

THE UNIVERSITY OF MANITOBA

AN ASSESSMENT OF THE FOOD INTAKES OF CHILDREN WHO  
PARTICIPATED IN A SCHOOL MILK PROGRAM IN THE  
FRONTIER SCHOOL DIVISION OF MANITOBA

by

MARGARET IRENE O'NEILL

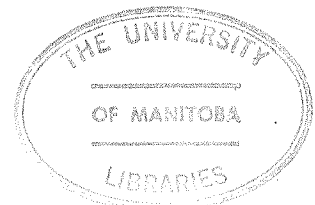
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A dissertation submitted to the Faculty of Graduate Studies of  
the University of Manitoba in partial fulfillment of the requirements  
of the degree of

MASTER OF SCIENCE

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## ABSTRACT

In the spring of 1974 the Government of Manitoba gave approval for a School Milk Program, for students attending Kindergarten through Grade Four in the Frontier School Division of the Province, with the objective of providing a milk supplement to school children and nutrition education for the program participants and their families. Three-day food records of 145 children were assessed qualitatively by food-groups in relation to Canada's Food Guide recommendations. The investigation included two surveys, the first being conducted in the summer of 1974 before the initiation of the program, and the second being conducted in the winter of 1975 after the children had been receiving the milk supplement for approximately six months and nutrition education for approximately eight months. The data obtained were divided into three studies: Study One included data from 103 children who participated in the summer survey, Study Two included data from eighty-one participants in the winter survey, and Study Three included data from thirty-nine children who participated in both the summer and winter surveys. On the basis of the food records it was shown that the mean milk intake of the children was 1.98 cups in Study One, 2.42 cups in Study Two, and 2.28 cups and 2.59 in the summer and winter surveys, respectively, of Study Three. The mean intakes of fruit was 1.27 servings in Study One, 1.17 servings in Study Two, and 1.32 and 1.31 servings in the summer and winter surveys, respectively, of Study Three. In Study One the mean potato intake was 0.96 servings, in Study Two it was 0.79 servings, and in the summer and winter surveys of Study Three it was 1.19 and 0.89 servings, respectively. The mean vegetable intake of the children was 0.45 servings in Study One, 0.48 servings in Study Two, and 0.47 and 0.56 servings in the summer and winter surveys, respectively, of Study Three. The mean intake of bread-cereal was 3.58 servings in Study One, 4.58 servings in Study Two, and 3.30 and 4.11 servings in the summer and winter surveys, respectively, of Study Three. The mean meat intake was 1.85 servings in Study One, 1.60 servings in Study Two, and 1.47 and 1.71 in Study Three's summer and winter surveys respectively. It was found that there was a significant change in the milk intake and bread-cereal intake from the summer survey to the winter survey of Study Three. In general, however, the children's intakes of the vegetable, fruit, milk, and potato food-groups were below the recommendations of Canada's Food Guide, while intakes of the meat and bread-cereal food-groups were in closer agreement with Food Guide recommendations. A household profile and supplementary information questionnaire were also completed for participating households.

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## INTRODUCTION

The nutritional welfare of the school child is of interest and concern to parents, educators, and governments, alike.

E. N. Todhunter (44), a noted nutrition educator, has written the following commentary:

"The child comes to school at age five and, hopefully remains in school until eighteen years of age. In these school years he has to accomplish a major physiological job ... the job of growth and development .... This physiological growth and development is accomplished through the nutritive processes associated with an adequate intake of quantity and quality of food .... The major reason the child goes to school is to learn, to gain the education which will help him to be a fully functioning adult. The school is expected to guide him in the development of his intellectual capacity to his full potential ... in addition to so called 'book-learning', the child surely has a right to learn how to care for his own health. This includes learning desirable food choices and the basis of food habits that will serve him nutritionally throughout life."

How can the school play this important role of promoting and maintaining the nutritional welfare of the child?

School feeding programs are increasingly viewed as important contributors to the health and well-being of the school child. The provision of supplementary food and/or meals can contribute to the nutritional status of the child and nutrition education can provide the child with knowledge of proper food selection and information on how food affects health. Hence, together, nutritional supplementation and educational stimulation can help children develop wholesome attitudes toward food, desirable eating habits, and understanding that will enable them to carry their good eating habits into adulthood (20).



However, it must be noted that the existence alone of feeding programs in schools does not necessarily assure improvement of the nutritional status and food habits of children (12, 21, 37). Factors such as level of participation in programs, knowledge of the nutritional deficits of the children being served, control over the nutritional composition of the childrens' diet, and parental interest and cooperation, have been found to affect the success or failure of school programs (12, 20, 37).

In the spring of 1974 the Government of Manitoba initiated a School Milk Program for students attending Kindergarten through Grade Four in the Frontier School Division of the Province. The program provided a daily diet supplement of eight ounces of milk or dairy products of equivalent nutritional value to approximately 3,000 school children and a nutrition education program to the inhabitants of the communities served by the Program.

Good results have been obtained from some nutrition programs, yet often we do not know which factors contributed to these results. Conversely, we do not know why other seemingly well-planned programs have been unsuccessful. Thus, nutrition programs must be so planned that they will include adequate controls, methods for evaluating each step and procedure, and methods for evaluating both the immediate and long term effects of a program (43).

The ideal evaluation would be to set up a study in which the deviation from a standard of normal nutriture would be determined on two comparable samples of a population. As the only variable, one sample would be exposed to a nutrition program. Re-examination of both groups for nutritional status at the end of the program should reveal

whether a change had occurred. This ideal technique of objective evaluation is not feasible in most nutrition programs, however, even though such a study may never be done in a particular program, the same underlying principles may be applied to some extent in the evaluation of certain aspects or of specific components of nutrition programs (4). The following investigation is involved with one aspect of program evaluation, namely, assessment of food intake.

In this investigation an attempt is made to assess the food intakes of children who participated in the Northern Manitoba School Milk Program. The investigation included two surveys, one being conducted in the summer of 1974 before the initiation of the Program, and the second being conducted in the winter of 1975 after the children had been receiving the milk supplement for approximately six months and nutrition education for approximately eight months. In each survey three-day food intake records, household profiles, and supplementary information data were collected and assessed with the following objectives in mind:

- 1) to study the adequacy of the food-group intakes of the children attending Kindergarten through Grade Four in the Frontier School Division of Manitoba in relation to the recommendations of Canada's Food Guide; and
- 2) to examine the changes that occurred in the food-group intakes of these children.

## REVIEW OF LITERATURE

The ultimate objective of the majority of supplementary feeding programs is the establishment and maintenance of the best possible nutritional state among members of the population served. In new programs, and programs already in progress, some criteria of effectiveness and procedures for evaluation are necessary to measure the success of a program in achieving its purpose.

There are two main classifications used to evaluate the effectiveness of supplementary feeding programs. The first is measurement of nutritional status of the participants, which usually consists of data on dietary, anthropometric, clinical, and biochemical measures. The second classification is measurement of behavior and attitude which includes assessment of sociability, mental development, and school achievement.

In the past fifty years, a number of studies have been made of the effects of supplementing the diets of children, but most of these were made before the incorporation of the field of statistics and advances in measurement of nutritional status. However, in recent years more refined methods and procedures have been developed which can be used to measure the effects of supplementary feeding programs. A selection of studies which employed varied criteria for measurement will be presented here in chronological sequence.

In a series of three studies (8, 32, 33) conducted in California in the 1920's, weight gain was used to compare the influence of various types of supplementary lunches. School children were given either oranges, milk, figs, or no supplementary lunch. In all studies

oranges seemed to be most effective in producing a gain in weight, while milk and figs produced a favorable but less marked gain. It was not possible to draw definite conclusions from these results as the number of cases was small and the period of feeding was short. However, it was thought by the researchers that oranges supplemented the home diet of these children "by their antiscorbic vitamin content" and, at the same time, did not detract from the appetite of the children.

Gain in weight was also the criterion for measurement used in a study by Lininger (26) in Philadelphia from 1930 to 1932 to assess the relationship between the use of milk and the physical progress of undernourished school children. The children were divided into two groups - milk users and non-users. It was found that those who did not consume milk had lower weight gains than the children who used milk. The milk users were further divided into four groups and these children were found to have weight gains in the following order: those who purchased milk at school and received it at home; those who received milk at home; those who received free school milk and milk at home; and those who received free school milk. It was concluded that the use of milk in the home was more closely related to gain in weight than was the use of milk in school.

Growth and food intake were used to study the effect of nonfat dry milk solids on children in an investigation carried out by Moore and co-workers (31) in Louisiana from 1946 to 1947. One hundred and forty-four children were followed for one and one-half school years. During this time, half the children were given nonfat dry milk solids, equivalent to nine ounces of fluid milk, in the school lunch, and half the children, who served as controls, continued to

receive the school lunch but without the additional milk solids. Food intake, recorded by the children for one week at the end of the study, was tabulated and evaluated qualitatively by food groups by a dietitian. Examination of the seven-day dietary records showed that foods eaten at home were essentially the same for both groups of children. The children who received the milk solids showed slightly greater physical growth in weight, height, pelvic width, and calf circumference than those who had not, but the differences were not significant.

A Canadian study (42) was conducted from 1947 to 1949 to observe the effects of a well-balanced school meal on the growth, physical and dental condition, mental development, school achievement and absenteeism on school children from low-income families. For over two years a well planned and prepared school lunch was served to a large group of children, aged five to ten years. A well-matched group of children ate at home and served as controls. The children were examined before and after the study. The experimental group showed slight improvement in growth and blood biochemical parameters, no improvement in dental condition, and although absences were less, no improvement was shown in school progress as compared with the controls. It was found, however, that the buying habits of the families whose children received the school lunch improved during the course of the study, whereas those of the control families became worse. In general then, the effect of the school lunch was very small, but it was noted that the physical condition of both groups of children was good throughout the entire study.

Eppright and co-workers (13) conducted an investigation in 1955 using dietary records, physical and biochemical measurements, and dental examinations to ascertain the effect on girls of a supplement of foods designed to bring their intake of milk and fruit and vegetables, all high in ascorbic acid and vitamin A value, up to the standards of the Recommended Dietary Allowances. One hundred and eighty-five girls, aged eight to fourteen years, were studied for one and one-half school years. The girls were divided into two well-matched groups, an experimental group which received the nutritive-rich supplement of fruit and vegetables rich in ascorbic acid and carotenoids plus one-half pint of frozen milk concentrate, and a control group given a supplement of fruit and vegetables low in ascorbic acid and carotenoids plus a capsule of cornstarch. During the course of the study dietary information was collected by a dietitian by means of four two-day records kept by the girls assisted by their mothers. It was found that the nutritive-rich supplement brought the diets of almost all the experimental girls within the limits of 66 to 100% of the Recommended Daily Dietary Allowances for calcium, vitamins A and D, and ascorbic acid. It also resulted in approximately 200 more calories in their daily diet. Biochemical measurements of ascorbic acid and carotenoids in serum were found to be increased significantly during the supplementation. However, there were no significant effects on physical measurements of height, weight, and skinfolds that could be attributed to the supplements. Evidence was also presented indicating that the nutritive-rich supplement tended to retard development of dental caries in a group such as the experimental group included in this study.

A study by Edwards and co-workers (15), reported in 1956, investigated the influence of a fortified soybean grits product on the height, weight and scholastic achievement of school children in Alabama. One hundred and twenty children, in grades one through eight, were studied for six months. The children were divided into groups which ate the regular school lunch, the school lunch plus the supplement, soup plus the supplement, or lunches brought from home. The researchers found significant responses in height and weight when the supplement was added to the school lunch of the children. The children receiving the dietary supplement appeared to be more cooperative, more energetic, more responsive in class, and school attendance improved, although differences between the supplemented and unsupplemented groups were not significant.

The effects of a balanced lunch program on school children in India were measured by weight gain, nutritional status, sociability, and school performance. In the study (38), boys and girls, aged five to seven years, were given a free mid-day meal designed to supply one-third to all the total daily requirements for nutrients as established by the Indian Council of Medical Research. A control group, selected from the same school, ate lunches brought from home. The study was carried out for five months. Some evaluation of food intake at home was carried out through surveys of a non-random sample of the childrens' families. There was an indication that the control group had an intake of major nutrients somewhat greater than that of the experimental group, however, it was noted that many of the control children were from homes of better socio-economic status than the experimental children.

The experimental group had a weight increase of almost four pounds, which was significantly greater than that of the control group, although estimation indicated a similar daily caloric intake. There was an apparent increase in sociability and school performance of the experimental group, but the increases were not significant.

A statewide nutrition survey (6, 7) was conducted among 80,000 Massachusetts public school children in 1969. By means of comprehensive survey forms, data was obtained on 24-hour dietary intake, school lunch, breakfast, the Basic Four, and miscellaneous data to help answer questions raised about the value of school feeding programs. General instructions on the survey forms were discussed at meetings with school personnel prior to the survey and were also included with the survey forms. Children in grades one through three completed an abbreviated, simplified picture form questionnaire with the help of teacher aides, and children in grades four through twelve completed a detailed questionnaire on all aspects of the survey. It was found that those children who participated in school lunches fared best, as approximately three-quarters of them ate an adequate lunch on the day of the survey, while three-quarters of those children who ate at home had an inadequate lunch. It was also learned that only 5% of the children ate a good breakfast that morning. Criteria for lunch and breakfast adequacy were established on the basis of selection of foods from the Basic Four. Data from the 80,000 children who participated in the survey indicated that Basic Four recommended servings of meat were consumed by 63% of the children, milk recommendations by 72%, and vegetable and/or fruit recommendations by 45% of the children on the day of the survey.



Other studies have been made to learn about food habits and to determine the need for supplementary feeding programs. These studies employed the same methods of assessment of nutritional status as the previous investigations cited.

A series of two Canadian studies (45, 48) was carried out in 1952 and 1956 to determine the eating habits of Toronto school children with the purpose of arousing the interest of parents, teachers, and others in the welfare of children by use of the results of the studies. One-day food records of 4,734 grade six students in the first investigation, and 4,425 grade eight students in the second study, were assessed in terms of essential food-groups based on the recommendations of Canada's Food Guide. The children were instructed on recording their food intake by their teachers, who had been previously instructed by nutritionists. When the 1952 study records were assessed it was found that intakes of citrus fruits, vegetables, and whole grain cereals were particularly low when Canada's Food Guide recommendations were used as a criterion. The 1956 study concluded that only meat appeared to be used to a satisfactory extent by the group as a whole and it was also noted that lack of vitamin D was particularly marked.

Myers and co-workers (35, 36) in a study reported in 1968, used dietary, physical, biochemical, and dental parameters to determine whether there were any indications of nutritional problems of sufficient magnitude to justify nutrition education and feeding programs. The investigation included 332, nine through thirteen-year old students from two elementary schools in a depressed district of Boston. Four-day dietary records, kept by the children assisted by their parents, teachers, and nutritionists, were assessed for meal pattern and food-groups on the basis of "satisfactory" and "unsatisfactory"

scores developed by the researchers. Meal pattern scores were unsatisfactory in 33% of the subjects for lunch, 17% for breakfast, and 14% for the evening meal. The group as a whole had unsatisfactory ratings in all the food-groups scored. Those groups especially low were milk, citrus fruit, and green and yellow vegetables. Generally, the children presented a "good-to-excellent" clinical picture, however, 50% of the boys and 43% of the girls were in the twenty-five and under percentiles for height and weight using Stuart-Boston standards. On the basis of biochemical determinations of hemoglobin, hematocrit, cholesterol, thiamin, riboflavin, urea, total nitrogen, and creatinine, these children exhibited values which could be related to poor nutrition. The overall dental picture was also poor as each child had an average of six decayed, missing, or filled teeth. An obvious need was thus shown for a school feeding program in conjunction with parent-teacher orientation to nutrition.

In summary, it can be seen that various methods and procedures can be used to measure the effects of supplementary feeding programs. Early studies used weight gain, anthropometric measurements, and school achievement in their assessment of feeding programs. Work done in the 1950's and 1960's included dietary evaluation and biochemical analysis to widen the scope of nutritional evaluation, and observation of behavior and academic achievement in assessing behavioral and mental development. Nevertheless, it should be noted that selection of criteria for evaluation of feeding programs is influenced by many factors including the purpose of the study, the size of the sample, the characteristics of the population to be tested, and the availability

of funds, personnel, time, and equipment. One or a combination of these factors can determine the criterion of measurement which will be used to assess the effect of a supplementary feeding program.

## THE NORTHERN SCHOOL MILK PROGRAM

In the spring of 1974 the Government of Manitoba gave approval for a School Milk Program for students attending Kindergarten through Grade Four in the Frontier School Division of the Province. The program was initiated to provide a diet supplement to school children and nutrition education for the program participants and their families in communities "where poor nutritional habits are noted because of low socio-economic status and inaccessibility to a reasonably priced food supply"\*.

The School Milk Program was developed by the Planning and Research Branch of the Provincial Department of Education and consisted of two parts:

- 1) the provision of a daily milk supplement or dairy product of equivalent nutritional value to approximately 3,000 school children; and
- 2) the provision of nutrition education to the inhabitants of approximately forty-four communities in which the schools were located.

Distribution of the milk to the schools began with the opening of the school term in the fall of 1974 and continued on a daily basis, with the exception of weekends and holidays, until the close of the school term in June 1975. The children were given eight ounces of fluid milk daily or dairy products such as cheese, yoghurt, or ice cream, in an amount equivalent to the nutritional value of the milk

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\* School Milk Program. 1974. Submission To The Health, Education And Social Policy Committee of Cabinet. Province of Manitoba.

supplement. The supplement was given to the children by their teachers before morning classes, during the morning recess, or during the lunch break - the time being decided at the discretion of individual school principals. The milk and dairy products were supplied on a contract basis by a Winnipeg dairy and were delivered weekly or monthly by truck, rail, or air transport, depending on the location of the schools.

The nutrition education segment of the School Milk Program was implemented in the summer of 1974. In order to carry out this part of the program it was arranged that eleven non-professionals would be employed as Nutrition Advisors. The Nutrition Advisors were engaged under New Careers, an on-the-job training and education program for disadvantaged adults sponsored by the Manitoba Government. Nine women and two men, all of Native origin and ranging in age from twenty to fifty-five years, were recruited on the basis of their interest in the program, their potential to relate to community members, and their knowledge of the people, problems, resources, life style, and language of the communities to be served by the School Milk Program.

The Nutrition Advisors had a minimum of four years to a maximum of thirteen years of formal education and none had previous training in foods and nutrition. Consequently, it was necessary to provide the Nutrition Advisors with a training program to enable them to help families improve the nutritive quality and adequacy of their diets and make the best use of their resources.

Under the direction of a home economist, and other support professionals, the Nutrition Advisors received training in basic foods and nutrition, teaching techniques, and other areas of information

helpful when working in the community. The training program was carried out during the ten-day sessions held every two months, beginning in July 1974 and continuing for the duration of the program. The courses given covered the following topics:

- 1) orientation, data gathering, and basic nutrition;
- 2) helping relationships;
- 3) basic food preparation and food buymanship;
- 4) gardening in the north; and
- 5) teaching techniques and Native foods.

The Nutrition Advisors were responsible for nutrition education in their home community and one to three other communities close to their home community. Nutrition education was carried out by means of puppet shows, school classes, and day camps with children, and home visits, cooking classes, and school committee meetings with adults. Some or all of these forms of nutrition education were used by the Nutrition Advisors depending on the needs and interests of specific communities. The Nutrition Advisors were also responsible for collecting data for the present investigation and received instruction on this subject from the author.

The School Milk Program was to be carried out for a two-year period, beginning in July 1974 and ending with the close of the school term in June 1976. The information presented in this report is based on the data collected during the first eight months of the program.

## METHODOLOGY

The purpose of this investigation was to assess the food intakes of children attending kindergarten through Grade Four in the Frontier School Division of Manitoba who participated in the Northern School Milk Program. It was postulated that these children would have dietary intakes that were inadequate in relation to the recommendations of Canada's Food Guide. Therefore, this investigation was conducted to learn if the food intakes of those children who participated in the School Milk Program would change following the diet supplementation and nutrition education provided by the program.

The investigation included two surveys, the first was conducted in the summer of 1974 during the months of July and August, and the second survey was carried out in the winter of 1975 during February and March. Twenty-two communities in the Frontier School Division were selected to be surveyed (Figure 1). The communities selected included the eleven home communities of the Nutrition Advisors and another eleven communities chosen in order that communities from a range of population sizes could be surveyed.

In each community households were chosen on the basis that they had one or more children attending Kindergarten to Grade Four, inclusive, in the Frontier School Division. The households were chosen from lists made available by the Assistant Field Superintendents of the Frontier School Division. As the time allotted for conducting the first survey was one week per community, it was decided that six households in each community would be selected to be surveyed. In the second survey two weeks were allowed for data collecting in each

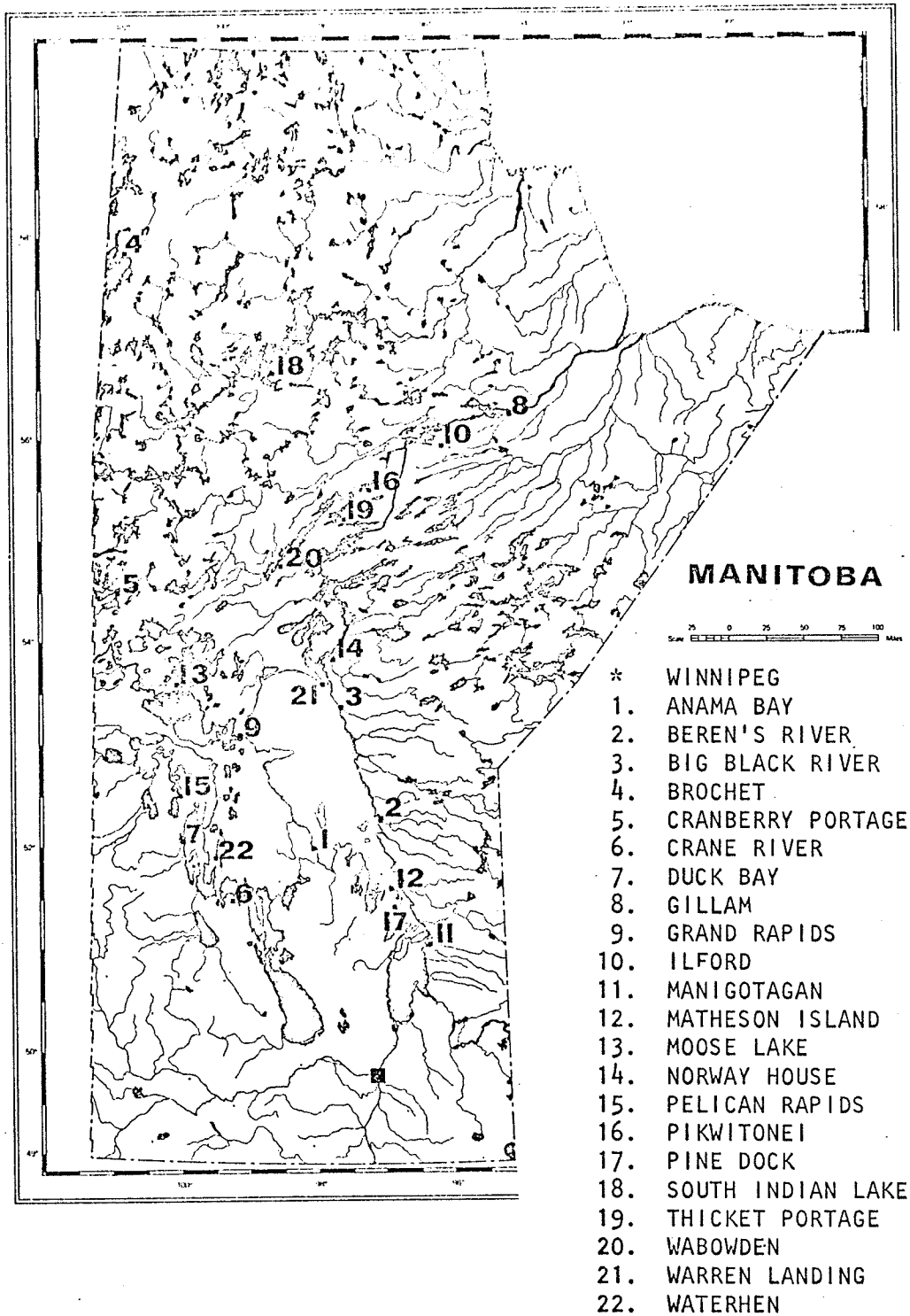


FIGURE 1

MAP OF COMMUNITIES TO BE SURVEYED



community and thus the original six households plus an additional six households were to be surveyed.

In order to assess the food intakes of the children a research instrument (refer to Appendix A) was devised by the author. This research instrument consisted of three parts: a three-day food intake record form; a household profile; and a supplementary information questionnaire. The Nutrition Advisors administered the research instrument in designated communities following instructions given to them by the author during two-day training sessions prior to both the summer and winter survey.

The three-day food intake record form consisted of an instruction sheet with directions for completing the forms and sheets for recording three-days' food intake. The Nutrition Advisors were instructed to deliver the food intake record form to the selected households and at this initial visit the instruction sheet was to be explained to the person in the household who would be responsible for recording the child's food intake. The households were to be visited on two subsequent days by the Nutrition Advisors to answer questions and to assist in completing the food intake record if required. At the fourth and final visit the food intake record was to be collected. The three-day food intake record was to be completed on days Monday to Friday, inclusive.

The household profile asked for information on family composition, which included the names, relationship, age, and employment status of the members of a participating household. The supplementary information questionnaire inquired about the means of cooking, storage,

purchase and preparation of food, infant feeding, use of indigenous foods, and the consumption frequency of milk and dairy products. The Nutrition Advisors were instructed to complete the household profile and supplementary information questionnaire at the initial visit to the households. All records and information collected by the Nutrition Advisors were forwarded to the Planning and Research Branch of the Manitoba Department of Education in Winnipeg.

It had been intended to analyze the three-day food intake records quantitatively by nutrient analysis. However, the data obtained from many records was not explicit enough as to specific amounts of food consumed to allow nutrient calculation. For example, if bread or bannock was taken it was usually recorded as one piece rather than the number of slices or specific amount consumed. Nevertheless, sufficient information was available to analyze the food intake records qualitatively by food-groups. This method of evaluating the nutritional quality of diets has been employed by many investigators (21, 22, 24). It has proven to be a practical technique and can provide a simple and quick way to assess the overall nutritional value of diets.

The food-groups selected for assessment in this investigation were seven and included: milk; fruit; potato; vegetable; bread-cereal; meat; and sweets. Potato and vegetable intakes were assessed separately to learn about their individual consumption. The first six groups were calculated on the basis of Canada's Food Guide food-group portion amounts and food-group substitute portion amounts (refer to Appendix B). The seventh food-group, sweets, included foods such as soft drinks, candy, potato chips, cake, and pie, and their incidence was recorded.

The three-day food intake records of the subjects were broken down into seven food-groups and the average quantity of each food-group consumed was calculated. The subjects' food-group intakes were recorded and assessed. Guttman analysis (41) and chi-square tests (11) were applied to these data. Data from the household profiles and supplementary information questionnaires were also recorded.