participate in the program and 22 cooks completed a nutrition knowledge test. The nutrition education program comprised four table tents with messages based on dietary recommendations for Canadians and a poster of Canada's Food Guide. Change in food selection behaviour and knowledge were measured by a pretest and posttest analysis of three day food records and a specific nutrition knowledge test. Nutrient intake was assessed for 25 men and 15 women using the pretest food record. Opinions about the program were measured by questionnaire survey.

Mean scores of 56 % for cooks, 47.5 % for male diners and 58.5 % for female diners on the nutrition knowledge test indicate that knowledge was poor. Questions pertaining to nutrient sources were fairly well answered. Questions about energy balance were answered well by cooks and female diners, but male diners had misconceptions. Although subjects recognized that diets high in animal fats and cholesterol were associated with increased risk for heart disease, fat composition was poorly understood, particularly by male diners. Nutrient intakes ana-

lyzed in terms of estimates of true deficient showed a large percentage of men deficient in ascorbic acid (25%), vitamin A (37%) and folate (37%) and a large percentage of women deficient in thiamin (25%), iron (50%), ascorbic acid (21%), vitamin A (35%) and folate (51%). Many subjects consumed inadequate servings of fruits and vegetables and many women consumed inadequate servings from all other food groups. The nutrition education program was a partial success. Significant changes occurred in fruit consumption ( $p \leq 0.01$ ), sodium intake in men ( $p \leq 0.05$ ), knowledge of Canada's Food Guide ( $p \leq 0.01$ ) and knowledge of fat and salt ( $p \leq 0.01$ ). No changes occurred in the other areas of knowledge tested nor in other consumption categories. Opinions questionnaire results indicated the program was generally well received and diners are receptive to nutrition education.

These findings indicate that nutrient intake is less than satisfactory, especially for women, and knowledge is poor for cooks and diners. To ensure that prudent choices are available and selected, nutrition education is necessary. The program tested was partially successful.

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## Chapter I

### INTRODUCTION

The current interest in Canada to promote healthy lifestyles in order to prevent disease has led to the development of the Life Quality Improvement Program (LQIP) within the Canadian Forces (CF). Nutrition is an important component of LQIP in order to combat "diseases of choice" resulting from faulty nutrition (Bardsley, 1978).

Mateau (1978) and Wallace (1980) have both examined the nutrient intake of men in the CF. To date, no studies have been conducted to examine the nutrient intake of women in the CF.

To provide base-line data for LQIP, Wallace examined the nutrient intake, energy expenditure and incidence of obesity among experienced servicemen at a CF base in Ontario in 1980. As a result of her findings, she recommended that a nutrition education program be conducted in CF dining rooms. To date, no attempt has been made to assess the nutrition knowledge of service personnel, nor have any data been obtained about their opinions of nutrition education.

Not only is it important to arm the diners with knowledge so that they can make informed choices, but it is equally necessary to ensure that food items which are considered to be appropriate choices are available. No attempt has yet been made to assess the nutrition knowledge or opinions about nutrition education of the CF cooks and supervisors who procure food and prepare menus and food for the diners.

The purposes of this study are:

1. To examine the nutrient intake of women and men in the CF.
2. To conduct a simple nutrition education program in CF dining rooms.
3. To evaluate change in knowledge and food choice following the nutrition education program.
4. To assess nutrition knowledge and opinions about nutrition education of military cooks and service personnel.

The assumption is made that limited resources, particularly of personnel, are available for implementation of a nutrition education program.



## Chapter II

### REVIEW OF LITERATURE

#### 2.1 NUTRITION STATUS

Nutrition Canada revealed that the most prevalent problem in a large portion of the adult population in Canada was overweight. Furthermore, there was evidence of iron deficiency, particularly in women, shortage of calcium and vitamin D in the diets of adolescents, low thiamin intakes in adults, especially men, and large numbers of Canadians of all age groups had low serum folate values. There was no clinical evidence of folate and vitamin B12 anemia (Health Protection Branch, 1973).

In 1978, Mateau assessed the nutritional status and food habits of male recruits at point of entry into the CF, at week 12 and after 18 weeks of military life by using 24 hour recall of food eaten, biochemical analysis of blood and urine samples and anthropometric data. The survey comprised three independent samples for a total of 181 subjects. He found mean serum cholesterol values of 161.7 mg/100 ml at week one and 152.9 mg/100 ml at week 18. None of the subjects had serum cholesterol values exceeding 220 mg/100 ml, which is considered to be at risk by the three level interpretive standard of the Nutrition Canada survey (Health and Welfare Canada, 1973). He also found that 18.4 % of subjects at week one and 21.7 % of subjects at week 18 had ponderal indices between 11.6 and 12.5.

In 1980, Wallace studied nutrient intake, energy expenditure and incidence of obesity in two groups of experienced servicemen from 35 to 45 years old. Her sample, totalling 42 subjects, completed a three day food record and activity record and a food habits questionnaire. Serum cholesterol was measured and anthropometric data were determined. She found mean serum cholesterol values of 229 and 230 mg/100 ml for living-in and living-out subjects respectively. Of these subjects, 37.5 % of living-in and 16.5 % of living-out were considered to be at risk by Nutrition Canada standards because they had serum cholesterol values exceeding 240 mg/100 ml. She also found that 73.9 % of living-in and 33.3 % of living-out had ponderal indices of less than 12.5, therefore they were considered to be at risk by Nutrition Canada standards. Although the validity of using ponderal indices to measure overweight is questionable, it is obvious from the studies of Mateau and Wallace that there is a definite trend in weight gain and increased serum cholesterol from the new recruit to the experienced serviceman.

Wallace also observed that alcoholic beverages accounted for a larger proportion of total energy intake for servicemen than for civilian populations and linoleic acid to saturated fat ratios (L/S) were low. L/S was 0.13 for living-in and 0.26 for living-out subjects. Based on these observations, recommendations were made to alter rations and menus for military dining rooms, as well as to develop a program of nutrition education to be carried out in all dining rooms.

Both Wallace and Mateau reported low incidence of inadequate intakes of nutrients for individual male subjects. However, both researchers used the interpretive standard of the Nutrition Canada survey for classification of individual nutrient intake. The interpretive

standard of Nutrition Canada was based on recommended nutrient intakes established in 1965. Since Nutrition Canada, major revisions to recommended nutrient intakes have been made in 1975 and 1982.

Sauberlich and Associates (1981), in a summary of several studies conducted on American military personnel, reported that servicemen and women consume diets high in calories, total fat, and cholesterol. Inadequate intakes were observed for some nutrients such as iron, vitamins A and C, riboflavin and folacin. For example, two studies were conducted in 1978 and 1979. Less than 30 % of men in the 1978 study and less than 20 % of men in the 1979 study consumed an adequate daily intake of vitamin A. For women, less than 25 % in the 1978 study and less than 5 % in the 1979 study consumed an adequate average daily intake of vitamin A. Less than 5 % of women consumed adequate iron intakes in the 1978 and 1979 studies. It is small wonder that the American military is very interested in implementing a nutrition education program.

## 2.2 NUTRITION KNOWLEDGE

Knowledge in itself is not normally an instigator of change, but it is a necessary prerequisite to change. However, consumers must possess at least minimal knowledge about nutrition and health related issues in order to make informed food selections, because ignorance is one reason for faulty food habits (Woolcott, 1981). It is important to determine the areas in which a population lacks knowledge and has misconceptions in order to provide the necessary information in a nutrition education program.

Several studies have been conducted in Canada to determine nutrition knowledge and factors related to nutrition knowledge.

The Nutrition Concepts study was conducted in 1979 on 400 respondents from B.C., the Prairies, Ontario and Atlantic Canada. Rae and Nielsen (1980) reported that generally concepts from nutrition recommendations for Canadians were understood, but breads and cereals were not often mentioned as being part of a sensible diet. Furthermore, 40 to 45 % of respondents could not define the term polyunsaturated fatty acid. Those having most difficulty with this term were men under 34 years of age.

In 1979, Woolcott conducted a study on 195 men who ranged in age from 18 to 72 years. She found that overall nutrition knowledge was weak with respondents scoring a mean of 59 % on a 20 item multiple choice nutrition knowledge test. She also found that the term polyunsaturated fatty acid was poorly understood, but questions related to energy sources, saturated fat and cholesterol were well answered. Questions pertaining to the effect of cooking method on the nutrient content of foods were not well understood. Nutrition knowledge was positively correlated with age, education and participation in preparing and planning meals.

In a study conducted by Batt (1979) on 38 men from 25 to 35 years of age, nutrition knowledge was again found to be low, with respondents scoring a mean of 38 % on the nutrition knowledge test. She found misconceptions about balanced food selection and low levels of knowledge about food composition and nutrient sources and weight control. Questions pertaining to vegetable oils were answered more correctly than those about hydrogenated forms of these oils. Batt also

found that nutrition knowledge was significantly higher for those men who were sole planners and/or preparers of meals on a regular basis. She reported a significant inverse relationship between nutrition knowledge and practice.

Sullivan and Schwartz (1981) conducted a study on 281 Metropolitan Vancouver residents to explore public awareness of diet and cardiovascular disease. They found that questions pertaining to body weight and nutrient composition of processed meat, fish, poultry, fruit, eggs and alcohol were correctly answered 80 % of the time. Questions about fat, cholesterol and nutrient composition of oils and food substitutes such as coffee creamers were poorly answered. More than 75 % of the sample could not define polyunsaturated fatty acids. They reported that men had less knowledge than women, decreased knowledge was associated with being older than 50 years and knowledge increased with education. They found a zero to weak relationship between nutrition knowledge and practice.

In 1980, Rahn studied nutrition knowledge and concerns in a sample of 210 urban women. Her nutrition knowledge test was an adaptation of Woolcott's (1979). Weak knowledge was reflected by the mean score of 54 %, which was slightly lower than that found in Woolcott's male subjects. She found that her respondents knew more about micronutrients than the concept of energy balance and the sources of saturated fats, polyunsaturated fats and cholesterol. Nutrition knowledge was positively correlated with education and age.

In a study to determine nutrition misconceptions of Canadian university students, McCarthy and Sabry (1973) found that the 274 stu-

dents who completed the 70 question true-false questionnaire scored a mean misconception score of 18.6, a mean correct score of 37.8 and a mean "don't know" response of 13.6. There was little difference in scores between males and females.

Mackie (1973) studied a sample of 982 Calgary residents to determine knowledge and attitudes toward cardiovascular diseases, as well as relevant preventive health practices. She found that men had less knowledge than women, knowledge increased with education and less knowledge was evident in the youngest and the oldest.

Studies of nutrition knowledge in Canada indicate that there is a need to educate the population in general. Although some of the studies cited have reported conflicting results, generally younger people who do not have a university education and who are not sole preparers or planners of meals are likely to have less knowledge. Although some studies found men less knowledgeable than women, the difference in knowledge was not great. This description fits the majority of the target population to be tested in the CF, which further justifies the necessity for a nutrition education program and an assessment of their present knowledge.

### 2.3 DESIGNING A NUTRITION EDUCATION PROGRAM

Knowledge is necessary in order for people to make informed choices, but knowledge alone is not an instigator of change. Knowledge is merely a tool for people to use when they are ready to change (Hochbaum, 1981). The first step to instigate change involves people becoming aware that there is a need to modify behaviour. To achieve this awareness, they

must first be exposed to information (Sims, 1981). The question arises, "What is the most effective way of presenting nutrition information?"

Several researchers in the field of health and nutrition have found that recognition of personal susceptibility to disease is a motivating factor to change behaviour. Rosenstock (1966) hypothesized that a decision to follow preventive health behaviour will not take place in the absence of symptoms unless the following conditions are satisfied:

1. The individual must feel personally susceptible to the condition and possible occurrence of the condition must be viewed as having serious personal consequences.
2. The individual must feel that the preventive action is feasible and appropriate and would reduce perceived susceptibility or severity of the condition. There must be no psychological barriers to the action.
3. A cue or stimulus must occur to trigger the response.

Guthrie (1978) stated that fear of health consequences is a more potent motivating factor than extensive knowledge. Gussow (1981) recommended that nutrition education programs focus on the relationship of diet to disease as well as physiological, sociological, psychological and economic factors affecting food choice.

To what extent do Canadians feel susceptible to diseases which may result from poor nutritional behaviour? Woolcott (1979) found that only 7 % of her sample of men felt that they were personally susceptible to heart disease, yet 50 % of these men will probably die from cardiovascular disease. The results found by Mackie (1973) were similar to those of Woolcott. Mackie found that people in high risk categories did

not recognize their own vulnerability, and in general, were not particularly fearful about heart disease or its consequences. Mackie found that cancer was a far greater fear and concern.

Based on the reports of these researchers, it appeared important to conduct a nutrition education program focusing on the relationship of diet to disease.

Nutrition education must not be just the storage of information. It must be related to specific actions (Johnson, 1965). Leventhal (1973) reported that after creating a motive or decision to change behaviour in order to avoid danger, an action structure must be built to link attitudes to behaviour. In other words, the action structure recommends action and details the specific steps necessary for behaviour change. The theoretical basis of the successful Stanford Three Community Study was derived from the theory of Cartwright (Stern *et al.*, 1976). Cartwright (1949) postulated that three kinds of changes must take place to achieve mass persuasion:

1. Changes in cognitive structures (information).
2. Changes in affective structures (attitudes).
3. Changes in action structures (guiding specific actions).

He further stated that traditionally, mass media campaigns are reasonably successful in influencing attitudes and knowledge, but they do an inadequate job of guiding specific actions or behaviours. Thus, it was decided to include specific instructions on how to change behaviour in the nutrition education program.

Dwyer (1981), Guthrie (1978), Hochbaum (1979) and Richmond (1981) have recognized the importance of providing information where



people are confronted with food choices. Glanz (1981) recommended that we should capitalize on situations where people make life changes in conjunction with making nutrition decisions such as providing nutrition education in college dormitory cafeterias. It is also important to involve the whole group if behaviour change is to occur. Yarbrough (1981) reported that mass media techniques are important to create awareness and interest but at later stages in the adoption process, peer influences are more important. Hochbaum (1981) recognized that even the most conscientious person will eat in places where nutritious foods are not offered in order to join and be accepted by his peers. Thus it was decided to provide information in the dining room where food choices are being made and where maximum impact can be made on the peer group.

#### 2.4 NUTRITION EDUCATION PROGRAMS

Few point of purchase programs conducted on "healthy" populations requiring minimum resources have been conducted, evaluated and reported.

Larsen-Brown (1978) conducted a study on point of purchase information on machine vended foods. Small nutritive value cards stating calories and expressing protein, calcium, thiamin, vitamin C and iron as a percent of the U.S. Recommended Dietary Allowances were posted on vending machines for each of the foods available. Base-line data obtained from one month prior to nutrition information being posted were compared to data from sales during one month of posted nutrition information. There was a significant shift in sales reflecting a decrease in sales of less nutritious foods and an increase in sales of more nutritious foods. These results must be treated with caution because the

vending machines were not always stocked. Experimental design was weak because there were no control vending machines without nutrition information.

Martilotta and Guthrie (1980) conducted a study to determine the impact of providing milk options and nutrient information in school lunch programs. The study consisted of three phases, the "no milk choice" phase when only whole milk was provided, the "milk choice" phase when skim and low fat milk were provided as well as whole milk, and the "milk choice plus nutrition education" phase when posters depicting the fat and energy content of each type of milk were displayed. Results showed that when students were offered a choice of milk, participation in the program increased from 65 % to 71 % and 13 % of students chose low fat or skim milk. No change in participation occurred after the introduction of nutrition information, but 20 % of the students chose low fat or skim milk. Although most students chose the type of milk that they used at home, 16 % indicated that their choice was influenced by information on the fat and calorie content of milk provided by the posters. Older students used the option of low fat or skim milk more frequently.

Hertzog (1978) conducted an informal nutrition education program consisting of table tents and posters which emphasized calcium, iron and ascorbic acid on grade 9 high school students. He found no differences in posttest levels of nutrition knowledge, plate waste or food consumption patterns. It is possible that awareness or interest may have increased, but these parameters were not measured. Lack of success of the program may be a result of using information which was not of interest,

not understood or not perceived to be relevant by his target population. His target population was, in fact, uncooperative. It is also possible that using group data are not the most appropriate way of measuring change in food selection behaviour because changes in individual behaviour are concealed.

The American military (U.S. Troop Support Agency, 1981) conducted a nutrition education study in which they used colour coded posters and table tents, colour coded calorie count labels and a poster depicting a typical low calorie meal to reinforce selection of low calorie items. In order to provide a control for comparison, a dining facility with two mirror image serving areas was selected. Unfortunately, the study was poorly conducted as the information was posted in the serving area which had previously provided only short order items. Thus, there was actually a higher consumption of high calorie foods in the serving area with nutrition education material. The nutrition education material was subsequently moved to the other serving area and an overall decrease in consumption of high calorie foods was realized in both serving areas.

## 2.5 ASSESSING THE TARGET POPULATION

Probably no professional in the field of nutrition would dispute that it is very difficult to change eating behaviour. Perhaps one reason for lack of success is the development and delivery of nutrition education materials which consider professional objectives but fail to identify the concerns, understanding, interests and priorities of the target audience (Fleming and Brown, 1981). These researchers elaborate that we

can let our target audience tell us how to meet its needs, how to shape the content of messages, which type of appeals to use and which media to convey messages. A child in a survey of schoolchildren's health concerns was reported as saying, "Don't teach us what you want to teach us, teach us what we want to know." (Thomas, 1979).

In order to identify concerns, interests and priorities of the target audience as well as discover from them when, where and how nutrition information should be presented, it is necessary to ascertain opinions about nutrition education and the CF food services system.

#### 2.6 THE NEED TO ASSESS AND CHANGE THE ENVIRONMENT

Rosenstock (1966) recognized that changing people is much more difficult than changing the environment. In order to increase the possibility of people taking preventive action, he stated that it is necessary to minimize environmental barriers to action, increase opportunities to act and provide cues to trigger responses or changes. Hochbaum (1981) also stressed that it is imperative that educational efforts be linked to efforts which make the desired behaviour easier and remove existing barriers. In other words, desirable food choices must be readily accessible and must be perceived to be readily accessible. Dwyer (1981) felt that to foster healthful food consumption practices and integrate nutrition concerns into the American military food services system, prudent choices and options must be available.

Jacobs (1978) recognized that for the American military, an interdisciplinary approach is necessary to change the food services system to provide food, food service and an environment conducive to meeting

dietary goals as well as to change the consumer by changing his acceptance patterns, food habits and lifestyle so that free choices meet dietary goals. For example, Jacobs (1978) reported that caloric intake in a single lunch can be decreased by as much as 30 % by having smaller portions available.

In a summary of several studies conducted on American military personnel, Sauberlich et al. (1981) recognized that food and food services available to American military personnel may not always be compatible with interests of individuals to practise healthful dietary habits. They reported that dietary surveys of military feeding systems have often revealed that diets available are rich in calories and high in total fat, saturated fat and cholesterol. Vitamin A and iron density of average mess hall meals consumed by men and women were determined in studies conducted in 1977 and 1978. No explanation was given as to the method used to determine the nutrient density of average mess hall meals, but the results reported are of interest. Less than 30 % of men in the 1977 study and less than 20 % of men in the 1978 study consumed dining hall meals adequate in vitamin A. Less than 25 % of women in the 1977 study and less than 5 % of women in the 1978 study consumed dining hall meals adequate in vitamin A. No women consumed dining hall meals adequate in iron in either the 1978 or 1979 study. These researchers also observed that food services personnel had little, if any, nutrition education.

In the CF, it is the responsibility of the Officer or Noncommissioned Officer in charge of a unit or kitchen to procure food and prepare menus. Although items such as skim milk, soft margarine and whole grain bread are available, they may not necessarily be procured.

Similarly, excessive quantities of fried or high fat food items could continually be available on the menu. Of the over 200 units in the CF, approximately 12 to 15 have dietitians in charge of food services. The remainder of the units have cooks of Officer and Noncommissioned Officer status in charge of food services. CF cooks are trained after entry into the CF. Similar to the American military (McCarthy, 1981), the nutrition portion of their training consists of two hours of instruction. In the CF this instruction includes Canada's Food Guide, nutrients and their function and how to best preserve nutrients during cooking. More advanced cooks' courses contain the same nutrition education package. This nutrition education package does not appear to cover the current dietary recommendations for Canadians. The CF is in a unique position because it feeds healthy personnel three meals per day, potentially over the duration of an individual's working career. Therefore, the role that cooks play to ensure that appropriate foods are available is important to the continued well being of our military members.

As the first step to ensuring that barriers in the environment are minimal, it would seem logical to assess the knowledge and opinions about nutrition education of those who actually procure and prepare the food. Little research has been conducted in this area. A study of nutrition education needs of Michigan School Food Service directors and supervisors conducted by Kende et al. (1980) indicated that the majority did not feel any great need for further training. Interest was not expressed in topics of nutrition, with the exception of weight loss diets and teaching and explaining nutrition to food service staff.

Talmage and Iverson (1979) conducted a study in four schools in an attempt to identify factors and relationships that may bring about changes in attitudes and behaviours towards foods. The one school which was rated by teachers and students as much higher than the others for quality of the lunch program, had a manager who was involved and interested in being a part of the educational program. Effort was put into providing a service to the clients. For example, a choice was available for the main course, food preparation was imaginative, student ethnicity was acknowledged and portions suited students' needs. There was little or no waste of food.

## 2.7 SUMMARY

From studies previously done to assess nutritional status of service personnel and from studies done to assess levels of knowledge of the Canadian public, there is little doubt that nutrition education is necessary in the CF to decrease risk of obesity and heart disease. For nutrition education to be successful, it must function as a comprehensive effort to make the consumer aware of better alternatives. The first steps are to discover what the consumer does, in fact, already know and to determine what his interests and opinions are. If industry spends millions of dollars in exploring consumer needs, interests and awareness in order to market its products, it is a little naive and presumptuous for nutrition educators to feel that they can sell their product solely on its own merit. It is also equally naive to create a want for a product, if the product is not available or if it is difficult to procure. For this reason, it is equally important to assess the environment from

which the consumer is selecting the product. In this study, the kitchen and the dining room comprise the environment.

Although little is known about the effectiveness of nutrition education programs because few have been conducted and evaluated, and there is a great deal that is not known about the target groups that comprise this study, it is essential that some effort be made to find out what will make an impact. The words of Ann Somers, Chairperson of the Task Force on Health Promotion and Consumer Education in the U.S. reinforce the importance of developing and evaluating a nutrition education program (Cutting, 1981):

"The precise effectiveness of most current education and health promotion programs is unknown, that is to say, the state of the art is still primitive. Substantial research is needed to identify specific and long term results. However, we learn only by doing and measuring, not by doing nothing. The practice of nutrition education can no more be put off until "all the data are in" than can the practice of medicine. Moreover, there will never be a time when all the data are in since the whole context of American society is constantly in flux."



### Chapter III

#### OBJECTIVES AND HYPOTHESES

There were several objectives of this study. They were as follows:

1. To determine opinions about nutrition education and food services in the CF from military diners eating in the Junior Ranks (Jr Ranks) dining room and from cooks who plan the meals and prepare the food.
2. To assess the nutrition knowledge of cooks and military diners eating in the Jr Ranks dining room.
3. To develop, test and evaluate a simple nutrition education program requiring limited resources.
4. To assess the nutrient intake of male and female military diners who eat in the Jr Ranks dining room.
5. To determine the opinions of cooks, participating diners and non-participating diners about the nutrition education program.
6. To make recommendations concerning nutrition education and food services in the CF.

The null hypotheses for relationships to be statistically tested were as follows:

1. The nutrition education program will not increase the nutrition knowledge of military diners eating in the Jr Ranks dining room.
2. The nutrition education program will not change food selection behaviour of military diners eating in the Jr Ranks dining room.

Null hypotheses were rejected if the probability was 5 % or less.

Chapter IV  
METHODOLOGY

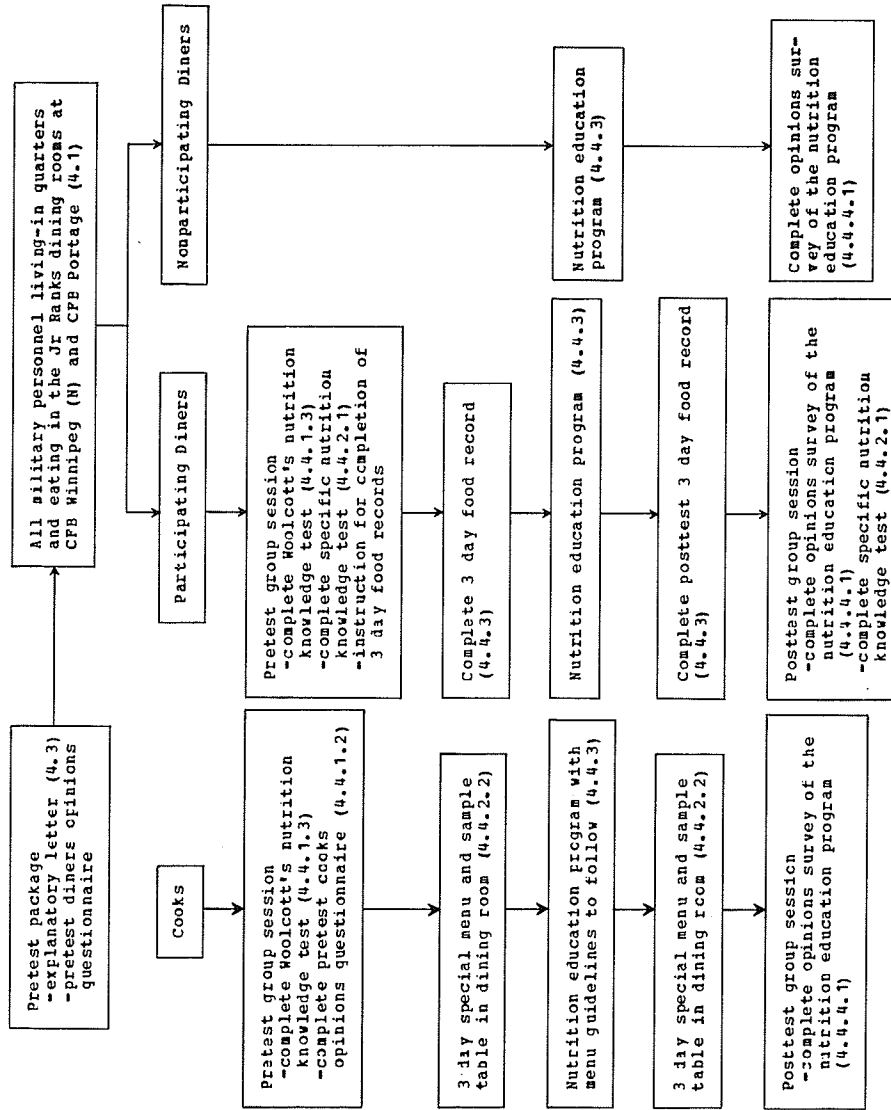
4.1 SUBJECTS

The study which is the topic of this thesis was carried out between the beginning of October and the middle of November, 1981, at two CF bases, Winnipeg and Portage la Prairie. The subjects were cooks and military personnel eating in the Jr Ranks dining room. These locations were chosen because they are both air bases whose service personnel have similar types of employment and trade structure. The majority of the jobs at both of these bases are sedentary. Most of the food for both locations comes from the same sources. Both locations are exposed to similar information from the press, radio and television. Figure 1 illustrates the overall plan of the research for diners and cooks. The numbers in brackets refer to the relevant section of the text.

4.2 PRETEST

Two pretests were conducted using all questionnaires and educational materials except the posttest opinions questionnaires. The first pretest was conducted on 15 Jr Ranks at CFS Beausejour. Beausejour was selected because it is a radar station. Being an air unit, trade structure and employment would be similar to that found at an air base.

A second pretest was conducted informally on eight food services and supply personnel at Air Command Headquarters. The purpose of this pretest was to test changes made as a result of the first pretest.



NOTE: the numbers in brackets refer to the relevant section of the text

Figure 1: Progression of the Study

#### 4.3 IMPLEMENTATION OF THE STUDY

Nominal rolls of all service personnel living-in quarters and eating in the Jr Ranks dining rooms were obtained from the ration clerks at Portage and Winnipeg. Living-in Senior Noncommissioned Officers (Sr NCO's) at Portage were included because they eat in the Jr Ranks dining room. A letter explaining the study (Appendix A), a copy of the pretest diners opinion questionnaire (Appendix B) and a self addressed envelope were sent to each individual listed in the nominal rolls through his/her section head. An accompanying letter was sent to each section head explaining the program. All personnel were asked to complete and return the questionnaire regardless of whether or not they were participating in the study. Personnel who would be absent from the base on leave, temporary duty or posting during any part of the study were asked not to participate. Reminder letters with another copy of the questionnaire were sent to those who did not reply to the original letter.

All cooks at both bases were asked to participate in the study.

#### 4.4 INSTRUMENTS

##### 4.4.1 Pretest Information

###### 4.4.1.1 Diners

A questionnaire was designed to determine diners' opinions about nutrition education and food services in the CF (Appendix B). Two-way questions were asked which required a choice between precoded "yes" or "no" answers. A subsequent open-ended question asked subjects to elaborate further on their answer. Open-ended questions were used in order to ensure that maximum input of original ideas was received from respondents.

It was thought that closed answer questions would "set" the direction of participant's ideas or trigger specific responses and lead to bias in the results.

During the pretest study, it was discovered that some diners spent a long time completing this questionnaire. It was decided to send this questionnaire with the initial letter requesting volunteers. The reasons for this were threefold:

1. Time for completion of the remaining questionnaires during the group session would be shortened.
2. Opinions were desired from all diners and not just those participating in the program.
3. Information would be obtained to describe the sample population who did not participate in the study.

The original questionnaire was lengthened to include demographic information about the sample population. Questions were also asked concerning whether subjects were on diets, and if so, what type and who prescribed the diet. The purposes of these questions were:

1. To determine if subjects' eating habits were unduly influenced in some manner by medical intervention.
2. To report information about this area of concern.

Because people feel intimidated if they are required to sign a "contract-like" form, this questionnaire also served as the consent form. Personnel merely checked the appropriate box as to whether or not they were willing to participate.

#### 4.4.1.2 Cooks

A questionnaire was adapted from the diners' opinions questionnaire to determine cooks' opinions about nutrition education and food services in the CF (Appendix C). The format of the questionnaire and type of questions asked were the same as those for the diners. The consent form was not included as the questionnaire was administered in group meetings.

#### 4.4.1.3 General Nutrition Knowledge

Nutrition knowledge was assessed using the questionnaire adapted by Woolcott in 1981 from the questionnaire originally designed and used by her (Woolcott, 1979). The first pretest was conducted using the questionnaire designed by Batt (1979). Batt's questionnaire was not deemed to be suitable because the mean score of the pretest group was only 27.6%. Not only did the pretest group seem visibly upset at being given such a difficult questionnaire, but five of the 15 people correctly identified the foods which constitute Canada's Food Guide in an open ended question, but none was able to answer correctly the same "tricky" multiple choice question on Batt's questionnaire.

Woolcott's questionnaire was given to the second pretest group. The mean score was 63.75%. This mean was more consistent with the instructions given by Ebel (1972) on how to judge the quality of a test. He stated that the average score should be somewhat more than half the maximum score. Specifically the ideal mean is regarded as the midway point between the maximum possible score and the expected chance score. The expected chance score is the number of test items divided by the number of choices per item. As Woolcott's test had 20 four-choice

items, the expected chance score is five. Therefore, the ideal average score is 12.5 or 62.5 %.

The reliability of Woolcott's questionnaire was 0.70 when tested on a sample of 142 men (Woolcott, personal communication, 1982). The reliability of Batt's questionnaire was 0.69 when tested on a sample of 38 men (Batt, 1979). Woolcott's questionnaire was deemed to be better for use with the sample population (Appendix D).

#### 4.4.2 Pretest Posttest Dependent Variables

##### 4.4.2.1 Specific Nutrition Knowledge

An open ended questionnaire was designed to be applied pretest and posttest in order to measure change in nutrition knowledge, specifically in those areas in which nutrition information was provided (Appendix E). Open ended questions were used instead of multiple choice questions in order to ensure that respondents were informed (Payne, 1954). Total recall of such information is necessary to make appropriate selections when people are confronted with food choices. Questions were reworded and modified slightly after the first pretest.

##### 4.4.2.2 Food Selection Behaviour Measured By Three Day Food Records

Three day estimated food records were maintained before and after the nutrition education program to measure change in food selection behaviour. The pretest food record was used to report nutrient intakes which presumably represented those of the population.

The 24 hour recall was not deemed to be a suitable instrument. The 24 hour recall is used to report group averages (Burke and Pao,

1976). The recall method is prone to over reporting low intakes and under reporting high intakes, resulting in a downward bias of extremely low and extremely high intakes which could result in a failure to detect differences in groups (Gersovitz et al., 1978). It was imperative to use an instrument which would effectively evaluate the program by detecting differences in pretest and posttest values. To assess nutrient intakes, it was deemed important to utilize an instrument which measured usual individual intake. The 24 hour recall is not suitable for this purpose (Beaton et al., 1979).

Because this was an instrument to measure change in behaviour and report individual nutrient intake, duration of recording intake had to consist of a time span which would include individual variation, but not compromise validity or cause dropout due to excessive respondent burden. Gersovitz et al. (1978) reported that validity declined by the fifth day of maintaining food records. The sample became biased toward the more educated by the seventh day of record keeping because of increased dropouts of the less educated. The three day record seemed the most suitable instrument to use.

In order to maximize reliability of the food records a "sample table" was set up in both dining rooms. Standard servings of all menu items were weighed or measured and displayed on the table with cards indicating the quantity of each. Sample bowls, cups and glasses of all sizes were marked with graduated quantities. A set of measuring cups and spoons was placed on the table for subjects to estimate quantities of other food items selected. Subjects were given a six inch plastic ruler to measure appropriate food items and a pocket size booklet which



could be carried everywhere to record quantities immediately after food selection.

In order to increase the validity of measuring change in food selection behaviour, the same menu was used pretest and posttest in both locations concurrently and in conjunction with completion of the three day food record. The kitchens were given a list of simple guidelines to follow during the nutrition education program to ensure that particular foods were available.

Three consecutive week days of Tuesday, Wednesday and Thursday were chosen for the three day data collection pretest and posttest. There were several reasons for choosing these days:

1. The sample population often leave the base during weekends therefore eating fewer meals on base.
2. More food services staff work during the week, thus having more time to cope with the increased work load of preparing sample tables.
3. All food services administrative staff would be working, thus there would be better supervision to ensure that menus are followed and the sample table is properly set up.

#### 4.4.3 Nutrition Education Program - The Independent Variable

The nutrition education program was based on Canada's Food Guide (Health Protection Branch, 1977a) and dietary recommendations for Canadians (Murray and Rae, 1979). The food guide poster entitled "Choose Food Each Day This Way" which was adapted from Canada's Food Guide and printed by the Ontario Milk Marketing Board was used. This poster was chosen

instead of the Health and Welfare Canada's Food Guide poster because it was more colourful, foods were more realistically portrayed, numbers of servings were stated more clearly and the foods to use "with caution" were shown.

Table tents were used to advertise messages pertaining to dietary recommendations for Canadians. These table tents were professionally made by Instructional Media at the University of Manitoba. They were hard backed, plastic coated and measured 33 centimeters by 25 centimeters. Four separate table tents were designed with messages for reducing fat, reducing salt, reducing sugar and increasing fruits, vegetables and whole grains. One side of the table tent warned of risks associated with the faulty nutrition habit and the other side provided positive action statements to correct the habit. Messages used on the table tents were validated by personnel of the Home Economics Directorate for the Province of Manitoba. The messages used on the table tents were given to the two pretest groups to read in order to ensure comprehension of the material. Minor revisions were made to the wording for the final versions.

Table tents were colour coded. Green is associated with fruits and vegetables in Canada's Food Guide, thus it was used for "increasing fruits, vegetables and whole grains". Yellow is associated with fat in the diabetic exchange, thus yellow was used for "reducing fat". Blue is associated with sodium and salt in current advertisements about hypertension, thus blue was used for "reducing salt". No particular colour was associated with sugar, thus red was used for "reducing sugar intake". The actual wording of the tents appear in Appendix F.

#### 4.4.4 Posttest Information

##### 4.4.4.1 Posttest Opinions Questionnaires

Questionnaires were designed to solicit opinions and evaluate the nutrition education program from the point of view of participating diners, nonparticipating diners and cooks (Appendix G). Questions were multiple choice and two way with precoded "yes" and "no" answers. Replies to open ended questions were requested when elaboration of "yes" and "no" answers was required. Respondents were encouraged and given the opportunity to freely express ideas about what they would like to see in future programs.

#### 4.5 RESEARCH DESIGN

This study was a pretest posttest control static group comparison design. The independent variable was the nutrition education program. The dependent variables were nutrition knowledge measured by the specific nutrition knowledge questionnaire and food habits measured by three day food records.

The two table tent messages about reducing sugar intake and increasing fruits, vegetables and whole grains were used at Winnipeg. The other two table tents about reducing fat and reducing salt were used at Portage la Prairie. The Ontario Milk Marketing Board's poster "Choose Food Each Day This Way" was posted in both dining rooms. Thus, each group was experimental and control to the other group at the same time. This minimized threats to internal validity which could occur if one group only received treatment.

#### 4.6 DATA COLLECTION AND TIME FRAME OF THE STUDY

The pattern for collection of the data is set out diagrammatically in Figure 1. The entire study took six weeks for completion. The first week was devoted to collection of pretest information from cooks and diners. During the second week, diners completed the pretest three day food record. The nutrition education program was conducted during the third and fourth weeks of the study. The food guide poster was displayed at both locations for the entire two weeks. Each table tent message was displayed for one full week each in their respective dining rooms. The posttest three day food record was completed during the fifth week of the study. Posttest information from cooks and diners was obtained during the sixth week of the study.

##### 4.6.1 Diners

Those who indicated willingness to participate in the study were sent letters specifying times to meet in small groups to complete questionnaires, receive further instruction and ask questions about the study. During the first meeting, Woolcott's questionnaire and the specific nutrition knowledge questionnaire were completed. Instructions were given to complete the three day food records. Self addressed envelopes were provided in order to mail the three day food records through Central Registry (CR).

After implementation of the nutrition education program, the second three day food record booklet was sent to participants through CR mail along with a letter reminding them of dates for completion of the food record. A second meeting with participants was scheduled to com-

plete the posttest nutrition knowledge questionnaire and the opinions questionnaire. Diners who did not participate in the study were sent opinions questionnaires and self addressed envelopes through CR mail.

#### 4.6.2 Cooks

Cooks willing to participate in the study met in groups and completed the pretest opinions questionnaire and Woolcott's general nutrition knowledge test. At the end of the program, cooks employed in the Jr Ranks mess met in groups and completed the posttest opinions questionnaire in order to determine their opinions of the program.

### 4.7 DATA ANALYSIS

Statistical analysis was performed using programs in the Statistical Analysis System(SAS) (SAS Institute Inc, 1979).

#### 4.7.1 Pretest and Posttest Opinions Questionnaires

A nominal scale was used to code pretest and posttest opinions questionnaires (Appendix B, C and G). Similar answers to open ended questions were grouped together. Responses to open ended questions and frequency of answers to all questions were reported.

#### 4.7.2 Woolcott's Nutrition Knowledge

Frequency of replies to all questions was reported for cooks, male diners and female diners (Appendix D). Mean, standard deviations and range of scores based on correct answers were determined for Jr NCO cooks, Sr NCO cooks and all cooks as well as for male and female diners.

#### 4.7.3 Nutrient Intake

Three day food records were coded using food code numbers published in the United States Department of Agriculture Handbook No.8 (Watt and Merrill, 1963). Mean nutrient intakes for male and female diners and individual nutrient intakes were assessed using the Food Analysis Program (FAP) and Nutrient Analysis Program (NAP) of the Department of Foods and Nutrition at the University of Manitoba. Individual nutrient intakes were reported as a percentage of male and female diners who did not meet recommended nutrient intakes for Canadians (Health Protection Branch, 1982). In addition, individual nutrient intakes were used to calculate the estimate of true deficient of the male and female sample. True deficiencies were calculated by the method developed at the University of Toronto by Anderson (1980) and Beaton (1971, 1975). To calculate true deficiencies, subjects consuming 85 % to 99 % of recommended intakes were assigned a probability factor of 0.07. This represented the probability that they were deficient. Similarly, subjects consuming 70 % to 84 % of recommended intakes had a probability factor of 0.31, those consuming 55 % to 69 % of recommended intakes had a probability factor of 0.69, those consuming 40 % to 54 % of recommended intakes had a probability factor of 0.92 and those below 40 % of recommended intakes had a probability factor of 1.0 that they were deficient. The sum of the probability factors for all male and female subjects consuming a specified nutrient represented the estimate of true deficiencies.

Food habits were also assessed by determining numbers of servings from Canada's Food Guide. Canada's Food Guide Handbook (Health Protection Branch, 1977a), Good Health and Eating Guide (Canadian Diabe-

tes Association, 1981) and Nutrient Value of Some Common Foods (Health Services and Promotion Branch and Health Protection Branch, 1979) were used as the basis for assessing servings of foods. One serving of milk was equated to 300 mg of calcium from dairy products and one serving of fruit was equated to 10 g of carbohydrate from fruits. Because some fruits have almost twice the carbohydrate of other fruits, 20 g of carbohydrate from fruit was considered to be a marginal intake and 40 g of carbohydrate from fruit was considered to be an adequate intake. One serving of meat and alternates was assessed as 7 g of protein from vegetables, nuts, seeds, meats and cheese. One serving of breads and cereals was assessed as 15 g of carbohydrates. Marginal intake of breads and cereals was considered to be 45 g of carbohydrate from grain products which include baked products such as pies, cakes and cookies. An adequate intake of breads and cereals was considered to be 45 g of carbohydrate from grain products excluding rich baked products. Vegetables were divided into four groups of potatoes, corn, high carbohydrate vegetables and low carbohydrate vegetables. An average serving of potatoes was 18 g of carbohydrate, an average serving of corn was 17 g of carbohydrate, an average serving of high carbohydrate vegetables was 10 g of carbohydrate and an average serving of low carbohydrate vegetables was 2.5 g of carbohydrate. An adequate intake was considered to be two servings of vegetables with potatoes accounting for a maximum of one serving of vegetables. Because carbohydrate content of vegetables differs considerably from one vegetable to another and because several subjects consumed mostly vegetables which have very low carbohydrate content, food records of subjects initially not meeting the criteria for

adequate vegetables were examined and subjects meeting quantities of vegetables required for servings as stated in Canada's Food Guide were assessed at two servings.

Consumption of ethanol in alcoholic beverages and total calories from alcoholic beverages was assessed. Mean, standard deviation and range of caloric intake from ethanol and alcoholic beverages as well as percent contribution of alcoholic beverages to the total energy intake of the diet was calculated for male and female diners.

The percent contribution of energy from fat, carbohydrate and protein was assessed. Because alcoholic beverages were consumed in large quantities by some subjects, percent protein, fat and carbohydrate were reported including energy from ethanol as part of total energy and excluding energy from ethanol as part of total energy. Case studies were analyzed to demonstrate the importance of specifying percent fat and percent carbohydrate in terms of defining the quantity of alcohol and the type of carbohydrate consumed.

#### 4.7.4 Evaluation of the Program

##### 4.7.4.1 Change in Food Selection Behaviour

A three factor (sex x place x time) mixed design analysis of variance (ANOVA) was conducted on individual pretest and posttest values of percent fat, the carbohydrate content of foods containing large amounts of simple sugars, fruits, vegetables and whole grains and the sodium content of foods consumed. Added salt was not taken into account. ANOVA was performed on these values because they represented the information which was given in the nutrition education program. Carbohydrate con-



tent was used to assess foods high in sugar, fruits, vegetables and whole grains because it was generally the nutrient most common to all of the foods within each one of these groups.

#### 4.7.4.2 Change in Nutrition Knowledge

Scores were assigned to questions on the pretest and posttest specific nutrition knowledge questionnaires (Appendix E). One mark was assigned for each correct point given as an answer to each question. A three factor (sex x place x time) mixed design ANOVA was performed on the pretest and posttest score on the question about Canada's Food Guide (question 1) and the sum of the scores pertaining to fat and salt (questions 4, 5, 9 and 10) and the sum of the scores of questions pertaining to sugar, fruits, vegetables and whole grains (questions 2, 3, 6, 7 and 8).

Chapter V  
RESULTS AND DISCUSSION

5.1 PRETEST DINERS

5.1.1 Subjects

The pretest diners' opinions questionnaire and accompanying letter were sent to a total of 183 living-in members at Portage and Winnipeg. Responses were received from 150 people, which is 82 % of the population. Table 1 indicates response rate from Winnipeg and Portage separately.

Table 2 describes the demographic characteristics of those who responded to the questionnaire. Demographic characteristics were similar for Portage and Winnipeg.

5.1.2 Results and Discussion

When asked if they felt that they had enough information about nutrition to select nutritionally sensible meals, 80.7 % of the diners responded saying "yes". Further elaboration was requested by asking "What would you like to know more about?" Table 3 states the answers received.

A high percentage of this population obviously feel that they have sufficient knowledge to select nutritionally sensible meals. Whether these people actually do select nutritionally sensible meals and have sufficient knowledge will be discussed later. Table 3 indicates several areas of interest to be included in a nutrition education program, but there was few requests for information in any one area in particular.

TABLE 1

Frequency Of Response To The Pretest Diners' Opinion Questionnaire By  
Location

	Portage	Winnipeg	Total
questionnaires sent	79	104	183
responses received	71 (90%)	79 (76%)	150 (82%)

TABLE 2

Demographic Characteristics of Respondents to the Pretest Diners'  
Opinions Questionnaire by Location

	Winnipeg n=79	Portage n=71	Total n=150
<b>Sex</b>			
male	58 (73%)	48 (68%)	106 (71%)
female	21 (27%)	23 (32%)	44 (29%)
<b>Age</b>			
18-24 years	66 (84%)	52 (73%)	118 (78%)
25-34 years	10 (13%)	12 (17%)	22 (15%)
35-44 years	2 (2%)	4 (6%)	6 (4%)
45-54 years	0 (0%)	3 (4%)	3 (2%)
no response	1 (1%)	0 (0%)	1 (1%)
<b>Education</b>			
some high school	28 (35%)	28 (40%)	56 (37%)
completed high school	35 (45%)	38 (54%)	73 (49%)
some university or technical school	12 (15%)	3 (4%)	15 (10%)
completed university or technical school	4 (5%)	1 (1%)	5 (3%)
no response	0 (0%)	1 (1%)	1 (1%)

TABLE 3

Frequency of Response to the Question "What would you like to know more about?"

<u>Response</u>	<u>Frequency</u>
(a) no response	132 (88%)
(b) Breakdown of foods into nutrients such as calories, vitamins and minerals	6 (4%)
(c) Any information about nutrition	4 (3%)
(d) Information about balanced diets	3 (2%)
(e) Information about foods with greater nutritional value	3 (2%)
(f) Information to prevent heart disease	1 (0.5%)
(g) Information about nutrient requirements	1 (0.5%)

The question, "Do you think that the CF should teach you basic nutrition information?" received 47% "yes" answers and 53 % "no" answers. When asked where and how nutrition education should be done, 58.7 % did not respond. Of those that did respond, some stated two answers, thus table 4 reports frequency of response.

It is interesting and promising to note that close to 50 % of respondents felt that it was the responsibility of the CF to educate them in nutrition. Such a positive attitude may be indicative of a receptiveness to nutrition education. Generally, most respondents felt that nutrition education should be taught during basic training and on bases by seminars, classes, lectures, films and meetings. Several respondents felt that pamphlets and posters were valuable.

In response to the question of whether the respondents thought that nutritionally sensible meals were available in CF dining rooms, 81 % answered "yes" and 19 % answered "no". Respondents were given an opportunity to state changes that they would like to see in meals available in CF dining rooms and to state any other comments, suggestions or ideas. The majority of diners had no suggestions to make as 78 % did not answer the question relating to changes they would like to see in CF dining rooms and 88 % did not have any further comments to make. Table 5 reports frequency of responses to these two questions. These questions are reported together because similar responses were obtained for them.

Although the majority of the respondents felt that nutritionally sensible meals were served in CF dining rooms, a considerable number disagreed for a variety of reasons. However, only a small percentage stated changes that they would like to see.

TABLE 4

Frequency of Responses to the Question "Where and how should nutrition education be done?"

<u>Response</u>	<u>Frequency</u>
(a) seminars, classes, lectures, films, meetings on base	29
(b) during basic training	25
(c) pamphlets and/or posters	12
(d) carry out weight control programs at the MIR by a doctor or dietitian	3
(e) during Trade Qualifying Level 3 (TQ3) course	2
(f) should be ongoing to maintain awareness	1
(g) during physical training (PT)	1
(h) individuals will find out on their own if they really want to know	1
(i) cooks should be responsible for ensuring nutritionally adequate meals are available	1

TABLE 5

Frequency of Response to Changes Diners Would Like to See in CF Dining  
Rooms and Other Comments Pertaining to Food Services.

<u>Response</u>	<u>Frequency</u>
(a) Too many high fat and/or high calorie foods served such as fried foods, foods in gravies and sauces, butter added to vegetables and breaded foods, includes box lunches being high in calories	14
(b) overcooking of foods, particularly vegetables, leftovers appearing again and again on the steam table or buffet	8
(c) Menu variety poor ( includes box lunches, all of the same type of meat at one meal and all ethnic food at one meal)	8
(d) Food preparation poor	8
(e) Increase fruit and raw vegetable selection, poor quality and spoiled fruit often available, make brown bread available	4
(f) Vegetables should be fresh and steamed not canned and boiled	2
(g) Too many sweets such as pies, pastries and desserts are available	2
(h) Lunch meals are better than supper meals during the week and all meals on weekends	1
(i) More attendance and involvement of the Jr Ranks dining committee	1
(j) Old bread, leftover salads etc should be permitted to go over to quarters	1
(k) More fresh fish	1
(l) Initiative is required on the part of the individual to select sensible meals	1
(m) Problem lies with what the individual selects to eat at other than meal times	1



In discussions with diners during group meetings to complete questionnaires, many of the same comments stated in Table 5 were vocalized strongly. Of particular note and concern because they were not evident from the questionnaire, were the following complaints:

1. One base had a sizeable portion of living-in persons consuming box lunches daily. Diners who ate box lunches complained about their poor overall quality and lack of variety. Of particular concern to many diners was the high caloric content of these box lunches and the apparent unwillingness of the kitchen to prepare "special" ones unless the individual had a prescription from a Medical Officer.
2. Many diners were concerned about fruit. Apparently, many times quality is very poor and variety is nonexistent. Even when seasonal fruit is available it is seldom seen in the dining room. Sometimes when it is procured, it is used in the preparation of high caloric desserts such as strawberry shortcake.
3. Participants complained about the overall prevalence of high caloric foods. For example, adding butter to vegetables, frying foods and cooking foods in gravies and sauces. For low caloric alternatives, diners go to the buffet table but find salads already mixed with dressings instead of being served plain.
4. Complaints about overall quality were registered. For example, salad items at supper were leftovers from lunch, meal preparation and menu items at lunch were better than supper, meals on weekends were inferior to those during the week. These complaints are particularly serious for those who eat box lunches daily.

5. Diners were advised by the researcher that complaints should be aired through the Junior Ranks Dining Committee (JRDC). Some diners were not aware of the existence of this committee, some diners did not know who their representatives were and one representative to whom the author spoke did not know when meetings were held and did not attend. The diners also felt intimidated by JRDC meetings. They said that they were the only members of the committee who were young and of the rank of Private or Corporal. The other members were Officers and Sr NCO's. They claimed that when complaints were raised, the Food Services Officer and/or Sr NCO's would not take the complaint seriously, would deny their occurrence, or would state that the problem would be rectified and no subsequent action would be taken. The diners felt that the words of the Officer or Sr NCO were always believed over their own words. Thus issues would or could not be further pursued.

It is the opinion of this researcher that relatively few comments were written on the questionnaire because it was an open ended questionnaire with no prompting answers whatsoever. Had the questionnaire been of another format with precoded answers to choose from, it is felt that more recommendations for change may have been made.

When subjects were asked if they followed a diet, 19 % indicated that they did. Of the 29 subjects who indicated that they were on a diet, 16 were women and 13 were men. This accounted for 36 % of the female population and 12 % of the male population. Of the 29 subjects on diets, 21 were self prescribed. Of the remaining seven, three were pre-

scribed by a doctor and three were prescribed by the respondent in conjunction with a doctor. One person on a diet did not answer this question. Table 6 indicates the frequency of types of diets that respondents indicated that they followed.

A relatively large number of respondents, especially females followed diets. This group is of special concern because of difficulties encountered in meeting iron requirements when following low calorie regimes (Woolcott, 1981). At least seven subjects were following diets which were considered inappropriate and hazardous to health.

Table 7 summarizes the demographic characteristics of those who gave consent to participate in the program, those who indicated that they would be absent on leave, temporary duty or posting and those who did not give consent to participate in the program. The only factor which appears to influence participation in the program is education. As education increased, there appeared to be more willingness to participate in the study.

Table 8 states frequency of reasons given for not participating in the program.

## 5.2 PRETEST COOKS

### 5.2.1 Subjects

Table 9 describes the demographic characteristics of the 22 cooks who participated in the study.

The majority of cooks felt that they had sufficient knowledge to plan and prepare nutritionally sensible meals. Whether, in fact these cooks have sufficient knowledge will be examined later.

TABLE 6

## Frequency of Types of Diets That Respondents Followed

Response	Frequency
(a) No response	4
(b) Balanced weight control, cutting down, decrease calories but following Canada's Food Guide	10
(c) Low calories with high protein and/or low carbohydrates, Scarsdale diet	6
(d) Special diet (allergy, low cholesterol)	2
(e) Watch what I eat and/or Canada's Food Guide	2
(f) Running diet	1
(g) Reducing sugars and starches	1
(h) Weight watchers	1
(i) One meal a day	1
(j) Reduce fatty foods	1

TABLE 7

Demographic Characteristics of Subjects Who Consented, Indicated They Would Be Absent and Did Not Give Consent to Participate in the Program

		Consent (n=74)	Absent (n=42)	Nonconsent (n=34)
Place				
Winnipeg	(n=79)	35	25	19
Portage	(n=71)	39	17	15
Sex				
male	(n=106)	51	32	23
female	(n=44)	23	10	11
Age				
no response	(n=1)	0	0	1
18-24 years	(n=118)	59	30	29
25-34 years	(n=22)	11	8	3
35-44 years	(n=6)	3	3	0
45-54 years	(n=3)	1	1	1
School				
no response	(n=1)	0	0	1
some high school	(n=56)	19	17	20
completed high school	(n=73)	41	22	10
some university or technical school	(n=15)	11	3	1
completed university or technical school	(n=5)	3	0	2

TABLE 8

## Frequency of Reasons Given For Not Participating in the Study

Reason	frequency (n=34)
(a) Moving or moved off Base	9
(b) Don't want to/not interested	8
(c) Too busy	5
(d) Seldom eat in mess	5
(e) Shift worker	4
(f) Did not feel that input would be beneficial or felt normal eating habits would change	2
(g) Already on a special diet	1

TABLE 9

Demographic Characteristics of Cooks Who Completed the Pretest Cooks'  
Opinions Questionnaire

	Number
	n=22
Sex	
male	18
female	4
Age	
18-24 years	7
25-34 years	3
35-44 years	10
45-54 years	2
Education	
some high school	14
completed high school	7
some university or technical school	1
Rank	
Private-Master Corporal	12
Sergeant-Master Warrant Officer	10

### 5.2.2 Results

When asked if they felt that they had enough information about nutrition to plan meals and to prepare food that is nutritionally sensible, 18 cooks responded with "yes" and four cooks responded with "no". Only one cook answered the question which asked what they would like to know more about. That cook stated that he/she would like to know which foods have more nutritional value.

Three of the cooks did not feel that it was the responsibility of the CF to educate them in nutrition. The other 19 felt that the CF was responsible to educate them in nutrition. Only 12 cooks answered the question asking where and how nutrition education should be done. Table 10 states the frequency of different answers to this question. Some cooks gave two answers to this question.

The majority of cooks felt that it was the responsibility of the CF to educate them in nutrition. It would have been interesting to determine the reasons for the three cooks not feeling that the CF was obliged to teach them nutrition, especially as two of these three cooks were supervisors. The majority of cooks felt that instruction should be carried out on Trade Qualifying Level 3 (TQ3) and Trade Qualifying Level 5 (TQ5) courses.

Eighteen cooks felt that the CF served nutritionally sensible meals, two cooks felt that the CF did not serve nutritionally sensible meals and two cooks felt that sometimes the CF served nutritionally sensible meals. When asked what changes the cooks would like to make to improve meals, only three answered with the following comments:



TABLE 10

Frequency of Replies by Cooks When Asked "Where and How Should Nutrition Education Be Done?"

Response	Frequency
(a) Cooks course (TQ3 and TQ5)	11
(b) On the job	2
(c) Supervisors explain nutrition	1
(d) Pamphlets and handouts	1

1. Use less fat when frying, use broiling and baking cooking methods and don't overcook vegetables.
2. Don't overcook vegetables and avoid shortcuts in preparation.
3. Implement standard menus throughout the CF.

Although the majority of cooks felt that nutritionally sensible meals were served, a small number did recognize that there was a need to modify cooking methods from frying to broiling and baking and to take more care in the cooking of vegetables.

When asked to give other comments, suggestions or ideas concerning nutrition education and food services, 13 cooks did not reply. Table 11 summarizes frequencies of responses to this question. More than one response per cook was received.

It is interesting to note that the most frequent comment that cooks made about nutrition education was that there was a need to educate the diners. Of further interest is the fact that this comment was made in all cases by supervisors. From many of the comments that diners have made, they would like the cooks to provide them with foods that are more in accordance with the dietary recommendations for Canadians. Clearly, there appears to be misunderstanding and breakdown in communication between these two groups.

### 5.3 NUTRITION KNOWLEDGE

#### 5.3.1 Subjects

Table 12 summarizes the demographic characteristics of male and female diners who completed Woolcott's nutrition knowledge test. With the exception of one male subject, all were subjects who met for the pretest

TABLE 11

Frequency of Responses by Cooks When Asked for Other Comments,  
Suggestions or Ideas Pertaining to Nutrition Education and Food Services

Response	Frequency
(a) Educate the diners	5
(b) CF should consider types of foods diners like	2
(c) People are going to eat the foods they want to eat	1
(d) Menus are repetitious	1
(e) Eggs, hamburgers and hot dogs are all that are served on week-ends	1

briefing. The one subject who completed the questionnaire but did not meet for the pretest briefing, completed his pretest diners opinion questionnaire late, thus he was unable to participate in the complete study. Comparing the demographic characteristics in Table 2 with the demographic characteristics of those who consented to participate in the program, it was apparent that male subjects were most likely to drop out. It is interesting that only 11 % of the women did not have at least high school education as compared to 36 % of the men.

Cooks completed the nutrition knowledge test at the same time as the pretest cooks' opinions questionnaire was completed. Thus, Table 9 describes their demographic characteristics.

### 5.3.2 Results and Discussion

Table 13 states the mean, standard deviation and range of scores for male and female diners and Sr NCO cooks, Jr NCO cooks and the total cook population. Female subjects had a higher mean score than male subjects which supports the findings of Sullivan and Schwartz (1981) and Mackie (1973) that women have more knowledge of nutrition than men. It must be remembered that the females were better educated than the males. Woolcott (1979), Sullivan and Schwartz (1981), Rahn (1980) and Mackie (1973) all found that nutrition knowledge was positively correlated with education.

The males in this sample scored lower than the males in Woolcott's (1979) sample. Woolcott's scored a mean of 59 %. This difference is probably due to the fact that Woolcott's sample were considerably better educated than the male subjects tested in this study. Over

TABLE 12

Demographic Characteristics of Male and Female Subjects Who Completed  
Woolcott's Nutrition Knowledge Test

	Male n=35	Female n=19
Location		
Winnipeg	15 (43%)	11 (58%)
Portage	20 (57%)	8 (42%)
	100%	100%
Age		
18-24 years	25 (71%)	16 (84%)
25-34 years	6 (17%)	3 (16%)
35-44 years	3 (9%)	0 (0%)
45-54 years	1 (3%)	0 (0%)
	100%	100%
Education		
some high school	13 (37%)	2 (10.5%)
completed high school	15 (43%)	15 (79%)
some university or technical school	6 (17%)	2 (10.5%)
completed university or technical school	1 (3%)	0 (0%)
	100%	100%

TABLE 13

Mean, Standard Deviation and Range of Scores of Male and Female Diners  
and Sr NCO, Jr NCO and Total Cooks on Woolcott's Nutrition Knowledge  
Test

	Mean	SD	Range
Diners			
males (n=35)	9.5 (47.5%)	3.3	3-15
females (n=19)	11.6 (58.5%)	3.8	4-16
Cooks			
Sr NCO's (n=10)	12.4 (62.0%)	2.5	8-18
Jr NCO's (n=12)	10.3 (51.5%)	3.2	5-15
Total (n=22)	11.2 (56.0%)	3.0	5-16

50 % of subjects in Woolcott's study graduated from university. Of these, 15 % had post graduate degrees. An additional 16 % of her subjects had some university courses. Less than 25 % completed high school or had some high school education.

The women in Rahn's study (1980) had a mean score of 54 % on an adaptation of Woolcott's nutrition knowledge questionnaire. This was slightly lower than the mean score of the women in this sample. The women in Rahn's study had a mean of 12 years of education. Her sample had similar education to women in this study.

It is disappointing to note that the cooks have only slightly better mean scores than male diners and with the exception of Sr NCO cooks, do not have mean scores as high as female diners. Although chi square analysis was attempted to determine if relationships existed between scores on the nutrition knowledge test and demographic characteristics, there were insufficient numbers in the sample to produce valid results.

Table 14 summarizes the frequency of replies for each answer to every question for male and female diners and cooks.

TABLE 14

Frequency and Percent for Cooks and Male and Female Diners to Each Question on Woolcott's Nutrition Knowledge Test

	Cooks	Males	Females
1 The energy value of a food tells you:			
A. number of vitamins it contains	4 (18%)	4 (11%)	1 (5.5%)
B. number of calories it contains	13 (59%)	19 (55%)	13 (68%)
C. amount of protein it contains	4 (18%)	8 (23%)	4 (21%)
D. amount of iron it contains	1 (4%)	4 (11%)	1 (5.5%)
2 You get vitamin C from:			
A. Milk and Cheese	1 (4.5%)	3 (8.5%)	3 (16%)
B. fruits and vegetables	18 (82%)	25 (71.5%)	11 (58%)
C. cod liver oil	2 (9%)	3 (8.5%)	1 (5%)
D. sunshine	1 (4.5%)	4 (11.5%)	4 (21%)
3 Three substances in foods which give energy to the body are:			
A. carbohydrates, proteins, fats	8 (36%)	18 (51%)	12 (63%)
B. fats, proteins, vitamins	5 (23%)	8 (23%)	4 (21%)
C. carbohydrates, vitamins, minerals	8 (36%)	7 (20%)	2 (11%)
D. proteins, water, fibre	1 (5%)	2 (6%)	1 (5%)
4 A person who is active needs more:			
A. protein	8 (36%)	16 (46%)	4 (21%)
B. iron	1 (4.5%)	4 (11%)	2 (10.5%)
C. calories	12 (55%)	13 (37%)	10 (53%)
D. vitamins	1 (4.5%)	2 (6%)	2 (10.5%)
no response	0 (0%)	0 (0%)	1 (5%)
5 A food which supplies bulk (fibre) in the diet is:			
A. oatmeal	13 (59%)	22 (63%)	14 (74%)
B. yogurt	1 (5%)	2 (6%)	3 (16%)
C. steak	8 (36%)	8 (23%)	0 (0%)
D. crackers	0 (0%)	3 (8%)	2 (10%)
6 The best way to lose weight is to:			
A. eat a high carbohydrate diet	0 (0%)	2 (6%)	1 (5%)
B. eat a high protein diet	3 (14%)	7 (20%)	2 (11%)
C. lift weights	0 (0%)	0 (0%)	0 (0%)
D. eat less and exercise more	19 (86%)	26 (74%)	16 (84%)
7 The disease caused by not enough iron in the diet is:			
A. scurvy	7 (32%)	5 (14%)	3 (16%)
B. rickets	1 (4.5%)	9 (26%)	3 (16%)
C. anemia	11 (50%)	18 (51%)	13 (68%)
D. diabetes	2 (9%)	3 (9%)	0 (0%)
no response	1 (4.5%)	0 (0%)	0 (0%)



Table 14 continued

	Cooks	Males	Females
8 The best source of calcium among the following foods is:			
A. pork chop	1 (5%)	0 (0%)	0 (0%)
B. whole grain cereals	4 (18%)	8 (23%)	2 (10.5%)
C. spinach	2 (9%)	3 (8.5%)	2 (10.5%)
D. cheese	15 (68%)	24 (68.5%)	15 (79%)
9 The method of cooking meat which uses most fat is:			
A. frying	17 (77%)	25 (71%)	16 (84%)
B. roasting	3 (14%)	4 (11.5%)	0 (0%)
C. barbecuing	2 (9%)	2 (6%)	0 (0%)
D. broiling	0 (0%)	4 (11.5%)	3 (16%)
10 Which one of the following foods contains the most fat?			
A. granola	5 (23%)	11 (31.5%)	6 (32%)
B. rice	5 (23%)	10 (28.5%)	5 (26%)
C. rolled oats	1 (4%)	3 (8.5%)	3 (16%)
D. whole wheat bread	8 (36%)	11 (31.5%)	5 (26%)
no response	3 (14%)	0 (0%)	0 (0%)
11 Which one of the following is highest in polyunsaturated fats?			
A. butter	5 (23%)	9 (26%)	8 (42%)
B. lard	2 (9%)	15 (43%)	2 (10.5%)
C. olive oil	3 (14%)	0 (0%)	2 (10.5%)
D. corn oil	12 (54%)	11 (31%)	7 (37%)
12 Which one of the following is highest in saturated fats?			
A. peanuts	16 (73%)	21 (60%)	15 (79%)
B. beef	6 (27%)	6 (17%)	4 (21%)
C. salmon	0 (0%)	2 (6%)	0 (0%)
D. chicken	0 (0%)	6 (17%)	0 (0%)
13 Margarine and butter are different because:			
A. margarine contains less fat than butter	6 (27%)	14 (40%)	5 (26%)
B. margarine contains more saturated fat	2 (9%)	3 (8.5%)	1 (5%)
C. margarine contains vegetable oil	12 (55%)	14 (40%)	10 (53%)
D. margarine contains fewer calories	2 (9%)	4 (11.5%)	3 (16%)
14 If you wanted to lower the amount of cholesterol that you eat, you would cut down on:			
A. sirloin steak	11 (50%)	12 (34%)	9 (47%)
B. tuna fish	3 (14%)	4 (11.5%)	2 (11%)
C. baked chicken	2 (9%)	9 (26%)	1 (5%)
D. baked beans	6 (27%)	10 (28.5%)	7 (37%)
15 Of the following groups of foods, the one with the most cholesterol is:			
A. broccoli, chicken, rice	2 (9%)	6 (17%)	3 (16%)
B. green salad, whole wheat bread, margarine	4 (18%)	4 (11.5%)	2 (10.5%)
C. apple pie, lemon sherbet, coffee	8 (36.5%)	14 (40%)	6 (31.5%)
D. shrimp, whole milk, liver	8 (36.5%)	11 (31.5%)	8 (42%)

Table 14 continued

	Cooks	Males	Females
16 One of the following is not considered to be a risk factor for heart disease:			
A. a diet high in animal fat	0 (0%)	4 (11%)	0 (0%)
B. high blood levels of cholesterol	2 (9%)	1 (3%)	0 (0%)
C. a high intake of dietary fibre	19 (86%)	28 (80%)	18 (95%)
D. a high intake of salt	1 (5%)	2 (6%)	1 (5%)
17 One of the following meals would be recommended to someone concerned with preventing heart disease:			
A. half grapefruit, eggs, bacon, toast, coffee with cream	4 (18%)	8 (23%)	0 (0%)
B. orange juice, toast with peanut butter, 2 % milk	13 (59%)	19 (54%)	15 (79%)
C. grapefruit juice, sausages, sweet roll, 2 % milk	4 (18%)	5 (14%)	3 (16%)
D. orange, homemade roll, butter, fried ham, coffee	1 (5%)	3 (9%)	1 (5%)
18 As you grow older, your body's need for certain nutrients changes in one of the following ways:			
A. more vitamin E is required	3 (13.5%)	4 (11%)	2 (11%)
B. fewer calories are required	9 (41%)	9 (26%)	11 (58%)
C. there is no change	1 (4.5%)	1 (3%)	1 (5%)
D. more vitamins and minerals are required	9 (41%)	21 (60%)	5 (26%)
19 Two foods which contain the same number of calories are:			
A. a potato and a tomato	3 (13%)	15 (43%)	4 (21%)
B. a glass of whole milk and a glass of skim milk	4 (18%)	2 (6%)	0 (0%)
C. a teaspoon of butter and a teaspoon of margarine	12 (54%)	6 (17%)	9 (47%)
D. a piece of chocolate cake and a bran muffin	3 (13%)	13 (34%)	6 (32%)
20 A nutrient which is most likely to be destroyed by heating (boiling, baking, etc) is:			
A. phosphorus	1 (5%)	0 (0%)	2 (10%)
B. vitamin A	2 (9%)	5 (14%)	7 (37%)
C. protein	4 (18%)	14 (40%)	3 (16%)
D. vitamin C	15 (68%)	16 (46%)	7 (37%)

The questions which were most frequently answered correctly by cooks and male and female diners were basically the same questions. The two questions most frequently answered correctly were questions 16 and 6 which asked to identify the factor not associated with heart disease and the best way to lose weight. Both Woolcott and Rahn also found that these questions were answered well. There were three other questions which were answered fairly well. They were questions 9, 2 and 8 which asked the method of cooking which used the most fat, the source of vitamin C and the best source of calcium. Generally, these questions were also answered well in Woolcott's (1979) and Rahn's (1980) studies. The questions which were answered most poorly for diners and cooks were questions 12 and 10 which asked to identify the foods highest in saturated fats and the food containing the most fat. It was rather interesting that most cooks incorrectly identified peanuts as highest in saturated fats (question 12) and yet 54 % of cooks knew that corn oil was highest in polyunsaturated fats.

Other questions which were answered poorly differed between the groups. Cooks had difficulty with question three which was to identify carbohydrates, proteins and fats as the three substances which gave energy to the body. Only 36 % of cooks could correctly identify the answer whereas more than 50 % of male and female diners correctly identified the answer. Cooks also had difficulty with questions 15 and 18 which pertain to identifying the foods with the most cholesterol and realizing that fewer calories are required as one grows older. The remainder of the questions were identified correctly by at least 50 % of cooks.

Male diners had several questions in addition to the two discussed which posed difficulty. The question most poorly answered with only 17 % answering correctly, was question 19 concerning butter and margarine having the same number of calories. Woolcott (1979) also found that her subjects had difficulty with this question as only 27.7 % knew the correct answer. Other questions poorly answered were 18, 11, 15, 14, 13 and 20 concerning fewer calories being required as one gets older, corn oil as being highest in polyunsaturated fats, foods having the most cholesterol, cutting down on sirloin steak to reduce cholesterol intake, margarine and butter differing because margarine contains vegetable oil and vitamin C being destroyed by heat. The questionnaire used in Woolcott's (1979) study asked a question concerning the food containing the highest amount of linoleic acid. The later adaptation of this questionnaire which was used in this study, asked for the food containing the highest amount of polyunsaturated fat. Only 20 % of Woolcott's men could correctly answer the question about linoleic acid, whereas 31 % of men in this study correctly answered the same question when the term polyunsaturated fat was used. The term polyunsaturated fat appears to be better understood than the term linoleic acid. Woolcott (1979) found that 75 % of her men could identify anemia as being the disease caused by insufficient iron, yet only 51 % of male subjects in this study were able to do so.

In addition to questions 12 and 10 which were previously discussed, women had difficulty with questions 11, 20, 15 and 14 concerning corn oil being highest in polyunsaturated fats, vitamin C being destroyed by heat, foods having highest cholesterol count and cutting down on sirloin steak to reduce cholesterol intake. Rahn (1980) found that

her women had difficulty with the questions concerning vitamin C being destroyed by heat and foods having the highest cholesterol content. However, 58 % of her women were able to recognize that cutting down on sirloin steak reduces cholesterol intake whereas only 47 % of this group of women correctly identified the question. Rahn's questionnaire did not ask the source highest in polyunsaturated fats, but rather, the source highest in linoleic acid. Only 19 % of her sample correctly identified the answer. Presumably, polyunsaturated fat is a better known term as 37 % of the women participating in this study correctly identified the answer.

It is rather interesting that certain questions were answered very well or very poorly by one of the three groups. For example, both male and female diners recognized that carbohydrates, proteins and fats give energy to the body. Cooks performed very poorly on this question, and yet one would assume that they should answer this question well. Instruction in this area must be lacking. Cooks and female diners recognized that a person who is more active needs more calories. Men had difficulty correctly answering this question, with a greater number of men erroneously thinking that protein requirements increased. A much greater percentage of female diners than male diners or cooks recognized that insufficient iron is the cause of anemia. Women are probably more aware of this relationship because of publicity about higher requirements than men and difficulties in meeting these higher requirements. Cooks answered the question about polyunsaturated fat better than male and female diners. Perhaps training in food preparation has accounted for more knowledge in this area. The poor showing of diners in response

to this question confirms the findings of the Nutrition Concepts Study (Rae and Nielsen, 1980) and Sullivan and Schwartz (1981) that the term polyunsaturated fatty acid is poorly understood. Male diners did not seem to recognize that margarine is different from butter because it contains vegetable oil. Many thought that margarine has fewer calories. Women had superior knowledge to cooks and male diners in answering the question about the meal recommended to someone concerned with heart disease. It is rather disappointing that only 59 % of cooks were aware of what the composition of this meal should be. Female diners were also far more likely to identify that fewer calories are required as one grows older. The majority of male diners and many cooks thought that increased vitamins and minerals were required. Male diners appear to have a very poor concept of caloric content of foods. Most male diners thought that a potato and tomato or a piece of chocolate cake and a bran muffin had about the same number of calories. Very few correctly identified that butter and margarine have the same caloric content. As would be expected, cooks answered the question about vitamin C being destroyed by heat better than male or female diners.

Generally, questions concerned with nutrient sources were answered fairly well. Questions about energy balance were answered well by cooks and female diners, but male diners had misconceptions. Although subjects recognized that diets high in animal fats and cholesterol were associated with increased risk for heart disease, questions concerning fats and cholesterol were poorly answered by all three groups, and especially male diners.

## 5.4 NUTRIENT INTAKES

### 5.4.1 Subjects

Table 15 indicates the demographic characteristics of those who completed the pretest three day food record and those whose three day food records were actually used. Comparing subjects who consented to participate in the program (Table 7) with those who actually did participate in the program by completing food records, we find that male subjects were most likely to drop out.

One female subject was sick during the pretest three day food record and her results were therefore not used. There were eight other subjects whose food records were discarded because they were not completed accurately. Subjects stated that they ate foods at certain meals when that particular food item was served at a different meal or in some cases, on a different day. Again, it was mainly male subjects who did not accurately complete the three day food record. Table 16 states the age and education of male and female subjects whose three day food records were analyzed.

### 5.4.2 Results and Discussion

#### 5.4.2.1 Nutrient Intakes

Table 17 states nutrient intakes for the group of male subjects. Mean daily nutrient intakes for men met or exceeded recommended intakes in all cases except total folate and vitamin A. Compared to the national average reported by Nutrition Canada (Health Protection Branch, 1977b) for men 20 to 39 years of age, the sample population consumed less energy, less iron, less vitamin A and less folate. The male sample in this

TABLE 15

Demographic Characteristics of Subjects Who Completed Food Records and  
Subjects Whose Food Records Were Analyzed

	Subjects Who Completed Pretest Food Records n=49	Subjects Whose Pretest Food Records Were Used n=40
Location		
Winnipeg	22	17
Portage	27	23
Sex		
Male	32	25
Female	17	15
Age		
18-24 years	37	29
35-34 years	8	7
35-44 years	3	3
45-54 years	1	1
Education		
some high school	12	10
completed high school	28	24
some university or technical school	8	5
completed university or technical school	1	1



TABLE 16

Age and Education of Male and Female Subjects Whose Pretest Food Records  
Were Analyzed

	Male	Female
	n=25	n=15
Age		
18-24 years	16	13
25-34 years	5	2
35-44 years	3	0
45-54 years	1	0
Education		
some high school	9	1
completed high school	12	12
some university or technical school	3	2
completed university or technical school	1	0

study had nutrient intakes comparable to those reported by Wallace (1980) for subjects living-in during work days, with the exception of vitamin A and fibre. Wallace reported vitamin A and fibre intakes more than twice that found by Nutrition Canada. Apparently liver was served one day during her study and total fibre instead of crude fibre was assessed using the nutrient analysis program at Guelph.

Mean daily nutrient intakes for women as reported in Table 18 met or exceeded recommended intakes for all nutrients except iron, vitamin A and total folate. Compared to the national averages reported by Nutrition Canada for women 20-39 years of age, the sample population consumed less energy, less iron and less vitamin A.

Table 19 reports male and female subjects not meeting recommended nutrient intakes for Canadians. Of particular concern are the high percentage of men with inadequate intakes of thiamin, ascorbic acid, vitamin A and folate and the high percentage of women consuming inadequate intakes of most nutrients.

Table 20 reports estimates of true deficient. Of particular concern are the large number of men calculated as deficient in ascorbic acid, vitamin A and folate and the large number of women calculated as deficient in calcium, iron, ascorbic acid, vitamin A and folate.

Nutrient intakes for vitamin A and folate must be treated with caution. Vitamin A is stored in the body and an individual's intake may vary considerably from day to day, thus a longer period of assessment is necessary in order to accurately determine intake (Beaton, 1975). The food data on folate are not complete (Health Protection Branch, 1977b). Although adequate folate is consumed to maintain serum folate levels in

TABLE 17

## Mean Daily Nutrient Intakes of Male Subjects

Nutrients	Present Study		Wallace (1980)		Nutrition Canada (Health Protection Branch, 1977b)
	n=25		n=24		n=999
	Mean	SD	Mean	SD	Mean
Energy (kcal)	2876	793	2544	1002	3374
Protein (g)	112	30	108	42	119
Fat (g)	126	43	107	47	154
Carbohydrate (g)	283	103	238	100	351
Fibre (g)	4.40	3.92	15	9	4.61
Calcium (mg)	1330	516	1142	693	1081
Iron (mg)	13.6	5.5	14	5.1	18
Thiamin (mg)	1.60	0.78	1.48	0.64	1.57
Riboflavin (mg)	2.74	0.94	2.95	1.39	2.59
Niacin (NE)	44.5	12.5	*44.2	-	48
Ascorbic acid (mg)	98	97	127	95	118
Vitamin A (RE)	908	536	3480	4380	1551
Total folate (ug)	178	84	-	-	221

\* originally reported in mg and for purposes of comparison in this study was converted to NE

TABLE 18

## Mean Daily Nutrient Intakes of Female Subjects

Nutrients	Present Study		Nutrition Canada (Health Protection Branch, 1977b)
	mean	SD	Mean
Energy (kcal)	1694	653	2001
Protein (g)	70	34	72
Fat (g)	72	38	89
Carbohydrate (g)	178	94	227
Fibre (g)	3.6	3.0	3.2
Calcium (mg)	893	472	709
Iron (mg)	9.8	5.3	12
Thiamin (mg)	1.07	0.78	1.02
Riboflavin (mg)	1.74	0.81	1.70
Niacin (NE)	25.5	14.4	28
Ascorbic acid (mg)	102	115	89
Vitamin A (RE)	763	540	1292
Total folate (ug)	141	91	146

TABLE 19

Number and Percent of Total Male and Female Subjects not Meeting  
Recommended Nutrient Intakes for Canadians (1982)

	Male	Female
Nutrient	n=25	n=15
Calcium	2 (8%)	5 (33.3%)
Iron	2 (8%)	12 (80%)
Thiamin	6 (24%)	6 (40%)
Riboflavin	0 (0%)	2 (13.3%)
Niacin	0 (0%)	3 (20%)
Ascorbic acid	11 (44%)	7 (46.7%)
Vitamin A	14 (56%)	8 (53.3%)
Total folate	20 (80%)	11 (73.3%)

TABLE 20

Estimates of True Deficients From Nutrient Intakes of Male and Female  
Subjects

	Male	Female
Nutrient	n=25	n=15
Calcium	0.76 (3%)	2.91 (19.4%)
Iron	0.38 (1.5%)	7.51 (50.1%)
Thiamin	1.04 (4.2%)	3.68 (24.5%)
Riboflavin	0 (0%)	1.00 (6.7%)
Niacin	0 (0%)	0.83 (5.5%)
Ascorbic acid	6.28 (25.1%)	3.07 (20.5%)
Vitamin A	9.28 (37.1%)	5.23 (34.9%)
Total folate	9.13 (36.5%)	7.60 (50.7%)

True deficients were calculated according to the method described by Anderson (1980) and developed by Beaton (1971, 1975)

90 % of Canadians (Health Protection Branch, 1977), male subjects in this study consumed 20 % less folate than male subjects in Nutrition Canada.

#### 5.4.2.2 Food Group Servings From Canada's Food Guide

Table 21 states numbers of subjects consuming adequate, inadequate and in some cases marginal servings of foods from food groups.

Examination of Table 21 shows a large percentage of men and women who consumed inadequate quantities of fruits and vegetables. This could be related to the numerous complaints stated in the pretest opinions questionnaire about the poor selection and quality of fruits and vegetables available to diners. In addition, there are a large percentage of women eating inadequate servings from all other food groups. Nutrition Canada (Health Protection Branch, 1977b) found that fruits were a primary source of vitamin C and a secondary source of folate. Vegetables were a primary source of folate and a secondary source of vitamin A. For males, vegetables were a primary source of vitamin C and for females a secondary source of thiamin and vitamin C. Evidence points to the low intakes of fruits and vegetables being the cause of the large percentage of men and women in this study who consumed less than adequate quantities of ascorbic acid, vitamin A and folate. Nutrition Canada (Health Protection Branch, 1977b) found that cereal products were a secondary source of iron and for females, a primary source of thiamin. The large percentage of female subjects who consumed inadequate and marginal intakes of breads and cereals probably account for the large proportion of women who consumed less than the recommended amounts of iron

TABLE 21

Numbers and Percent of Male and Female Subjects Consuming Adequate  
Servings of Each Food Group in Canada's Food Guide

	Recommended Servings	Male n=25	Female n=15
Milk	2		
inadequate		2 (8%)	7 (47%)
adequate		23 (92%)	8 (53%)
Fruit	2		
inadequate		15 (60%)	7 (47%)
marginal		6 (16%)	5 (33%)
adequate		6 (24%)	3 (20%)
Meat and Alternatives	2		
inadequate		0 (0%)	4 (27%)
adequate		25 (100%)	11 (63%)
Breads and Cereals	3		
inadequate		5 (20%)	8 (53%)
marginal		7 (28%)	4 (27%)
adequate		13 (52%)	3 (20%)
Vegetables	2		
inadequate		8 (32%)	6 (40%)
adequate		18 (68%)	9 (60%)



and thiamin. Almost 50 % of women consumed inadequate servings of milk, thus explaining one third of the women having inadequate calcium intakes. Although 27 % of women consumed less than two servings from the meats and alternates group, these same women did consume adequate protein through milk products and vegetables. It was noticed that poor nutrient intake and consumption of few servings from Canada's Food Guide were generally found associated with women on reducing diets. Of special concern is the fact that frequently these women were reducing caloric intake but were continuing to consume nutrient deficient foods and beverages. Only three subjects, one female and two males consumed adequate servings of all food groups from Canada's Food Guide.

#### 5.4.2.3 Alcohol Consumption

Table 22 summarizes intake of ethanol, intake of alcoholic beverages and percent of total energy from alcoholic beverages for male and female subjects. Nutrition Canada (Health Protection Branch, 1977b) reported that male and female adults 20 to 39 years of age consume 138 and 24 kilocalories of ethanol respectively. The Recommended Nutrient Intakes for Canadians (Health Protection Branch, 1982) reports that all Canadians over 15 years of age now consume an average of 225 kilocalories of ethanol daily. Although subjects in this study consumed more ethanol than averages reported in Nutrition Canada, they apparently consume less than the more recent Canadian statistics indicate. There were six male subjects and one female subject who consumed in excess of 225 kilocalories of ethanol. There were eight women (53 %) and ten men (40 %) who did not consume any alcohol.

Many alcoholic beverages also contain carbohydrate, so it is therefore useful to examine the contribution of energy from alcoholic beverages to the diet. Wallace found that living-in male subjects in her study consumed a mean of 451 kilocalories which was 20 % of total energy from alcoholic beverages. The much higher intake of alcoholic beverages in Wallace's subjects is probably attributed to the fact that several of her subjects were stationed in the Arctic at CFS Alert, where there is little else to do for entertainment.

#### 5.4.2.4 Percent Fat, Protein and Carbohydrate

Table 23 states percent fat, protein and carbohydrate which were calculated including ethanol as total calories and excluding ethanol as total calories. Ethanol was excluded from total energy in the calculation of percent macronutrients because several subjects consumed alcohol in high quantities which greatly influenced the proportion of macronutrients.

Nutrition Canada (Health Protection Branch, 1977b) found that Canadians consumed a diet with total energy consisting of 40 % fat, 14 % protein and 46 % carbohydrate and alcohol. Findings in this study are similar to Nutrition Canada except that both males and females in this study consumed more protein and females consumed slightly less fat. Percent carbohydrate (including ethanol as part of total energy) was 39 % and 42 % for men and women respectively. Percent carbohydrate and ethanol together was 45 % for both men and women. This agrees well with Nutrition Canada, but the contribution of ethanol to the diet is higher for subjects in this study, as was discussed in the previous section.

TABLE 22

Mean, Standard Deviation and Range for Male and Female Subjects of Daily Intakes of Ethanol and Alcoholic Beverages Expressed as Energy Intake and Percent Total Energy

	Mean	SD	Range
Ethanol (kcal)			
Male	190	262	0-788
Female	84	159	0-66
Alcoholic Beverages (kcal)			
Male	276	288	0-1110
Female	90	96	0-616
Alcoholic Beverages (percent)			
Male	10	10	0-27
Female	5	5	0-43

TABLE 23

Mean Percent of Fat, Protein and Carbohydrate of Total Energy Including Ethanol as Total Energy and Excluding Ethanol as Total Energy for Male and Female Subjects

	Male	Female
	n=25	n=15
% Fat		
including ethanol as total energy	39	38
excluding ethanol as total energy	42	39
% Protein		
including ethanol as total energy	16	17
excluding ethanol as total energy	16	17
% Carbohydrate		
including ethanol as total energy	39	42
excluding ethanol as total energy	42	44

Present dietary recommendations for Canadians recommend that fat comprise 35 % of total energy and that carbohydrate comprise 50 % of total energy (Health Protection Branch, 1977c). Subjects in this study consumed more fat and less carbohydrate than recommended. However, this researcher is of the opinion that reporting percent fat, protein and carbohydrate values are not meaningful unless these values are examined within the context of the total diet. The recommendations must be more specifically defined to be meaningful. The present recommendations ignore the issue of alcohol by not stating how alcohol should be calculated and the recommendations do not state the maximum that simple sugars should comprise of the 50 % carbohydrate. To demonstrate this issue, 13 subjects consumed 35 % or less of total calories as fat. Five of these subjects consumed no alcohol and another two of these subjects consumed up to 15 % of calories as alcoholic beverages. The other six subjects with less than 35 % fat consumed more than 15 % of calories as alcoholic beverages. There were only seven subjects in this whole study who consumed more than 15 % of their energy as alcoholic beverages. To give specific examples, one subject in this study consumed a mean of 1110 kilocalories of alcoholic beverages which was 43 % of total caloric intake. The fat intake was 29 % of total energy when ethanol was included as part of total energy. However, fat intake was 40 % of total energy when ethanol was not included. To further complicate the issue, when total caloric intake from alcoholic beverages which include carbohydrate contributed by alcoholic beverages was not included as total calories, fat intake rose to 51 %. Another subject consumed 15 % of total calories as fat and 63 % of total calories came from the miscellaneous food

group, almost all of which was alcohol and soft drinks. Alcohol alone comprised 27 % of total energy. Although extreme, these examples show that caution must be used in the reporting and interpreting of percent macronutrients.

## 5.5 EVALUATION OF THE NUTRITION EDUCATION PROGRAM

### 5.5.1 Change in Food Selection Behaviour

#### 5.5.1.1 Subjects

Table 24 compares demographic characteristics of male and female subjects who completed pretest three day food records to those subjects also of the pretest group who completed posttest records which were analyzed. There were four subjects who had pretest records discarded and who completed posttest three day food records. The posttest records of these subjects were discarded. It was felt that if subjects were unable to complete the first three day record as instructed, then it was highly unlikely that they would complete a second one properly. Furthermore, a posttest record could not be analyzed statistically without a pretest record to compare it to. In addition to these four subjects, there were two subjects, one male and one female both from Winnipeg, that completed pretest food records which were analyzed and whose posttest records were discarded. It was known that the female completed her food record several days after the specified three day period and the male specified foods eaten which were not available at the meals in question. The other six subjects who completed pretest food records but did not hand in posttest food records were away on temporary duty, moved off base, lost the food record or forgot to complete it. Male subjects located at Win-

Winnipeg were most likely to drop out. Unfortunately, only two men from Winnipeg were included in the posttest evaluation of the program.

#### 5.5.1.2 Results and Discussion

Change in food selection behaviour from information on the four table tents was measured by a three factor mixed design ANOVA (sex x place x time) with pretest and posttest measures of consumption of specific nutrients.

CFB Portage was given information on fat. Table 25 summarizes the results of the ANOVA performed on percent fat of total energy intake and Table 26 states the mean percent fat pretest and posttest for male and female subjects by location. From Table 25, it can be seen that there were no significant effects or interactions. Although no significant changes occurred over time, examination of Table 26 reveals that women in both locations, but especially those in Portage, decreased percent fat. Although it is not known specifically why only women decreased percent fat at both locations, perhaps it was a function of women simply being generally more aware of types of food eaten because nutrition information was available. It is known that the information probably had an impact on at least one subject in Portage. A female diner was following a low carbohydrate, high protein diet during the pretest data collection and her percent fat was 64 %. During the posttest data collection, her percent fat was reduced to 41.5 %, and she was no longer consuming excessive amounts of animal protein foods, which are generally associated with high fat intakes.

TABLE 24

Demographic Characteristics of Pretest and Posttest Subjects By Sex  
Whose Three Day Food Records Were Analyzed

	Pretest		Posttest	
	Male n=25	Female n=15	Male n=15	Female n=13
Location				
Portage	16	7	13	6
Winnipeg	9	8	2	7
Age				
18-24 years	16	13	10	11
25-34 years	5	2	2	2
35-44 years	3	0	2	0
45-54 years	1	0	1	0
Education				
some high school	9	1	6	1
completed high school	12	12	8	10
some university or technical school	3	2	1	2
completed university or technical school	1	0	0	0



TABLE 25

Summary Table for ANOVA on Percent Fat of Total Energy.

Source	df	MS	F
Between-subjects	(39)		
sex	1	2.97	0.03
place	1	43.68	0.50
sex x place	1	0.23	0.07
error-between	36	88.23	
Within-subjects	(28)		
time	1	47.58	1.72
sex x time	1	13.88	0.50
place x time	1	10.35	0.37
sex x place x time	1	33.40	1.20
error-within	24	27.73	
Total	(67)		

TABLE 26

Pretest and Posttest Mean Percent Fat of Total Energy for Male and  
Female Subjects at Portage and Winnipeg

	Pretest	Posttest
Winnipeg		
female	35.6 (n=8)	33.0 (n=7)
male	39.9 (n=9)	40.0 (n=2)
Portage		
female	40.4 (n=7)	33.6 (n=6)
male	39.1 (n=16)	40.1 (n=13)

Note: ANOVA on percent fat of total energy showed  
no significant effects or interactions over time.

CFB Portage was given information about sodium. Table 27 summarizes the results of the ANOVA performed on sodium values of foods consumed. Added salt was not taken into account. As can be seen from Table 27, there was a significant sex by time interaction. Table 28 states pretest and posttest mean sodium values for male and female subjects. The significant sex by time interaction is reflected in the posttest decrease in consumption of sodium for men and the increase in consumption of sodium for women. Although no significance was detected in the time by place interaction, both males and females in Portage decreased sodium intake substantially, as was reflected in Table 29. For unknown reasons, women in Winnipeg increased sodium intake substantially, thus explaining the sex by time interaction. Because there were only two men in the posttest sample from Winnipeg, and it is possible that they may have unduly influenced these results, a second ANOVA was performed omitting their posttest sodium values. F values remained almost the same in the second ANOVA and the only significant interaction was still sex by time. Because both men and women in Portage did decrease intake of sodium, the information provided may likely have been the reason for their decrease.

CFB Winnipeg was given information on reducing the intake of sugar. Table 30 summarizes the results of the ANOVA performed on carbohydrate content of foods high in sugar such as candies, cakes, cookies, pies and soft drinks. There were no significant effects or interactions.

CFB Winnipeg was given information on increasing fruits, vegetables and whole grains. Table 31 summarizes the results of the ANOVA

TABLE 27

## Summary Table for ANOVA on Sodium

Source	df	MS	F
Between-subjects	(39)		
sex	1	1303714.98	1.11
place	1	4105.09	0.00
sex x place	1	58954.78	0.05
error-between	36	1251953.30	
Within-subjects	(28)		
time	1	750916.66	2.56
sex x time	1	1850616.06	6.31 *
place x time	1	338029.09	1.15
sex x place x time	24	871479.99	2.97
error-between	24	293501.04	
Total	(67)		

\*  $p \leq 0.05$

TABLE 28

Pretest and Posttest Mean Sodium (mg) for Male and Female Subjects

	Pretest	Posttest
Female	1362.27 (n=15)	1549.83 (n=13)
Male	2507.36 (n=15)	1730.32 (n=9)

Note: ANOVA on sodium showed a significant interaction of sex by time ( $p \leq 0.05$ ).

TABLE 29  
 Pretest and Posttest Mean Sodium (mg) for Male and Female Subjects at  
 Portage and Winnipeg

	Pretest	Posttest
Winnipeg		
female	1270 (n=8)	1850 (n=7)
male	1883 (n=9)	1545 (n=2)
Portage		
female	1467 (n=7)	1199 (n=6)
male	2296 (n=16)	1759 (n=13)

Note: ANOVA on sodium showed a significant interaction  
 of sex by time ( $p \leq 0.05$ )

TABLE 30

Summary Table for ANOVA on Carbohydrate Content (g) of High Sugar Foods

Source	df	MS	F
Between subjects	(39)		
sex	1	3602.25	1.26
place	1	7427.55	2.59
sex x place	1	4448.18	1.55
error-between	36	2832.05	
Within-subjects	(28)		
time	1	823.85	0.91
sex x time	1	110.56	0.73
place x time	1	946.52	1.05
sex x place x time	1	2418.08	2.68
error-within	24	900.91	
Total	(67)		

performed on the carbohydrate content of fruits consumed. A significant interaction was found for sex by place by time. Because the posttest Winnipeg male sample comprised only two, a second ANOVA was performed eliminating these two posttest values. Probabilities for between-subjects sources remained almost the same, but there was a significant time effect ( $p \leq 0.05$ ). There were no within-subjects interactions, indicating that the two Winnipeg males did, in fact, unduly influence the results. From Table 32, it can be seen that noteworthy increases in the intake of fruit took place at both locations for both sexes. Because some fruit such as apples has a higher carbohydrate content than other fruit such as oranges, means of carbohydrate intake of different fruit were examined and an overall increase in carbohydrate intake of all fruits was observed. The overall increase in fruit consumption may be attributed to the table tents for Winnipeg subjects. Because Portage subjects increased consumption of fruit as well as Winnipeg subjects, it could be a function of the food guide poster or other reasons such as subjects becoming more aware that a better selection of fruit was available, exposure to information in the media or simply that nutrition information made subjects a little more conscious of the foods that they were eating.

Table 33 summarizes the results of the ANOVA performed on carbohydrate consumed from whole grain breads and cereals and Table 34 summarizes the ANOVA performed on carbohydrate consumed from vegetables. There were no significant effects or interactions in either. This information was considered not to be relevant to the target audience, it was not of interest, it was not understood or it was not sufficient to motivate change.



TABLE 31

Summary Table for ANOVA on Carbohydrate (g) From Fruit

Source	df	MS	F
Between-subjects	(39)		
sex	1	2.08	0.00
place	1	168.28	0.05
sex x place	1	36	
error-between			
Within-subjects	(28)		
time	1	2211.05	11.22 **
sex x time	1	0.01	0.00
place x time	1	599.99	3.04
sex x time x place	1	1573.06	7.98 **
Total	(67)		

\*\*  $p \leq 0.01$

TABLE 32

Pretest and Posttest Mean Carbohydrate (g) From Fruit for Male and Female Subjects at Portage and Winnipeg

	Pretest	Posttest
Winnipeg		
female	34.87 (n=8)	51.09 (n=7)
male	13.05 (n=9)	75.88 (n=2)
Portage		
female	42.39 (n=7)	57.48 (n=6)
male	37.89 (n=16)	49.66 (n=13)

Note: ANOVA on carbohydrate of fruit consumed showed a significant effect of time ( $p \leq 0.01$ ) and a significant interaction of sex x place x time ( $p \leq 0.01$ )

TABLE 33

Summary Table for ANOVA on Carbohydrate (g) From Whole Grain Breads and  
Cereals

Source	df	MS	F
Between-subjects	(39)		
sex	1	148.97	0.53
place	1	157.14	0.56
sex x place	1	100.33	0.36
error-between	36	277.72	3.70
Within-subjects	(28)		
time	1	7.88	0.10
sex x time	1	0.29	0.00
place x time	1	59.22	0.79
sex x place x time	1	66.30	0.88
error-within	24	75.08	
Total	(67)		

TABLE 34

Summary Table for ANOVA on Carbohydrate (g) From Vegetables

Source	df	MS	F
Between-subjects	(39)		
sex	1	555.31	0.78
place	1	1902.84	2.66
sex x place	1	1691.74	2.36
error-between	36	696.85	
Within-subjects	(28)		
time	1	443.23	1.81
sex x time	1	524.94	2.14
place x time	1	32.15	0.13
sex x place x time	1	293.60	1.20
error-within	24	245.25	
Total	(67)		

An attempt was made to assess food selection changes in terms of food groups recommended in Canada's Food Guide. This proved to be very difficult to present in a meaningful way because almost one third of the sample dropped out, and although positive changes were noted in several areas, there was also evidence of negative changes occurring. It was observed however, that intake of servings of fruit did improve, which supports the findings of the ANOVA performed on fruits. Several individuals who did not consume fruit during the pretest data collection, consumed fruit during the posttest data collection.

Information on table tents and the food guide poster did not have a specific definitive effect of changing food selection behaviour. However, information on table tents and the poster did appear to promote some positive changes. It is impossible to pinpoint whether changes occurred in response specifically to the table tents, the poster, simply having nutrition information available or other environmental factors. There is evidence that simply providing nutrition information caused subjects generally to be more aware of foods eaten. There were differences between pretest and posttest values which indicate some success from the program. Women in Portage reduced percent fat. This may be in response to the table tents. With the exception of women in Winnipeg, sodium intake from foods decreased in all groups of subjects. All groups of subjects consumed much larger quantities of fruits as indicated by the posttest food records. Although Winnipeg subjects could have responded to information on the table tents, increase in fruit consumption by Winnipeg and Portage subjects could be a result of the food guide poster. There was virtually no change in consumption of whole grains, vegetables and foods high in sugar.

Change in food selection behaviour found in this study is similar to change found in the few other nutrition education programs conducted on "healthy" populations which have been evaluated. Martilotta and Guthrie (1980), Larsen-Brown (1978) and the U.S. Troop Support Agency (1981) all found positive changes in food selection with the provision of nutrition information. However, all three of these studies used group data and not individual data to measure change. Hertzog (1978) is the only published study which used table tents to convey information. Although he found no change in food selection, he was dealing with a sample of school children who were not cooperative. He used group data to measure change, so it is possible that impact could have been made on individuals.

## 5.5.2 Change in Knowledge

### 5.5.2.1 Subjects

Table 35 states the demographic characteristics of male and female subjects completing the pretest and posttest specific nutrition knowledge questionnaire. Those that did not complete the posttest questionnaires were away on holidays, away on temporary duty, moved out from quarters or could not be contacted.

### 5.5.2.2 Results and Discussion

Change in knowledge was measured by a three factor mixed design ANOVA (sex x place x time) with pretest posttest measures of the score to questions answered on the specific nutrition knowledge test.

TABLE 35

Demographic Characteristics of Pretest and Posttest Subjects By Sex Who Completed the Specific Nutrition Knowledge Questionnaire

	Pretest		Posttest	
	Male n=34	Female n=19	Male n=26	Female n=16
Location				
Winnipeg	14	11	11	10
Portage	20	8	15	6
Age				
18-24 years	24	16	19	13
25-34 years	6	3	5	3
35-44 years	3	0	1	0
45-54 years	1	0	1	0
Education				
some high school	12	2	8	1
completed high school	15	15	12	13
some university or technical school	6	2	5	2
completed university or technical school	1	0	1	0

The Canada Food Guide poster was posted in both locations. Table 36 summarizes the results of the ANOVA performed on the scores of question one concerning Canada's Food Guide. The effect of time was found to be highly significant, indicating that subjects gained knowledge, probably from the poster. The mean score for all subjects rose from a pretest value of 3.58 to a posttest value of 4.74. Examination of Table 37 indicates that greatest knowledge was gained by females in Winnipeg and males in Portage.

The information on reducing fat and salt was presented via the table tents in Portage. Table 38 summarizes the ANOVA performed on the sum of questions 4, 5, 9 and 10 pertaining to fat and salt. The interaction of place by time was found to be highly significant indicating that the table tents probably effectively increased knowledge. Table 39 states mean scores obtained from the sum of these questions for the total population at each location and male and female subjects at each location. Although men at Portage appreciably increased their knowledge, it did not increase as much as women in Portage. However, increases were proportionate to each other for the sexes at Portage, thus there was no sex interaction. Being subjected to the pretest questionnaire appears to have a slight effect on improving posttest scores, as both men and women at Winnipeg increased posttest knowledge slightly.

The information on fruits, vegetables, whole grains and sugar was given to Winnipeg. Table 40 summarizes the ANOVA performed on the sum of the scores of questions 2, 3, 6, 7 and 8 pertaining to fruits, vegetables, whole grains and sugar. There were no significant effects or interactions. The failure to change knowledge in these areas may be



TABLE 36

Summary Table for ANOVA on Canada's Food Guide Question

Source	df	MS	F
Between-subjects	(39)		
sex	1	38.93	3.26
place	1	0.03	0.00
sex x place	1	6.13	0.51
error-between	49	11.92	
Within-subjects	(28)		
time	1	34.71	14.34 **
sex x time	1	0.30	0.12
place x time	1	2.78	1.15
sex x place x time	1	6.20	2.56
error-within	38	2.42	
Total	(94)		

\*\*  $p \leq 0.01$

TABLE 37

Pretest and Posttest Mean Scores on Canada's Food Guide Question for  
Male and Female Subjects at Portage and Winnipeg

	Pretest	Posttest
Winnipeg		
female	3.73 (n=11)	5.30 (n=10)
male	4.20 (n=14)	4.33 (n=11)
Portage		
female	4.50 (n=8)	5.00 (n=6)
male	2.70 (n=20)	4.53 (n=15)

Note: ANOVA on scores of Canada's Food Guide question showed a significant effect of time ( $p \leq 0.01$ )

TABLE 38

Summary Table for ANOVA on the Sum of Questions Pertaining to Fat and  
Salt

Source	df	MS	F
Between-subjects	(39)		
sex	1	42.72	9.09 **
place	1	0.50	0.11
sex x place	1	0.58	0.12
error-between	49	4.75	
Within-subjects	(28)		
time	1	11.44	8.46 **
sex x time	1	0.88	0.66 **
place x time	1	11.66	8.62 **
sex x place x time	1	1.12	0.83
error-within	38	1.35	
Total	(94)		

\*\*  $p \leq 0.01$

TABLE 39

Pretest and Posttest Mean Scores on the Sum of Questions Pertaining to  
Fat and Salt for Male and Female Subjects at Portage and Winnipeg

	Pretest	Posttest
Winnipeg		
total	2.60 (n=25)	2.76 (n=21)
female	3.55 (n=11)	3.70 (n=10)
male	1.86 (n=14)	1.91 (n=11)
Portage		
total	1.89 (n=28)	3.33 (n=21)
female	2.50 (n=8)	4.6 (n=6)
male	1.65 (n=20)	2.80 (n=15)

Note: ANOVA on pretest and posttest mean scores of the sum of questions pertaining to fat and salt showed significant effects of sex and time ( $p \leq 0.01$ ) and significant interactions of sex x time and place x time ( $p \leq 0.01$ )

the reason why food selection behaviour did not change for vegetables, whole grains and sugar. Because the question on Canada's Food Guide showed a significant increase in knowledge about the food guide, it appears likely that the poster had more of an influence on increasing fruit selection than the table tents.

Table tents and the food guide poster appeared to have some success at increasing knowledge of subjects. Results were highly significant for Canada's Food Guide and information on fat and salt. It was disappointing that little change was observed in Winnipeg subjects. There are several reasons for apparent lack of change in knowledge in Winnipeg:

1. Many subjects in Winnipeg had limited exposure to the information. They ate few meals in the dining room because they took box lunches to work for lunch. Those subjects who took box lunches and did not eat breakfast ate only a maximum of one meal per day in the dining room. It was observed that one female subject in Winnipeg ate no meals in the dining room during the pre-test and posttest data collection. She therefore would not have had the opportunity to read the table tents.
2. Many subjects in Winnipeg did not complete the posttest questionnaire until several days after the program was completed because they went on holidays.
3. The table tents on reducing sugar intake and increasing fruits, vegetables and whole grains may not have been as well understood or as interesting to the target population.

TABLE 40

Summary Table for ANOVA on the Sum of Questions Pertaining to Fruits,  
Vegetables, Whole Grains and Sugar

Source	df	MS	F
Between-subjects	(52)		
sex	1	2.77	0.75
place	1	5.26	1.43
sex x place	1	3.30	0.90
error-between	49	3.67	3.47
Within-subjects	(42)		
time	1	3.86	3.66
sex x time	1	1.73	1.64
place x time	1	0.06	0.07
sex x place x time	1	0.24	0.23
error-within	38	1.06	
Total	(94)		

4. Questions pertaining to reducing sugar intake and increasing fruits, vegetables and whole grains may not have been sensitive enough to measure change in knowledge.

The only other nutrition education program which evaluated change in knowledge was the study conducted by Hertzog (1978). He found no change in knowledge, but his sample were school children who did not appear to take the information seriously. As in this study, Hertzog also used the combination of posters and table tents to transmit information. Although not successful on his sample of school children, it does appear to be a successful method for an older population.

Overall, knowledge did change in this study. Because the same subjects were used to assess pretest and posttest knowledge, it cannot be determined whether knowledge increased because pretest questionnaires acted as a stimulus or cue to learn the information or whether simply providing the information would have generated sufficient curiosity in itself to encourage subjects to learn.

## 5.6 POSTTEST OPINIONS ABOUT THE NUTRITION EDUCATION PROGRAM

### 5.6.1 Subjects

Demographic information is not given on these subjects because it was not obtained for several nonparticipating diners. Cooks who completed the questionnaire were those who were actually employed in the Jr Ranks kitchens at Portage and Winnipeg.

### 5.6.2 Results and Discussion

Table 41 summarizes responses to the posttest participating diners survey. Generally, most subjects thought that posters and table tents were a good way of providing information. Most subjects thought that they learned from the educational material and found the information interesting.

Table 42 summarizes the specific educational materials that subjects thought they obtained knowledge from or found interesting. Portage seemed to find the information more beneficial and interesting, however subjects from Portage were more inclined than subjects from Winnipeg to indicate knowledge and interest in table tents that were not displayed in Portage, but were displayed in the dining room at Winnipeg. Subjects from Winnipeg did not appear to be very enthusiastic about their table tents. Only one third of Winnipeg subjects expressed interest or obtained knowledge from table tents displayed in their dining room. Portage participants did not seem to find the poster as beneficial as the table tents, whereas Winnipeg participants found the poster and table tents of equal interest, but stated that they thought that they learned more from the poster. One subject did not like the program, 27 subjects liked the program and 17 subjects liked part of the program.

Table 43 summarizes frequency of responses to questions asking about differences in foods served during the program and suggestions for future programs. More than one response was received from several subjects when asked about differences in food served during the program. The number of comments about better fruits and vegetables being available is especially interesting.



TABLE 41

Frequency of Responses to the Posttest Participating Diners' Opinions  
Questionnaire About the Nutrition Education Program

Response	Frequency		
	n=45		
	Yes	No	Don't know
Thought poster was a good way of providing information	40	3	2
Thought table tents were a good way of providing information	32	10	3
Thought learning resulted from the poster and/or table tents	36	9	0
Thought information was interesting	39	3	3
Noticed difference in the food served	23	22	N/A

TABLE 42

Frequency of Response by Location to Questions Asking Which Sources of Information Participating Diners Learned From and Thought Were Interesting

	Winnipeg n=21	Portage n=24
Learned from poster and table tents		
poster	9	12
salt	3	15
fat	2	14
sugar	5	5
fruits, vegetables and whole grains	7	4
Thought information was interesting		
poster	7	12
salt	3	16
fat	2	15
sugar	7	8
fruits, vegetables and whole grains	7	4

TABLE 43

Frequency of Different Responses by Participating Diners to Questions About Differences in Food Served During the Program and Recommendations for Future Programs

Response	Frequency
Differences in food served	
-meals and food better prepared	16
-better fruits and/or vegetables	12
-better service at steam table	1
-more roasted and baked foods	1
-nutritious foods received more prominent display and were more readily available	1
Suggestions and ideas for another nutrition education program	
-pamphlets, lectures, movies, direct counselling, information on sound reducing diets, high protein diets, balanced diets, nutrient content of foods and nutrient requirements	17
-longer period for table tents	1
-somebody to record foods eaten	1
-more fruit	1
-kitchen staff should not be aware of study so that usual meals served can be assessed	1
-lost interest in filling out second three day book	1
-getting more people involved	1
-samples of serving sizes valuable to increase awareness of quantities eaten	1
-too much chicken, beef and omelettes	1
-portions were not displayed at all meals	1
-sometimes forgot to complete the food record	1
-provide nutrition information as soon as people join the CF	1
-more information, didn't learn anything from this program	1

Table 44 summarizes responses to the posttest nonparticipating diners' survey. Most subjects responded favourably to the program. Nine subjects did not like the program, 16 subjects liked the program, 22 subjects liked parts of it and 6 subjects gave no response. Table 45 states the frequency of responses to questions concerning reading, learning and finding interest in the educational material. Again, there were slightly overzealous subjects who indicated that they read, learned and found interesting the table tents that were not at their location. Approximately half of respondents at both locations stated that they learned from the table tents and approximately one third found the information interesting. Table 46 states findings about food served during the program and suggestions for future programs. These were similar to those reported for participating diners in Table 43.

Table 47 summarizes responses to the posttest cooks' opinions questionnaire. Generally, cooks thought that the poster and table tents were a good way of providing information, found them interesting and thought that they learned from them. However, when asked specifically which ones were interesting and which ones they learned from, response was very poor as indicated in Table 48. Generally they found the poster interesting and said that they learned from it. Four cooks liked the way in which the program was carried out, one did not like it and seven liked parts of it.

Table 49 summarizes problems encountered with food preparation, procurement or menu planning, problems encountered with diners, comments on the provision of the same types of meals as served during the program and suggestions for another nutrition education program. It is inter-

TABLE 44

Frequency of Responses to the Posttest Nonparticipating Diners' Opinions  
Questionnaire About the Nutrition Education Program

Response	Frequency			
	Yes	No	Don't know	No response
Aware of program	50	3	N/A	0
Noticed the poster	39	14	N/A	0
Learned from the poster	26	26	N/A	1
Read the table tents	45	8	N/A	0
Learned from the table tents	34	19	N/A	0
Found the information interesting	30	12	10	1
Noticed difference in the food served	17	35	1	0

TABLE 45

Frequency of Response by Location to Questions Asking Which Sources of Information Nonparticipating Diners Read, Learned from and Thought Were Interesting

	Winnipeg n=21	Portage n=24
Read table tents		
salt	10	19
fat	9	16
sugar	18	4
fruit, vegetables and whole grains	20	4
Learned from table tents		
salt	7	11
fat	8	12
sugar	13	3
fruits, vegetables and whole grains	13	2
Found information interesting		
poster	5	5
salt	4	8
fat	6	7
sugar	11	2
fruits, vegetables and whole grains	11	1

TABLE 46

Frequency of Different Responses by Nonparticipating Diners to Questions About Differences in Food Served During the Program and Recommendations for Future Programs

Response	Frequency
Differences in food served	
-food better prepared	7
-better salad bar, fruits and vegetables	4
-different foods available, better variety	2
-more balanced meals available	1
-less salt put on meat	1
Suggestions and ideas for another nutrition education program	
-less fried foods, high sugar foods and "junk" foods on weekends	5
-better availability and variety of fruits, vegetables and salad bar	3
-hand out pamphlets, put information on menus	2
-investigate nutritional value of foods served (eg overcooking vegetables)	2
-better prepared foods, better variety	1
-posters and tents informative and were read by many	1
-tour through kitchen to see food preparation	1
-supply nutritious foods in section canteens	1
-food records should have been kept for two weeks not three days	1

TABLE 47

Frequency of Responses to the Posttest Cooks' Opinions Questionnaire  
 About the Nutrition Education Program

Response	Frequency		
	Yes	No	Don'tknow
	n=12		
Thought poster was a good way of providing information	12	0	0
Thought table tents were a good way of providing information	10	1	1
Thought learning resulted from the poster and table tents	10	2	0
Thought information was interesting	12	0	0
Encountered difficulties with food preparation	4	8	0
Encountered difficulties with diners	3	9	0
Willingness to take part in another nutrition education program	11	1	0
Like to see similar types of meals and food served all of the time	5	6	1



TABLE 48

Frequency of Response by Location to Questions Asking Which Source of  
Information Cooks Learned From and Thought Was Interesting

	Winnipeg n=7	Portage n=5
Learned from poster and table tent		
poster	6	3
salt	1	1
fat	1	1
sugar	1	0
fruits, vegetables and whole grains	2	1
Found information interesting		
poster	6	4
salt	0	1
fat	0	1
sugar	2	0
fruits, vegetables and whole grains	2	

esting to note that there were many comments from cooks about lack of variety and repetition, particularly of poultry and fish. It is even more interesting when one notes that only one diner mentioned lack of variety. As the matter of fact, many diners noted improvements in the quality of food preparation and mentioned that there was a better selection of fruits and vegetables, as stated in Tables 43 and 46.

Kitchens were given a three day menu to follow for the pretest and posttest data collection. They were given guidelines to follow for menu preparation during the period between the data collections when the educational materials were available to the diners. This was to ensure that prudent options were available because diners were being advised to eat them. The guidelines were very general and were not restrictive. Yet, several cooks, mostly at one location, felt that by following these guidelines, variety was limited.

This researcher is of the opinion that there are great obstacles to overcome in order to motivate and educate some cooks to ensure that foods considered to be prudent options are available. One kitchen in this study was cooperative and motivated to provide necessary assistance and support to the study. They were most interested to get feedback on complaints from diners and were keen to implement on a permanent basis, those parts of the menu guidelines that were popular with diners. The other kitchen initially felt threatened and expressed concerns that the object of the study may be to "check up on them" or compare their standards and quality of food with those of the other kitchen. They were assured that this was not the case. However, as this researcher discovered, the "threatened" kitchen in fact provided questionable service.

TABLE 49

Frequency of Different Responses by Cooks to Questions About Problems Encountered, Provision of Similar Types of Meals and Suggestions for Future Programs

Response	Frequency
Problems with food preparation, procurement or menu planning	
-repetition of menu items	2
-procurement due to ration scale	1
Problems with diners	
-not enough variety - too much chicken, turkey and fish, not enough variety in desserts	2
-serving own gravy	1
Like to see the same type of meals served at all times as were available during the program	
-too much poultry, fish, fried items	4
-too many complaints, not enough variety	1
-same meal quality, but not so much repetition	1
-diners need to be more aware of food choices	1
Suggestions for another nutrition education program	
-more variety, more meat instead of chicken and fish, better selection of vegetables, potatoes and desserts	5
-more participants, so fewer complaints	1
-handouts for diners	1
-more time for implementation, more diners involved	1
-have food service students or people in dietary training help set up program	1
-suggest devoting certain days to concentrating on certain areas such as desserts, main course, breakfasts etc	1
-must build up more awareness	1

It was only marginally cooperative in carrying out the program, and prudent options were available only because the operation was monitored. Because of many serious and adverse complaints from diners about certain aspects of the food service operation, the researcher felt obligated to bring these complaints to the attention of the supervisory staff. The reaction from supervisory staff was generally defensive. As the researcher is a senior administrator in food services in the CF and encountered these difficulties, it can be appreciated that those who eat in this dining room get even less consideration and attention.

Overall, the program was generally well received by diners and was received with mixed reactions from cooks.

## Chapter VI

### SUMMARY, CONCLUSIONS, RECOMMENDATIONS AND IMPLICATIONS

#### 6.1 SUMMARY AND CONCLUSIONS

Although most diners felt that they had sufficient nutrition knowledge to select nutritionally sensible meals, almost one half felt that the CF was responsible for teaching them nutrition. They felt instruction in nutrition should be conducted as classes, seminars, lectures, films, pamphlets and posters at bases and during basic training. Almost 20 % felt that nutritionally sensible meals were not available in CF dining rooms. Reasons cited were serving foods with high fat and caloric content, overcooking foods (particularly vegetables), poor menu variety, poor food preparation and poor quality of fruits and vegetables.

The majority of cooks felt that they had sufficient knowledge to plan and prepare nutritionally sensible meals and that the CF should provide instruction for them in nutrition during cooks' courses. Most cooks felt that nutritionally sensible meals were prepared, but a small number did recognize the need to modify cooking methods and avoid overcooking vegetables. When asked for suggestions or comments about nutrition education, the most common comment from cooks was that there was a need to educate the diners. In all cases, cooks of supervisory rank stated this comment.

Administration of Woolcott's nutrition knowledge test prior to the nutrition education program resulted in mean scores of 56 % for

cooks, 45.5 % for male diners and 59.5 % for female diners. Generally, questions pertaining to nutrient sources were answered fairly well. Questions about energy balance were answered well by cooks and female diners, but male diners had misconceptions. Although subjects recognized that diets high in animal fats and cholesterol were associated with increased risk for heart disease, questions pertaining to dietary sources of fats and cholesterol were poorly answered by all three groups, especially male diners.

Analysis of nutrient intake data showed that for both men and women, mean folate and vitamin A intakes were below recommended intakes and for women, mean iron intake was below recommended intake. Assessment of individual nutrient intakes found substantial numbers of men consumed less than recommended intakes of thiamin, vitamin A, ascorbic acid and folate and substantial numbers of women consumed less than recommended intakes of almost all nutrients. Further analysis of individual nutrient intakes to estimate numbers of true deficient found large numbers of men deficient in ascorbic acid, vitamin A and folate and large numbers of women deficient in calcium, iron, ascorbic acid, vitamin A and folate. In the entire study, only five subjects (four men and one woman) consumed recommended intakes of all nutrients. Servings of foods from Canada's Food Guide were assessed. Servings of fruits and vegetables were found to be low for men and women and servings from all other food groups were found to be low for women. There were only three subjects (two men and one woman) who consumed adequate intakes of all servings of foods from the food groups.

The null hypothesis about food selection behaviour cannot be rejected because there were no significant place-time interactions. However, there were indications that the nutrition education program had some impact on food selection behaviour. Percent fat of total energy decreased considerably for women at Portage, sodium intake from foods decreased considerably for men and women at Portage and consumption of fruits increased significantly for men and women at both locations.

The nutrition education program was successful in increasing knowledge. The null hypothesis about nutrition knowledge was rejected because there was a significant increase in posttest scores on the question pertaining to Canada's Food Guide and there was a significant place-time interaction with Portage having increased scores on questions pertaining to fat and salt. The program is not an undisputed success however, as Winnipeg did not increase posttest scores on the questions pertaining to sugar, fruits, vegetables and whole grains.

Posttest evaluation of the program by participating diners, non-participating diners and cooks indicate that generally the program was relatively well received by the diners. Cooks appeared to have a somewhat mixed reaction toward the program.

## 6.2 RECOMMENDATIONS ARISING FROM RESEARCH OBJECTIVES

In view of the results of nutrient assessment of diners, especially women, intervention programs are urgently needed. Although samples in this study are small, there can be no dispute that analysis of food habits has disclosed that continued patterns of eating such as those revealed in this study will endanger the health and well being of some of

our military members. Attention and action should be focused on several areas to avoid this outcome.

Before change can occur, people must first recognize and be aware that there are better alternatives and that continued patterns of undesirable behaviour will eventually manifest themselves in disease. The nutrition knowledge test administered to cooks and diners found knowledge low, especially for male diners. Nutrition education programs must be introduced into the CF in order to provide military members with knowledge to make appropriate choices. The audience is already receptive. Almost one half of diners in this study recognized the need. A logical starting point is basic training which is a life change situation. Establishment of desirable eating patterns at this point may maintain nutritionally sound practices throughout the service person's career and prevent health problems associated with faulty nutrition such as obesity and heart disease. Other information and programs must occasionally be available at all bases in order to maintain awareness and continue to stress the need for nutritionally sound eating practices. Some counselling on appropriate reducing diets is necessary. Low nutrient intakes of several women were a result of reducing diets. Attempting to reduce caloric intake while continuing to consume nutrient deficient foods and beverages is a problem.

The environment in which diners are eating is not as conducive to facilitating nutritionally sound eating habits as would be desirable. Some major changes are necessary in order to change this. Although cooks usually decide the foods which will be served in the dining room, their knowledge is poor as shown from the results of Woolcott's test.



They have only slightly better knowledge than male diners and slightly less knowledge than female diners. Cooks do not seem to follow nutritional practices which address the concerns of the 1980's such as providing foods and using cooking methods that decrease fat, increase complex carbohydrate and increase fruits, vegetables and whole grains. For example, cooks feel that variety in menu planning is important. To the exclusion of plain broiled and baked items, foods are therefore breaded, sauced and fried. Emphasis should be placed on serving fish, poultry and plain baked meats. If fried items are on the menu, the equivalent baked or broiled item should be available as well. Great emphasis is placed on desserts. This is less than satisfactory because most desserts are not in keeping with dietary recommendations for Canadians. Modifications should be made to usual desserts served, so that more emphasis is placed on such items as loaves made from whole grains and fruits.

Many diners do not eat fruit and vegetables which is one reason for a large percentage of diners not meeting recommended intakes of certain nutrients. The fact that many do not eat fruits and vegetables may in part be the result of poor quality, preparation and/or selection that diners reported in the pretest opinions questionnaire. To help improve the consumption of vegetables by diners, it is essential that care be taken to cook vegetables in relays, and that a good variety and selection of freshly prepared raw vegetables which do not have dressings added be available on the buffet table. Providing a good variety of quality fruit is important to entice diners to consume fruit instead of high caloric, sweet desserts. Training of cooks must emphasize procuring a variety of fresh fruits and taking advantage of seasonal fresh fruits.

Many subjects, especially women, did not consume sufficient servings of breads and cereals which was a major contributor to the large number of subjects consuming less than recommended intakes of many of the nutrients. Cooks' training should include emphasis on the use of whole grains and ways to encourage diners to consume breads and cereals. Service personnel may be encouraged to consume more grain products and specifically more unrefined grain products if muffins and rolls preferably made from whole wheat flour were available. Sandwiches made from whole wheat bread should always be available when sandwiches are on the menu.

Diners complained that box lunches are high in calories. Kitchen staff should make readily available special box lunches which are low in calories.

Although the recommendations stated thus far have applied directly to the research problem, it was also found that the practice of assessing nutrient intake and reporting it in terms of percent fat, carbohydrate and protein is of questionable merit. Percent macronutrients are meaningful only if the intake of energy from ethanol, energy from alcoholic beverages and type of carbohydrate is defined.

### 6.3 RECOMMENDATIONS BASED ON RESEARCHER'S OBSERVATIONS

In addition to the recommendations arising from research objectives and hypotheses of the study, many other important concerns came to light while conducting the study. Food services place great emphasis on providing a good selection of desserts, yet few subjects were observed to eat desserts. Food service personnel seem to think that desserts are

far more important than the diners who are eating them. Food services also places great emphasis on providing a good selection of prepared salads. There were very few subjects who selected mixed salads, other than tossed green salads. Many diners complained verbally during group sessions about dressings being added to salads. This researcher also observed that cooked vegetables other than potatoes and corn were seldom eaten, but freshly prepared raw vegetables such as tossed green salad, broccoli, cauliflower, green pepper, celery sticks, tomato, cucumber, radishes and carrot sticks were popular. Less emphasis should be placed on providing a variety of salads which few diners eat and more emphasis should be placed on making available plain, freshly cut vegetables. It is very important that vegetables be freshly prepared. Diners verbally complained at one location about fresh vegetables being prepared a long time in advance, thus quality was poor. As a result, fewer diners chose raw vegetables at that location. Freshly cut vegetables were very popular at the location that took care in preparation. With the exception of corn and beets, canned vegetables are usually of inferior quality to frozen or fresh vegetables. To encourage consumption of vegetables, canned vegetables should not be procured or served.

The problem with fruit is a critical issue that must be given immediate attention. Cooks either do not realize that they can reject poor quality items delivered from a supplier or the system for rejecting items is envisioned as being some sort of administrative nightmare. It is essential that action be taken to educate cooks on rejecting items and that the system for rejecting items be reviewed. The ration for fruit urgently needs to be changed or modified. Both locations in this

study used considerably more rations of fruit during this study than they were entitled to, and in addition, spent nonpublic funds to procure fruit. It was noted that some military members consumed six and more servings of fruit per day. For some fruits, the weight of one serving of that fruit used one entire ration of fruit. It is recommended that fresh fruits be a separate category on the ration scale so that procuring them does not compete with procuring fruit juices, frozen fruit and canned fruit.

Problems with the selection of fruits and the salad table appear to result from overall poor supervision of food serving areas away from the steam table. In addition to complaints about fruits and the salad table, diners also verbally commented on such things as bread that was moldy and milk that was sour. Food services staff must take more interest in these areas and food services supervisors should actively supervise these areas to maintain adequate standards of service.

It was observed that at one location, all sandwiches were made from white bread. Although this same location made fresh buns daily, only white refined flour was used. It is imperative that food services procure and use whole grain flours and breads in addition to white flour and bread.

Many complaints were received about the poor quality and lack of variety in box lunches. It appeared that nutrient deficient items were being purchased at section canteens because diners did not like their box lunch.

CF dining rooms should not be the only focus of attention for change. Examination of food records of subjects showed that many high

calorie, nutrient deficient foods such as soft drinks, chocolate bars, potato chips and doughnuts were procured from section canteens. Consideration should be given to a CF wide policy pertaining to section canteens, canex snack bars, vending machines and all other food outlets on bases to ensure that prudent food choices such as fruit juices, cheese and cracker snacks, certain biscuits, 2 % milk and sandwiches made from whole grain bread are available in addition to less prudent food choices.

The Jr Ranks dining committee does not appear to fulfill the function it was designed for. Members do not know who their representatives are, representatives are not always those interested in attending the meetings and satisfactory action to correct complaints does not often appear to happen. Action should be taken to inform bases of the importance of these meetings and headquarters should examine minutes very carefully in order to apply necessary pressure. Headquarters should be very alert to continued "minor" complaints.

#### 6.4 SUMMARY OF RECOMMENDATIONS

At the present time, the CF is carrying out practices which are associated with increased risk of obesity, cardiovascular disease, certain cancers and certain nutrient deficient states for some of its members. By implementation of a comprehensive program of nutrition education for diners and for food services personnel, this can be changed. The emphasis of instruction for cooks must change. However, the responsibility to ensure that food services problems are rectified lies with all senior food services personnel. They must be alert to the problems and recommendations stated in this study and ensure that food services practices

are carried out throughout their commands, bases and stations which encourage people to eat following Canada's Food Guide and dietary recommendations for Canadians.

#### 6.5 IMPLICATIONS

Although this study was conducted on military personnel, nutrition educators must ask themselves about equivalent young single civilian personnel in Canada. Although this study may give the impression that food served in CF establishments is generally poor, it is in fact generally well prepared and tasty. It must be remembered that the subjects in this study eat almost all of their meals in these dining facilities and therefore become very critical. If young, single women who have their meals prepared for them have nutrient intakes as reported in this study, what are young, single civilian women who must prepare their own meals eating? No research in Canada is directed toward this problem.

From personal observations, this researcher hypothesizes that problems encountered with selecting prudent choices from CF establishments are not so different from problems encountered with selecting prudent choices from most eating establishments. In view of the fact that the potential exists particularly for single people to consume most meals from eating establishments who offer limited prudent options, poor nutrient intakes could be a relatively widespread problem. Perhaps it is time for nutrition educators to exert some pressure so that eating establishments provide prudent choices.

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Appendix A

EXPLANATORY LETTER SENT TO ALL DINERS

CANADIAN FORCES  
AIR COMMAND



FORCES CANADIENNES  
COMMANDEMENT AÉRIEN

Dear

A study on nutrition knowledge and opinions and a nutrition education program has been developed for use in our CF dining rooms. It will be conducted on a trial basis in the Junior Ranks dining rooms at CFB's Winnipeg and Portage. Your participation in the study is requested because as many people as possible are needed to achieve the best results.

Participants will fill out short questionnaires on nutrition knowledge, taking no more than 45 minutes. Another short questionnaire will be completed later in the project taking no more than 30 minutes. In addition, participants will keep a record of what they eat over two specified 3-day periods, and this will take only a few minutes each day.

The first questionnaire and first 3-day period are in early October, and the second questionnaire and second 3-day period are in late October/early November so please do not participate if you will be posted or away on leave or on TD between September 28 and November 13. Participants will be notified of specific dates later.

Whether or not you can participate, it would be appreciated if you would take a few minutes to fill out the enclosed form. Please return it through CR mail in the enclosed envelope as soon as possible. All information collected will be kept completely confidential.

If you find you cannot continue to participate once the project starts, or if you have any questions, please leave a message with MWO Desjarlais, WO Freund, or Mrs. Bill at local 481 in Winnipeg or with Lt Thain at local 3209 in Portage. Your call will be returned.

Your cooperation would be greatly appreciated.

N. Bennett  
Major  
Nutrition Education Officer

Enclosure

Appendix B

QUESTIONNAIRE ON DINERS' OPINIONS ABOUT NUTRITION  
EDUCATION AND FOOD SERVICES IN THE CANADIAN FORCES

I. Your answers to the following questions will help design nutrition information programs in the future.

1. Do you think that you have enough information about nutrition to select nutritionally sensible meals? 1  YES  
2  NO

If your answer is no, what would you like to know more about?

2. Do you think that the CF should teach you basic nutrition information? 1  YES  
2  NO

If your answer is yes, where and how should nutrition education be done?

3. Do you think that nutritionally sensible meals are available in CF dining rooms? 1  YES  
2  NO

If your answer is no, what changes would you like to see?

Please give other comments, suggestions or ideas on the back, if you wish.

II. Please answer the following questions so that I can classify your information for statistical analysis.

1. I am 1  male 2  female  
2. My age is 1  18-24 2  25-34 3  35-44 4  45-54

3. The highest level of education that I completed is:

- 1  some high school (please specify grade) \_\_\_\_\_  
2  completed high school  
3  some university or technical school  
4  completed university or technical school

4. Are you on a diet 1  YES 2  NO

- If yes, (a) who prescribed the diet? 1  doctor  
2  self  
3  other \_\_\_\_\_ please specify

(b) what type of diet? \_\_\_\_\_

5. Do you have any food allergies? 1  YES 2  NO

If yes, what are they? \_\_\_\_\_

III. Please indicate the statement that applies to you.

- 1  I am willing to participate in the study.  
2  I cannot participate because I will be posted or away on TD or leave during September 28 - November 13.  
3  I am unable to participate in the study because \_\_\_\_\_

PLEASE DO NOT WRITE YOUR NAME ON THIS QUESTIONNAIRE. IT IS CODED WITH AN IDENTIFICATION NUMBER SO THAT CONFIDENTIALITY CAN BE MAINTAINED.

Appendix C

QUESTIONNAIRE ON COOKS' OPINIONS ABOUT NUTRITION EDUCATION  
AND FOOD SERVICES IN THE CANADIAN FORCES



COOKS' OPINIONS

There are no right or wrong answers to these questions. I am trying to find out what you think about certain things. All information is coded with an identification number for confidentiality so please do not write your name on this questionnaire.

I

1. Do you think that you have enough information about nutrition to plan meals and to prepare food that is nutritionally sensible?

Yes  No 

If your answer is "no", what would you like to know more about?

2. Do you feel that it is the responsibility of the CF to educate you in nutrition?

Yes  No 

If your answer is "yes", where and how should nutrition education be done?

3. Do you think that CF dining rooms serve nutritionally sensible meals?

Yes  No 

If your answer is "no", what changes would you like to make to improve meals nutritionally?

4. Please give other comments, suggestions, or ideas.

II Please answer the following questions so that I can classify your information for statistical analysis:

1. I am 1  male 2  female  
2. My age is 1  18-24 2  25-34 3  35-44 4  45-54
3. The highest level of education that I have completed is:  
1  some high school (please specify grade) \_\_\_\_\_  
2  completed high school  
3  some university or technical school  
4  completed university or technical school
4. My rank is  
 PTE  CPL  MCPL  SGT  WO  MWO

Appendix D

WOOLCOTT'S NUTRITION KNOWLEDGE TEST

For each of the following questions, circle the letter beside the statement that best answers the question being asked. It is important that you answer each question. Even if you are unsure of the correct answer, choose one you think is the closest. Be sure to give only one answer for each question.

1. The energy value of a food tells you:
  - A. number of vitamins it contains
  - B. number of calories it contains
  - C. amount of protein it contains
  - D. amount of iron it contains
2. You get vitamin C from:
  - A. milk and cheese
  - B. fruits and vegetables
  - C. cod liver oil
  - D. sunshine
3. Three substances in foods which give energy to the body are:
  - A. carbohydrates, proteins, fats
  - B. fats, proteins, vitamins
  - C. carbohydrates, vitamins, minerals
  - D. proteins, water, fibre
4. A person who is active needs more:
  - A. protein
  - B. iron
  - C. calories
  - D. vitamins
5. A food which supplies bulk (fibre) in the diet is:
  - A. oatmeal
  - B. yogurt
  - C. steak
  - D. crackers
6. The best way to lose weight is to:
  - A. eat a high carbohydrate diet
  - B. eat a high protein diet
  - C. lift weights
  - D. eat less and exercise more
7. The disease caused by not enough iron in the diet is:
  - A. scurvy
  - B. rickets
  - C. anemia
  - D. diabetes
8. The best source of calcium among the following foods is:
  - A. pork chop
  - B. whole grain cereals
  - C. spinach
  - D. cheese
9. The method of cooking meat which uses most fat is:
  - A. frying
  - B. roasting
  - C. barbecuing
  - D. broiling
10. Which one of the following foods contains the most fat?
  - A. granola
  - B. rice
  - C. rolled oats
  - D. whole wheat bread

PLEASE DO NOT WRITE YOUR NAME ON THIS QUESTIONNAIRE. IT IS CODED WITH AN IDENTIFICATION NUMBER SO THAT CONFIDENTIALITY CAN BE MAINTAINED

- 1.1 Which one of the following is highest in polyunsaturated fats?
- A. butter
  - B. lard
  - C. olive oil
  - D. corn oil
- 1.2 Which one of the following is highest in saturated fats?
- A. peanuts
  - B. beef
  - C. salmon
  - D. chicken
- 1.3 Margarine and butter are different because:
- A. margarine contains less fat than butter
  - B. margarine contains more saturated fat
  - C. margarine contains vegetable oil
  - D. margarine contains fewer calories
- 1.4 If you wanted to lower the amount of cholesterol that you eat, you would cut down on:
- A. sirloin steak
  - B. tuna fish
  - C. baked chicken
  - D. baked beans
- 1.5 Of the following groups of foods, the one with the most cholesterol is:
- A. broccoli, chicken, rice
  - B. green salad, whole wheat bread, margarine
  - C. apple pie, lemon sherbet, coffee
  - D. shrimp, whole milk, liver
- 1.6 One of the following is **not** considered to be a risk factor for heart disease:
- A. a diet high in animal fat
  - B. high blood levels of cholesterol
  - C. a high intake of dietary fibre
  - D. a high intake of salt
- 1.7 One of the following meals would be recommended to someone concerned with preventing heart disease:
- A. half grapefruit, eggs, bacon, toast, coffee with cream
  - B. orange juice, toast with peanut butter, 2% milk
  - C. grapefruit juice, sausages, sweet roll, 2 % milk
  - D. orange, homemade roll, butter, fried ham, coffee
- 1.8 As you grow older, your body's need for certain nutrients changes in one of the following ways:
- A. more vitamin E is required
  - B. fewer calories are required
  - C. there is no change
  - D. more vitamins and minerals are required
- 1.9 Two foods which contain about the same number of calories are:
- A. a potato and a tomato
  - B. a glass of whole milk and a glass of skim milk
  - C. a teaspoon of butter and a teaspoon of margarine
  - D. a piece of chocolate cake and a bran muffin
- 2.0 A nutrient which is most likely to be destroyed by heating (boiling, baking, etc.) is:
- A. phosphorus
  - B. vitamin A
  - C. protein
  - D. vitamin C

PLEASE DO NOT WRITE YOUR NAME ON THIS QUESTIONNAIRE. IT IS CODED WITH AN IDENTIFICATION NUMBER SO THAT CONFIDENTIALITY CAN BE MAINTAINED.

Appendix E  
SPECIFIC NUTRITION KNOWLEDGE TEST

NUTRITION INFORMATION

The following questions are about nutrition. All information is coded with an identification number for confidentiality so please do not write your name on this questionnaire.

Please answer the questions to the best of your ability. Do not feel you should know the answers. Answer the questions quickly.

1. What are the four food groups and how many servings or foods from each group is it recommended that you eat daily?

<u>Food Group</u>	<u>Number of Servings or foods from each Group</u>
-------------------	--

2. What disease has been associated with low fiber diets?
3. True or False? Eating sweet foods made of honey, brown sugar, or molasses is much better for you than foods made with white sugar.
4. What diseases are associated with high fat diets?
5. What ways can you cut down your intake of fat?
6. What are the risks associated with eating sugar?
7. How can you cut down your intake of sugar?
8. Why is it important to eat fruits, vegetables, and whole grains?
9. What disease is linked to a high intake of sodium?
10. How can you cut down your intake of sodium?

Appendix F

TABLE TENT MESSAGES BASED ON DIETARY RECOMMENDATIONS FOR  
CANADIANS

INCREASE FRUITS, VEGETABLES, AND WHOLE GRAINS

Increase your intake of fruits, vegetables, and whole grains to provide fibre and more vitamins and minerals. Eating foods which are mainly low in fibre has been associated with intestinal cancer and other intestinal problems.

INCREASE FRUITS, VEGETABLES, AND WHOLE GRAINS

To increase your intake of fruits, vegetables, and whole grains...

1. Have whole grain cereals for breakfast, such as shredded wheat, bran flakes, raisin bran, oatmeal, pep, shreddies, etc.
2. Enjoy fruits and vegetables often.
3. Try substituting whole grain, cracked wheat, rye breads, and whole wheat muffins for those baked items usually made with white refined flour.



### REDUCE SUGAR

Foods containing sugar are a major factor in the formation of dental cavities, particularly if the foods are sticky or are eaten between meals. Excess sugar may contribute to overweight, heart disease, and diabetes in some individuals.

Don't be fooled by those who promote honey, brown sugar and molasses as being nutritionally superior to white sugar. They are also used by the body in the same way.

### REDUCE SUGAR

To reduce your intake of sugar...

1. Use fruits for dessert or snacks instead of doughnuts, cookies, pastries, cakes, candies, chocolates, and soft drinks.
2. Try fruit such as unsweetened crushed pineapple or bananas for topping cereals or pancakes instead of sugar.
3. Add your own fresh fruit to plain yoghurt instead of eating the fruit flavoured sweetened variety.

REDUCE FAT

The average Canadian eats 45% of total calories as fat. Such high intakes have been linked with the development of heart disease, overweight and certain types of cancer. Decrease your risk of developing these diseases by reducing your fat intake to 35% of your total calories.

REDUCE FAT

To reduce your intake of fat...

1. Cut down on the amount of fried foods that you eat and try baked, barbecued, or broiled items instead.
2. Substitute fish, poultry, and veal at some meals instead of beef, pork, and lamb.
3. Use smaller amounts of high fat foods such as butter, margarine, salad oils, gravies, and rich desserts. Remember, fat has twice as many calories as the same amount of protein or carbohydrate.
4. Include low fat dairy products in daily meals such as skim milk and yoghurt.
5. Trim visible fats from meats and remove skin from poultry.

### REDUCE SALT

Some salt is necessary for good health, but too much may contribute to high blood pressure. The chemical name of table salt is sodium chloride and it is sodium which is involved in raising the blood pressure. Sodium is a part of many ingredients that we eat - for example, monosodium glutamate (MSG), baking powder, baking soda, and brine, which preserves pickles and flavours bacon and luncheon meats.

### REDUCE SALT

To reduce your intake of salt...

1. Cut down on snack foods that are highly salted, such as pretzels, potato chips, salted crackers, salted nuts, and salted popcorn.
2. Reduce your intake of cured and processed meats including ham, sausage, bacon, hot dogs, bologna, and luncheon meats.
3. Cut down on other high salt foods such as pickles, soup mixes, and highly salted convenience foods.
4. Taste your food before adding salt.

Appendix G

POSTTEST OPINIONS QUESTIONNAIRES OF THE NUTRITION  
EDUCATION PROGRAM

## Participating Diners Opinions

You have taken part in a nutrition education program during the past four weeks. Your answers to the following questions will be most helpful in designing nutrition education programs in the future.

1. Do you think that the poster was a good way of providing you with nutrition information?  
 Yes \_\_\_\_\_ No \_\_\_\_\_  
 Don't know \_\_\_\_\_
2. Do you think that using "table tents" was a good way of providing you with nutrition information?  
 Yes \_\_\_\_\_ No \_\_\_\_\_  
 Don't know \_\_\_\_\_
3. Do you think that you learned anything from the poster and/or table tents?  
 Yes \_\_\_\_\_ No \_\_\_\_\_  
 If yes, which ones?  
 Poster \_\_\_\_\_ Sugar \_\_\_\_\_  
 Salt \_\_\_\_\_ Fruits, vegetables \_\_\_\_\_  
 Fat \_\_\_\_\_ and Whole grains \_\_\_\_\_
4. Did you find the information interesting?  
 Yes \_\_\_\_\_ No \_\_\_\_\_  
 Don't know \_\_\_\_\_  
 If yes, what information?  
 Poster \_\_\_\_\_ Sugar \_\_\_\_\_  
 Salt \_\_\_\_\_ Fruits, vegetables \_\_\_\_\_  
 Fat \_\_\_\_\_ and Whole grains \_\_\_\_\_
5. Did you notice any difference in the food served?  
 Yes \_\_\_\_\_ No \_\_\_\_\_  
 If yes, what did you notice and what was your opinion of this?
6. Did you like the way that the program was carried out?  
 Yes \_\_\_\_\_ No \_\_\_\_\_  
 Parts of it \_\_\_\_\_
7. What suggestions, changes or ideas would you like to see in another nutrition education program?

NON-PARTICIPATING DINERS' OPINIONS

1. Were you aware that there was a nutrition education program being conducted?  
Yes \_\_\_\_\_ No \_\_\_\_\_
2. Did you notice the poster?  
Yes \_\_\_\_\_ No \_\_\_\_\_
3. Did you learn anything from the poster?  
Yes \_\_\_\_\_ No \_\_\_\_\_
4. Did you read any of the table tents?  
Yes \_\_\_\_\_ No \_\_\_\_\_  
If yes, please check which ones you read.  
Salt \_\_\_\_\_ Fat \_\_\_\_\_ Sugar \_\_\_\_\_ Fruits, Vegetables \_\_\_\_\_  
and Whole Grains \_\_\_\_\_
5. Do you feel that you learned anything from the table tents?  
Yes \_\_\_\_\_ No \_\_\_\_\_  
If yes, which ones?  
Salt \_\_\_\_\_ Fat \_\_\_\_\_ Sugar \_\_\_\_\_ Fruits, Vegetables \_\_\_\_\_  
and Whole Grains \_\_\_\_\_
6. Did you find the information interesting?  
Yes \_\_\_\_\_ No \_\_\_\_\_ Don't know \_\_\_\_\_  
If yes, what information?  
Poster \_\_\_\_\_ Sugar \_\_\_\_\_  
Salt \_\_\_\_\_ Fruits, Vegetables \_\_\_\_\_  
and Whole Grains \_\_\_\_\_  
Fat \_\_\_\_\_
7. Did you notice any difference in the food served?  
Yes \_\_\_\_\_ No \_\_\_\_\_  
If yes, what did you notice and what was your opinion of this?
8. Did you like the way that the program was carried out?  
Yes \_\_\_\_\_ No \_\_\_\_\_  
Parts of it \_\_\_\_\_
9. What suggestions, changes, or ideas would you like to see implemented in another nutrition education program?

PLEASE DO NOT WRITE YOUR NAME ON THIS QUESTIONNAIRE. IT IS CODED WITH AN IDENTIFICATION NUMBER SO THAT CONFIDENTIALITY CAN BE MAINTAINED.

## Cooks Opinions

You have taken part in a nutrition education program during the past four weeks. Your answers to the following questions will be most helpful in designing nutrition education programs in the future.

1. Do you think that the poster was a good way of providing you with nutrition information?  
 Yes \_\_\_\_\_ No \_\_\_\_\_  
 Don't know \_\_\_\_\_
2. Do you think that using "table tents" was a good way of providing you with nutrition information?  
 Yes \_\_\_\_\_ No \_\_\_\_\_  
 Don't know \_\_\_\_\_
3. Do you think that you learned anything from the poster and/or table tents?  
 Yes \_\_\_\_\_ No \_\_\_\_\_  
 If yes, which one?  
 Poster \_\_\_\_\_ Sugar \_\_\_\_\_  
 Salt \_\_\_\_\_ Whole grains, fruits \_\_\_\_\_  
 Fat \_\_\_\_\_ and Vegetables \_\_\_\_\_
4. Did you find the information interesting?  
 Yes \_\_\_\_\_ No \_\_\_\_\_  
 Don't know \_\_\_\_\_  
 If yes, what information?  
 Poster \_\_\_\_\_ Sugar \_\_\_\_\_  
 Salt \_\_\_\_\_ Whole grains, fruits \_\_\_\_\_  
 Fat \_\_\_\_\_ and Vegetables \_\_\_\_\_
5. Did you like the way the program was carried out?  
 Yes \_\_\_\_\_ No \_\_\_\_\_  
 Parts of it \_\_\_\_\_
6. Did you encounter any problems or difficulties with the food preparation, food procurement or menu planning?  
 Yes \_\_\_\_\_ No \_\_\_\_\_  
 If yes, what were the problems?
7. Did you encounter any problems or difficulties with the diners?  
 Yes \_\_\_\_\_ No \_\_\_\_\_  
 If yes, what were the problems?

- 2 -

8. Would you be willing to take part in another nutrition education program?  
Yes \_\_\_\_\_ No \_\_\_\_\_
9. Would you like to see the same types of meals and food served all of the time as were available during the program?  
Yes \_\_\_\_\_ No \_\_\_\_\_  
If no, why not?
10. What suggestions, changes, or ideas would you like to see implemented in another nutrition education program?