THE VALIDITY AND RELIABILITY OF THE THREE-DAY ESTIMATED FOOD RECORD OF FOOD INTAKE OF PRESCHOOLERS PROVIDED BY PARENTS AND CAREGIVERS

BY

JAN ELIZABETH TRUMBLE-WADDELL

A Thesis
Submitted to the Faculty of Graduate Studies in Partial
Fulfillment of the Requirements
for the Degree of

MASTER OF SCIENCE

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University of Manitoba
Winnipeg, Manitoba

ISBN 0-315-98995-5

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THE VALIDITY AND RELIABILITY OF THE THREE-DAY ESTIMATED FOOD RECORD OF FOOD INTAKE OF PRESCHOOLERS PROVIDED BY PARENTS AND CAREGIVERS

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ABSTRACT

Mothers traditionally have reported the food intake of preschool children. However, as more mothers are employed, caregivers also must report food intake. This study examined the variability in dietary data when two persons report the child's food intake, the effect this has on the reliability and validity of the three-day estimated food record, and the number of subjects and measurement days required in future studies. Subjects were 146 preschoolers (24-47 months) in dual-earner families. Parents and caregivers completed an estimated food record for each child and six weeks later were randomly assigned into two groups. One group (E-E) completed another estimated record (reliability test) while the second group (E-W) completed a weighed record (validity test). For the E-E group, there were no significant differences ($p > .05$) in group mean intakes of some nutrients between the two periods. Where significant differences were found ($p < .05$), the differences were not practically important. Similar results were found for the E-W group. Intra-subject variation in energy and nutrient intakes exceeded inter-subject variation (60-90% vs 10-40% of the total variation). The sample size required to detect a 10% change in mean intakes ($\alpha = .05$; power$=.80$) varied with the nutrient (Energy$=134$; Vitamin C$=900$). Using five versus three recording days would result in a 5-20% decrease in the difference between means detected for energy and nutrients ($\alpha = .05$; power$=.80$). The three-day estimated record was reliable and valid at the group level, however this was not true at the individual level since the confidence intervals for differences between individual mean intakes were wide. These results have implications for the design of studies of preschool children with employed parents.

ACKNOWLEDGEMENTS

The author would like to thank her committee for their guidance and encouragement: Marian Campbell, Brain Macpherson, and Gustaaf Sevenhuysen.

Gratitude is extended to all of the mothers and caregivers who participated in this study.

Gratitude is also extended to NHRDP Health and Welfare Canada for funding the research.

Thank you to Llwellyn Armstrong for her statistical "wizardry".

A special thanks to my husband, Garth, for his constant understanding and patience.

And above all, thank you to my parents for their emotional and financial support throughout the years and for the closeness of our family which helps to strengthen all the other aspects of my life.

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1.0 INTRODUCTION

Very little information is available on the eating habits and food intakes of preschool children in Canada. Thus obtaining data on the dietary intakes, food preferences and food habits of preschool children has been targeted as a high priority issue by the National Institute of Nutrition and the Federal/Provincial/Territorial Group on Nutrition (1988).

Traditionally, information on what preschool children eat has been provided by the primary caregiver, usually the mother. However, today we are faced with a new problem. Whether it be the economic times, a changing society or other factors, more mothers are entering the work force from both single-parent and two-parent families. For many parents employed away from home, their preschool children are cared for by day care centers or other non-parent caregivers while they are at work. Today both parents and non-parent caregiver(s) are involved in the feeding of preschool children. Therefore both need to be included in reporting children's food intakes if accurate information on what preschool children are eating is to be gathered.

It is not known how the involvement of the substitute caregiver and the parent will affect the variability in the dietary data, and the validity and reliability of the methods that adopt this approach. Research must address these methodological issues before studies are designed that use these methods. This information will allow researchers to calculate the number of subjects and measurement days necessary to achieve a certain

precision in future studies.

The reliability and validity of the dietary assessment method must be determined for the method to be of practical use (Block, 1982). Some researchers have looked at the reliability and validity of the 24-hour recall and food frequency questionnaire for populations of preschool children. Treiber et al. (1990) examined the reliability of the 24-hour recall using a test-retest procedure. Klesges et al. (1987) investigated the validity of the 24-hour recall using parental reports and a reference method of weighing the food. Ercel et al. (1952) examined the validity of the estimated record using the weighed record for school-aged children for one day mean intakes of energy and selected nutrients. There has been no documented research on the reliability and validity of the estimated food record for estimating the energy and nutrient intake of for preschool children. The three-day estimated record seems to be a suitable method for working parents and caregivers as it doesn't depend on recall.

Clearly, there is a need to determine the reliability and validity of the estimated food record when kept by substitute caregivers who are involved in the preparation and service of food to preschoolers. What is the magnitude of the variation in energy and nutrient intakes obtained by the estimated record that have two persons, the parent and the caregiver, reporting the food intake? What is the implication of this variation for determining the sample size and number of measurement days necessary in studies of preschool children? How reliable and valid is the three day estimated food record in assessing food intake when two persons are providing data for the child?

The research will address these issues by examining the reliability and validity of

the three-day estimated food record, the intra- and intersubject variation of nutrient intakes, and the sample size and number of measurement days required in future studies. The results of this study will contribute to the knowledge of food intake of preschool children. This information can then be used to develop nutrition education programs and investigate diet-disease relationships.

2.0 REVIEW OF LITERATURE

2.1 The Difficulties in Obtaining Dietary Intakes of Preschool Children

Minimal information is available in Canada on preschoolers' food intake and eating habits. This fact has been recognized by the government as a high priority health promotion issue (Federal/Provincial/Territorial Group on Nutrition, National Institute of Nutrition, 1989) and is encouraged by the recent report: The Canadian National Child Care Study (Statistics Canada, Health and Welfare Canada, 1992).

More information is required on the nutrient intake of preschool children and the variability in nutrient intakes (Misskey, 1987; Treiber et al., 1990; Gibson, 1985). Information on the nutrient intakes of preschool children would contribute to current efforts to adapt Canada's Food Guide for preschool children, the future development of Recommended Nutrients for Canadians, and the development of nutrition education programs.

Another issue suggested by researchers is to determine appropriate dietary assessment methods for this population (Gibson, 1987; Misskey, 1987; Persson et al., 1984). The use of the most reliable and valid methods of dietary assessment for preschool children would strengthen epidemiological studies of diet disease relationships for preschool children.

The most appropriate method for assessing group or individual intakes depends on the purpose of the research, the accuracy of the method, the target population and the

availability of resources (Cameron et al., 1988, p.53). The group level of assessment refers to the average collective intake for a set of people, while the individual level of assessment refers to the average intake for a person. Some researchers have investigated the methodological problems of dietary assessment for preschool children and suggest the direction of future research is to identify appropriate methods for this population (Treiber et al., 1990; Gibson, 1987, 1985, 1993; Klesges et al., 1987). Confronting these concerns would provide accurate information to the government and other concerned institutions in determining what preschool children eat and the needs assessment of this population.

In the past information on what preschoolers eat has been collected using food frequency questionnaires and 24-hour recalls (Meredith et al., 1951; Eppright et al., 1952). More recently investigators have used food records, both estimated and weighed as well as the previously mentioned methods (Gibson et al., 1993; Persson et al., 1984).

The food intake of preschoolers has usually been provided by the parents, most often the mother. The child is assumed to not be able to report their own intake as their language and communication skills are in a stage of development. Hence, the parent who was primarily responsible for feeding the child was responsible for recording this information.

Recently, there have been more parents entering the work force from two-parent families. This means that the child is not constantly in the care of either parent but a substitute caregiver is involved. In fact, approximately 72% of both parents work either full or part-time (Statistics Canada Census, 1990). Parents employed away from home

have their preschoolers cared for by day care centers or substitute caregivers, which may include relatives, neighbors or privately run care settings.

Previously, many studies made the assumption that parents are accurate reporters of their preschool children's eating patterns and nutrient intake (Misskey, 1987). However, there is little evidence which supports these claims that parents are accurate reporters of their children's food intake while the children are not under parental care (Misskey, 1987). Stein et al. (1992) found that parents could not confidently provide information on what their preschool children ate when they were not under parental supervision. It has also been suggested that working mothers may not be accurate reporters of their preschool children's food intakes (Emmons et al., 1973, and Meredith et al., 1951). However, parents have been found to be reliable reporters of their child's food intake when at home (Klesges et al., 1987).

The fact that both the parents and the substitute caregiver(s) are now involved in the feeding of preschoolers indicates the need to include caregivers in reporting children's intakes if we are to obtain accurate information on what preschoolers are eating. Hence, the dietary assessment method for preschool children with employed parents requires the inclusion of substitute caregivers.

It has been suggested that dietary study methods originally constructed for the adult population may be inappropriate for younger age groups because of their inability to report or record their own nutrient intakes and the need to involve of a third person (Persson et al., 1984). The various dietary methods used for the adult population may need to be revised or further developed for a younger population that may have two

persons reporting the food intake, for example, the parent and the caregiver (Persson et al., 1984). Two persons reporting on a third individual's diet can lead to recording errors, incorrect estimates of portion sizes and increased intra-subject variation (Persson et al., 1984; Gibson, 1987). The method used will need to incorporate the information required from both groups reporting the intake (ie. the parent and the caregiver(s)).

Concerns about dietary methodologies have always been of interest to researchers regardless of the population of interest (Block, 1982). The difficulties in obtaining the dietary intakes of preschool children range from how to collect information on the dietary intake of this population when both parents work outside the home to the assessment of the dietary methodology used in this process. A discussion of the purpose and appraisal of dietary methods follows.

2.2 Purpose of Dietary Assessment Methods

The purposes of dietary assessment methods are to collect information on the food habits or dietary intakes of individuals or groups which can be conducted by an interview, recording actual food intake or collecting duplicate portions of foods eaten, to name a few (Persson et al., 1984). It is equally important to understand that nutrient intake data only provide an estimate of nutrient adequacy since nutrient intake measures are unable to describe the nutritional status of an individual (Cameron et al., 1988, p.28).

The average usual nutrient intakes of a group can be estimated using single 24-hour recalls, or single estimated or weighed records (Gibson, 1990, p.50). Estimating the nutrient intakes of a group requires the study design to include days of the week

which are equally represented and subjects which are representative of the true population of interest (Gibson, 1990, p.50). The number of subjects required in the group to provide the average usual nutrient intake is dependent on the day-to-day variation in the nutrient intakes and the number of measurement days (Gibson, 1990, p.50). This information can be used for comparisons to similar populations in determining the relationship between dietary intakes and health and disease (Gibson, 1990, p.50).

The usual nutrient intakes of individuals can also be estimated using 24-hour recalls and estimated or weighed records. These methods are appropriate provided there are replicates of daily food intake measurements. The number of measurement days should be dependent on the day-to-day variation of energy and nutrient intakes (Gibson, 1990 p.50).

The amount and sources of the variability in the preschooler's food intake needs to be determined for this diverse population because the dietary intake is highly variable (Klesges et al., 1987). The issue now become more apparent: What is the magnitude and source of the variation in energy and nutrient intakes when parents and caregiver(s) report on the preschoolers' intake as reporters of the child's food intake? How valid and reliable are methods using parents and caregiver(s)? What are the implications of the number of measurement days and sample size?

2.3 Variation and Sources of Error

The precision and accuracy of the dietary assessment method may be affected by sources of error and variability (Gibson, 1987). In regard to dietary assessment,

variability can come from measurement errors and true variability in nutrient intake (Gibson, 1987).

2.3.1 Variation

There are two types of variation: intersubject or between subject variation and intrasubject or within-subject variation. The true variability in nutrient intake incorporates between-subject variation (differences among individuals) and within-subject variation (differences within one individual over time) (Gibson, 1987, and Beaton, 1979). The dietary assessment method should be designed so that both of these sources of variability can be separated and estimated using analysis of variance procedures (Beaton, 1979). As a result, the magnitude of the between- and within- subject variation can be considered when analyzing the data (Beaton, G., 1979).

Intersubject variation or between-subject variation refers to how the subjects differ in their true daily intake. This variation can be measured. Age and gender differences are examples of sources of variation that contribute to the between-subject variation (Gibson, 1987). Gender differences are often evident in the amounts of food consumed, rather than in the pattern of food consumption (Gibson, 1985). Therefore, total between subject variation can be attributed to the true between subject variation and variation due to gender and variation due to age. Variation due to gender and age should be controlled to isolate the true between-subject variation (Gibson, 1987). Age and gender can be controlled by selecting the subjects from a designated age and/or gender population.

Intrasubject variation or within-subject variation refers to the true day-to-day

variation of food intake within the same subject and other sources of variation (Gibson, 1987). The total intrasubject variation can be attributed to the true intrasubject variation, intrasubject variation due to day of the week, training or sequence effects, and seasonal effects (Gibson, 1987 and Todd et al., 1983). Preschool children, and people, in general, eat a variety of foods each day which contribute to a variety of nutrient intakes for each individual which results in the true intrasubject variation. Variation attributed to day of the week, training or sequence, and seasonal effects can be minimized by incorporating quality control measures into the study design such as collecting the nutrient intake data in one season, or equally representing all seasons (Gibson, 1987).

The between- and within- subject variation provide valuable information in the planning of dietary studies of a specific population (Beaton, 1979). For example, the between- and within- subject variation can be used to calculate the number of days required and the number of subjects for a specific population to estimate group or individual nutrient intakes with a specific precision.

Miller et al. (1991) investigated the nutrient intake variability for children 5-14 years of age. A minimum of three food records were used to generate an estimate of the children's nutrient intake. Inter- and intrasubject variances as well as the ratio of intra:intersubject variation were generated for energy and nutrients for both males and females. The ratio of within:between subject variation was found to be at least twice as great for the children as for the adults (Miller et al., 1991). This indicates that nutrient intake is more variable in children than adults. The variation found in their subjects was used to determine the minimum number of days required to estimate energy and nutrient

intakes. Limitations to this study are the use of twins yielding non-generalizable results, and the number of records completed by subjects was not consistent (ie. ranging from 3-23 food records). The authors did not indicate if the primary food preparer was more than one person or if it was the parent or not.

2.3.2 Sources of Error

Intrasubject variation reflects measurement errors, day of the week effects, seasonal effects, sequence effects and the true variation within a subject. Studies should attempt to reduce measurement errors and thus measure the true variation within subjects (Beaton, 1979; Gibson, 1987).

Measurement errors are of two types: 1. random errors, which cannot be completely removed, and 2. systematic errors (Gibson, 1987). Measurement errors can occur at any stage of a research project. Both types of measurement errors can be minimized by adopting various quality control procedures throughout the experimental period. The magnitude and extent of the errors vary with the dietary method used, the population of interest, and the nutrients investigated (Block, 1982, and Gibson, 1987). For example, a large random error increases the number of replicate measurement days necessary to define the distribution of usual nutrient intakes, in other words, a large intrasubject variation requires a greater amount of measurement days to obtain reliability in the nutrient intakes (Gibson, 1987).

Gibson (1987, 1990) identified the following which result in measurement errors: respondent biases, interviewer biases, respondent memory lapses, incorrect estimations

of portion sizes, flat slope syndrome (over-estimate low intakes and under-estimate high intakes), coding and computation errors, errors in the compilation of nutrient composition data, and errors during the nutrient analysis of food items. Measurement errors can be minimized by using various quality control procedures at each stage of the study design. For example, this involves training sessions for interviewers in interviewing techniques and standardizing interviewer protocols to reduce interviewer biases. Coders can also be trained on the protocol for coding food items and standardized recipes used for mixed dishes if the information is not present in the diet record in order to minimize coding. Gibson (1987) describes the various techniques for measurement error control in study designs.

Measurement errors, particularly random measurement errors affect the reliability of a method. Systematic errors introduce bias into the collected nutrient intake data which affect the validity of the dietary assessment method (Gibson, 1987). Systematic errors include those that reduce the accuracy of a measurement by altering the mean or median; alternatively, systematic errors have no effect on the precision of a method because there is no effect on the variance (Gibson, 1990, p.10). Examples of systematic errors include interviewer and respondent biases, or measurement biases of scales that constantly over- or underestimate weight.

2.4 Reliability and Validity

Many researchers acknowledge the need for establishing the validity and reliability of dietary assessment methods to assess the quality of a measuring instrument and the interpretation of using those methods (Gibson, 1987, 1985; Block, 1982). Reliability is defined as the reproducibility or repeatability of a method (Gibson, 1990). Validity is defined as the extent the method is a true measure of the what the researcher wants to measure, or in other words, describes the accuracy with which any measurement or index reflects the nutritional parameter of interest (Block, 1982).

2.4.1 Reliability

Reliability is a function of between- and within- subject variation as well as random errors inherent in the measurement or method (Beaton, 1979). The reliability or reproducibility of a method is often determined using the same method on two occasions which is often called test-retest reliability (Gibson, 1987; Lee-Han et al., 1989).

Treiber et al. (1990) examined the one week test-retest reliability of children's intake measured by the 24-hour recall and a food frequency questionnaire; compared nutrient intake data from a food frequency questionnaire with data from a 24-hour recall to determine what nutrient components are stable in reported intake from both brief and long-term periods; and compared their subject's nutrient intakes with that of other studies. The researchers had 55 participants aged 3 to 5 years, both male and female. Subjects completed a 24-hour dietary recall and then a three month food frequency

questionnaire on the same day followed by the identical protocol one week later. The work status of the parents was not indicated.

The results were analyzed using total energy and nutrient intakes, nutrient intakes expressed per kg and nutrient intakes expressed per 1,000 kcal. Pearson correlations for visit one and two and paired t-tests identified positive correlations and significant differences for some of the nutrients. There were also significant correlations for some of the nutrients when comparing the food frequency questionnaire to the two 24-hour recalls.

The 24-hour recall and the food frequency questionnaire were suggested to have the potential for assessing eating behaviors among children indicating use as a reliable method. Treiber et al. (1990) identified the preschoolers' nutrient intake as highly variable reflected in low correlations for some nutrients. Their research supports the findings of others that preschoolers have a highly variable intake (Stein et al, 1992). A limitation of this study is the lack of identifying the intra- and inter-subject variation.

The number of subjects were calculated based on the ability to detect three levels of nutrient intake change (10%, 25%, and 50% from the mean of the total intake) for each method (using alpha=.05 and power=.80). Ten percent change between periods greatly increased the required number of subjects for energy and each nutrient compared to 25% and 50%.

Treiber et al. (1990) acknowledge the need for further research into appropriate methodologies. Since the reliability of a method depends on factors such as the time interval between the two methods, sample size and measurement errors mentioned

earlier, these factors should also be further investigated. In addition the between- and within- subject variation contribute to the reliability of a method, all of which should be included in the assessment of reliability and validity of methods (Gibson, 1987).

2.4.2 Validity

The study design should consider the validity of all the measures selected (Block, 1982). The errors which affect the validity of a method are the systematic errors described previously. While it is extremely difficult to measure the absolute or "true" validity (where unobtrusive measures are used) in dietary assessment methods, researchers have accepted measures of relative validity (Block, 1982). Absolute validity is hard to obtain because many systematic errors are difficult to completely omit (Block, 1982). Therefore researchers often use relative validity which may be defined as the measurement of a determined method against some reference method (eg. Klesges et al., 1987). Relative validity is measured by comparing the test method to a selected reference method which is considered to be more accurate (Gibson, 1990, p.118; Lee-Han et al., 1989).

The selection of the reference method depends upon the method you wish to test. For example, the test method requires the comparison to a method (the reference method) which has a greater level of accuracy and precision (Block, 1987). The reference method must also examine the same characteristics as the method you wish to test, for example if the test method measures the usual intake of a group or individual then the reference method should also measure the usual intake of a group or individual (Gibson, 1990,

p.118).

Another factor in determining relative validity is the length of time between the two methods (Beaton, 1979, and Block, 1982). If the time interval is too short then the effects of one method may have an effect on the other method and if the two methods are separated by too great a time interval, a seasonal effect may surface (Gibson, 1987).

One group of researchers (Klesges et al., 1987) wanted to validate the 24-hour recall of parental reports of preschooler's food intake using a criterion reference of food weighing by an observer for the day of the recall. The other objective of this study was to determine the day-to-day variability in parent's reports of their children's intake. Thirty children (2 to 4 years of age), almost all females, participated in the study. The two-parent, middle-class families had one-third of the mothers working full time. The parents were asked to complete a 24-hour recall the previous day and then the food the child ate that day was weighed by an observer in the home. Another 24-hour recall was obtained the following day.

Klesges et al. (1987) found high day-to-day variability in the preschoolers dietary intake between the 24-hour recall and the same day weighed record and between the two 24-hour recalls. They found a close agreement between the weighed and recall records using Pearson correlation coefficients. The measurement errors discussed previously were not discussed by these researchers. A limitation to the study is the second 24-hour recall may have been reported more proficiently because the parents were watching everything that had to be weighed the previous day. Another limitation is that the time interval between the two recall methods may not have been adequate, hence they may

have incorporated training effects.

Significant positive correlations were found between the 24-hour recall and the same day weighed record ranging from .48 to .75 (average correlation was r=.65). The correlations were low for the comparison of the two 24-hour recalls ranging from -.05 to .44, indicating the need to examine the extent of the variability, the between- and within-subject variability, as well as the reliability of the method. This study clearly identifies the need to address the issues of reliability and validity of dietary assessment methods as well as the between- and within- subject variation. Another important factor to note was that substitute caregivers were not involved in reporting the preschoolers' dietary intake and the interviews were specifically collected for those days in which at least one parent was home. This suggested the lack of generalizability of the results.

Stein et al. (1992) completed a study very similar to Treiber et al. (1990). A non-random sample of 3 1/2 to 5 year old children was recruited to complete a food frequency questionnaire on two occasions and a 24-hour recall on four occasions over a twelve month period. Group mean intakes were compared for each method. There was limited consistency of nutrient intakes across the two dietary assessment methods. Mean group intakes for energy and nine nutrients were 1.4-1.9 times higher derived from the food frequency questionnaire compared to the 24-hour recall (Stein et al., 1992). Pearson correlation coefficients between the two methods were considered moderate (ranging from .23 for carbohydrate boys to .50 for calcium for both genders) (Stein et al., 1992).

The correlations with 95% confidence intervals for energy and the nutrients

improved when they were adjusted for energy intake and intraindividual variability using estimates of between- and within- person variation. A limitation to this study is the lack of information on the children's consumption when they were not under the direct supervision of their parents.

Reliability and validity can be assessed by measuring group or individual mean nutrient intakes or the distribution of the intakes of the group or individual. Other researchers have determined the reliability and validity of a method by comparing food groups or classification by quintile for a group or individual child (Horst et al., 1988; Eck et al.,1989; Basch et al., 1990; Emmons et al., 1973) and for adults (Karvetti et al., 1985; Van Leeuwen et al., 1983).

2.5 Summary of Literature Review

The research to date has not investigated the reliability or validity of the estimated food record for preschool children when both parents and caregivers are involved. Minimal information is available on the nutrient intake of preschool children in Canada and caregivers need to be included in reporting the intake of preschool children in dual-earner families. Studies have indicated the energy and nutrient intakes for children are more variable than in studies of adults.

The variation between and within subjects contribute to the reliability of a method. Measurement errors should be minimized and quality control measures developed in the study design to obtain the true intra- and inter-subject variation. A random sample of preschool children, involving substitute caregivers and a representative

number of work and non-work days are ways that would help reduce the measurement errors and variation found in Klesges, R.C. et al. (1987) work.

This study aims to provide knowledge on the usual dietary intake of preschoolers but first must address the concerns of the dietary methodologies applicable for this population. However, the purpose and appraisal of dietary assessment methods and controlling sources of error are mandatory considerations when investigating group or individual nutrient intakes (Block, 1982; Gibson, 1987). The knowledge of a valid and reliable method for preschool children with working parents will provide information on the nutrients and types of food the children consume. This information will contribute to the development of future programs and educational materials for the preschool child. Information on the nutrient intakes of preschool children may ultimately contribute to the more vast knowledge base of diet-disease relationships starting from early childhood.

3.0 OBJECTIVES AND HYPOTHESIS

3.1 Objectives

1. To determine if the 3-day estimated food record, kept by parents and caregivers, is a reliable and valid method of obtaining information about the dietary intake of preschool children .

2. To estimate the intra- and inter-subject variation in the dietary intake of preschool children obtained by the three-day estimated record.

3. To determine the sample size and number of measurement days which would be necessary in future studies of the dietary intake of preschool children who are fed by parents and caregivers.

3.2 Hypotheses

The reliability and validity of the three-day estimated record was judged using statistical criteria as well as practical judgement.

1. It was hypothesized that the three-day estimated record would be reliable if there were no differences between mean intakes of energy and selected nutrients when the record was administered on two occasions.

2. Likewise, it was hypothesized that the three-day estimated record would be valid if there were no differences between mean intakes of energy and selected nutrients obtained with the estimated record and the three-day weighed record.

3.3 Assumption

The basic assumption of the study is that the preschool children's energy and nutrient intakes will not change between the two periods. In other words, their diet will remain the same on two occasions.

4.0 METHODS

4.1 Study Design

4.1.1 Research Design

All subjects completed a three-day estimated food record at one time period and then were randomly assigned six weeks later to one of two groups. Group 1 comprised subjects who completed two three-day estimated food records, one at each time period. Group 2 comprised subjects who completed a three-day estimated food record in period 1 and a three-day weighed food record in period 2. Thus, the research design is basically a split plot design and the results were analyzed in the context of this design (see section 4.2 Data Analysis).

This design is similar to the incomplete block design with subjects assigned to several of the treatment conditions however the design in this study differs since each subject is only assigned one of the treatments (Neter, Wesserman and Kutner, 1985, pp.1069). The split plot design is useful when repeated measurements are made over time. The repeated measurements in this study are the days in each food record. The days are a random sample of three non-consecutive days for each period, hence the days are nested in periods.

The split plot design involves a treatment structure with two factors, group and period in this study. Correspondingly, there are two sizes of experimental units

involved. The larger experimental units comprise the main or whole plot experimental units, while the smaller experimental units are the subplots, or split plot experimental units. In this study the main plot is the group to which a subject is assigned. For example, Group 1 comprises subjects who completed an estimated food record at period 1 and period 2 for the reliability test while Group 2 comprises subjects who completed an estimated food record at period 1 and a weighed food record at period 2 for the validity test. Hence, the subjects are the larger or main plot experimental unit. Each subject is assessed for two three-day periods. The periods act as the subplot treatment. Hence, the days within the periods act as the smaller or subplot experimental unit. The split plot design is useful when one factor requires larger experimental units than another as indicated above (Neter, Wesserman and Kutner, 1985, pp.1069).

The split plot design is also advantageous as it increases the precision for comparing average effects of treatments in the subplots and, when interactions exist, for comparing the effects of subplot treatments for a particular main plot treatment (Little and Hills, 1978, pp.87). This study is comparing the average effects of the treatments in the subplot and this comparison of two periods in each group is critical to the assessment of reliability and validity.

The design tends to decrease the precision of estimating the average effects of the treatments assigned to the main plots compared to the subplots (Little and Hills, 1978, pp.87). In this research design, there are more day-to-day measurement effects in the subplot compared to the subject measurement effects in the main plot. The main plot error is often larger because it incorporates variability throughout the larger more widely

spaced main plots (Little and Hills, 1978, pp.87). In this case, the variability amongst subjects in groups is the main plot error. The reverse being that the subplot error is often smaller because it incorporates variability among closely spaced subplots within the main plots (Little and Hills, 1978, pp.87). The days for a subject within a period is the subplot error term for this study.

4.1.2 Selection of Subjects

4.1.2.1 Selection Criteria and Sampling Procedure

Subjects included 24 to 47 month old children in two-parent households where both parents were employed 15 or more hours per week outside of the home and the children were cared for by a substitute caregiver either in the child's home, another home or a child care facility while the parents were working. The subjects also had to receive at least one meal per work day from the caregiver. Hence, the inclusion criteria were: 24 to 47 month old children; two-parent household, both parents employed outside the home for a minimum of 15 hours per week; child cared for by a substitute caregiver who provided at least one meal per day while the parents were working; parents could speak English; child not on a therapeutic diet and had no medical problems which affected their growth or eating habits.

The sampling frame was obtained from the Manitoba Health Services Commission (MHSC) which lists all Manitobans for medical coverage. The MHSC list contains information on the number of adults living in the household and their ages; the child's

gender and age; and the most recent address for the household based on the last visit to a physician.

This study used a simple random sample of 24 to 47 month old children in two-parent households living in the Winnipeg Health Region from MHSC. The Access and Confidentiality Committee of the MHSC approved this project as well as the Ethics Committee of the Faculty of Human Ecology, University of Manitoba.

4.1.2.2 Sample Size

The required sample size was calculated for the paired t-test of means and the correlation coefficient following the procedures of Cohen (1977: 62, 75). Data on the variability in the intake of energy and each nutrient was obtained from published studies of preschool children (Table 1), however, none of these latter studies included children with the same characteristics as required in the present study nor did the other studies involve both the parents and caregivers in reporting the child's food intake.

These calculations suggested that a sample size of 60 in Group 1 (the reliability test) and 60 in Group 2 (the validity test) was reasonable for the various nutrients. Alpha was set at .05, power at .80 and a different effect size was used for energy and each nutrient of interest (protein, carbohydrate, fat, calcium, iron, vitamin C, thiamin, riboflavin, niacin, vitamin A, and folate) as shown in Table 1.

The lack of knowledge on the variability of food intake of this population made it difficult to calculate a precise sample size. It is for this reason that the present study

has been conducted to provide some information on the variation in the dietary intake data and thus allow more precise calculations of the sample size required in future studies.

Table 1. Magnitude of Correlation Coefficients and Differences Between Means to be Detected with 80% Power.

Nutrient	Difference Between Means	Correlation Coefficient
Energy (kcal)	100	.6
Protein (g)	5	.5
Carbohydrate (g)	20	.5
Total fat (g)	10	.5
Calcium (mg)	150	.6
Iron (mg)	2	.4
Vitamin C (mg)	20	.6
Thiamin (mg)	.3	.6
Riboflavin (mg)	.3	.5
Niacin (NE)	4	.6

The sampling frame did not distinguish between employed and unemployed parents. Therefore it was necessary to oversample from the MHSC taking into account the number of parents who were both employed or not employed outside the home in Manitoba (Statistics Canada, unpublished data). In order to obtain a sample of 120, the MHSC was asked to select a larger number of subjects, approximately 3500. This larger

number was required because the MHSC files only contained information on the child's birth date, gender, and the number of adults in the household and their birth date but did not include the work status of the parents.

The figure of 3500 was based on Statistics Canada (1985 and 1989) and other data (Campbell, 1991) which indicated the percentage of preschool children with both parents employed full-time and part-time, the percentage of divorces or separations that occur in a year, the percentage of homes with unlisted numbers, the percentage of subjects who may have moved from the address listed with the MHSC, and the percentage of preschool children with medical problems that affect their growth and eating patterns. The parents who were not employed were screened out of the study by a telephone interview to all subjects selected.

4.1.3 Instruments and Tools

4.1.3.1 Dietary Assessment Methods

The choice of a particular dietary assessment method depends on the purpose of the study in which it is used. Whether the mean consumption of a group of people, the distribution of a group of people or the consumption of the individual is required predisposes which methods are most appropriate (Cameron et al., 1988, p.172). In addition, different methods may be chosen if the purpose of the study is to assess the usual intake of a group or individual rather than the current intake. Methods which cover a long time span, for example a diet history or a food frequency questionnaire, are

more able to assess usual intakes than methods that cover a short period of intake, for example a 24 hour recall (Gibson, 1990).

The food record method was chosen for the present study since the goal was to assess both group and individual intakes. This method is considered appropriate for these purposes and is a reasonable estimate of usual intakes (Gibson, 1990).

The food record method of assessing food intake requires subjects to record food intake as it is consumed. The quantity of food consumed can be either estimated using household measures or weighed with a dietary scale. Records can be kept for any number of days. The choice between estimated and weighed records and the decision as to the number of recording days will now be discussed.

4.1.3.2 Estimated Food Records

The estimated food record was chosen as the test method for obtaining data on food intakes of preschool children when both parents and caregivers did the record keeping. There were several reasons for this choice.

First, the 24-hour recall, food frequency questionnaire and diet history methods all rely on the parents and caregivers ability to recall what the child ate. These are also referred to as retrospective methods (Gibson, 1990, p.37). Studies have indicated that parents are not familiar with what their children eat while they are at work (Emmons et al., 1973 and NRC, 1985, p.6-7). Caregivers who are responsible for many children were assumed to have difficulty recalling what any one child eats in the past day or month with any accuracy. Hence, the recall methods would not be appropriate for this

population. The record method provided both the parent and caregiver(s) the opportunity to document the food intake of the preschool child as it was eaten.

Secondly, the estimated food record is considered to be one of the least costly methods of obtaining data compared to weighing and observing methods (Cameron et al., 1988, p.110). The estimated food record is considered to be one of the most practical methods of data collection and can provide information on the specific time the food was eaten (Cameron et al., 1988, p.64).

The disadvantages of this method are that it must be used with a literate population and respondent burden is great (Cameron et al., 1988, p.65). The literacy rate was assumed to be high in this study.

To reduce respondent burden, participants were asked to record on non-consecutive days and thus provide a break in record keeping; the food record form for recording was developed into a user friendly format following the pretest; interviewers arranged interviews at the participants' convenience; incentives were given at the end of each time period and the respondents were frequently called by the interviewers to increase motivation and help solve any problems they had.

The decision to record for three days was felt to be realistic in terms of response burden, cooperation and data quality. Three days were chosen as a realistic number of days to obtain cooperation among parents and caregivers as well as decreasing respondent burden. Other researchers have used five and seven day food records for some adult populations. Some studies have shown the quality of the food record does decrease when the number of record days increases (Gersovitz et al., 1978). The author felt the

respondent burden would be too high if five or seven day food records were kept by working parents and caregivers. Therefore the three day estimated food record was utilized.

Three non-consecutive days with work and non-work days represented proportionately according to the parents work schedule (Table 2). Participants were encouraged to do Tuesday, Thursday, and Saturday in any combination unless their work schedules were different and required different work and non-work days. A work day was a day when the preschool child was with a caregiver and conversely, a non-work day was a day when the child was not with the caregiver.

Table 2. Criteria for representing work and non-work days.

Number of days parents work	Number of days parents don't work	Number of work days in Record	Number of non-work days in Record
5 (or >)	2 (or <)	2	1
4	3	2	1
3	4	2 or 1	1 or 2
2 (or <)	5 (or >)	1	2

The procedures for obtaining the three-day estimated food record and the food record form were modeled after a study by Campbell (1993) on preschool children with single employed mothers. The food record was revised following the pretest (Appendix C).

4.1.3.3 Weighed Food Records

The weighed record is considered the most accurate method available for estimating nutrient intakes except for unobtrusive weighing (Gibson, 1990, p.40). Hence, the weighed food record was chosen as the reference method to check the validity of the three-day estimated food record. The weighed dietary record is more objective than other methods as it minimizes measurement errors introduced when using household measures to estimate portion sizes (Gibson, et al., 1985).

The weighed food record was developed following the guidelines of Cameron and van Staveren (1988, pp.55-59) (Appendix D). The three-day weighed record procedures and reporting form were patterned after the three-day estimated food record to reduce the difficulty of respondents learning a new method which may introduce systematic errors (Cameron and van Staveren, 1988, p.55-59).

Digital Scales (Soehnle 8003 04, Switzerland) were used to measure portion size in grams (to 1 gram) and were calibrated using standard weights. In order to avoid bias in response, interviewers stressed to participants the desire to obtain the "usual" food intake, provided simple verbal and written instructions on how to weigh and record foods and gave a demonstration of how foods should be weighed or measured (Cameron and van Staveren, 1988, p.55-59).

To get a complete picture of nutrient intakes for preschool children, the use of vitamin and mineral supplements was assessed in each time period. The recording form is shown in Appendix F.

4.1.3.4 Telephone Questionnaire and Consent Form

The telephone call to the parents of the children selected by MHSC served two purposes. One purpose was to screen for dual-earner families that met our study criteria and the second purpose was to collect demographic information about the family, work, and caregiver situation.

The questions included screening questions; demographic questions pertaining to the parents' work (occupations, work hours, work days, job duration, and education level), ethnic background, total family income and number of children; caregiver information including type of child care arrangement, duration of present arrangement and meals and snack eaten with the caregivers. Many questions in the telephone questionnaire were styled after Statistics Canada census questions (1986, 1990) and Campbell (1991). The telephone questionnaire is found in Appendix B.

The consent forms and oath of confidentiality forms were approved by the Ethics Committee of the University of Manitoba and the MHSC (Appendix E).

4.1.4 Implementation

Data collection occurred throughout the months of March to July 1992. Period 1 was completed between the second week in March to the first week in May and period 2 was completed the second week in May to the middle of July. The goal was to control for season by choosing the months to do the study. However, delays in obtaining complete food records did not allow for this control.

The telephone numbers for the random sample (3500 names provided by the

MHSC) were obtained through the Winnipeg Telephone Directory using the addresses provided by MHSC. Potential subjects, those whose phone numbers were listed in the Winnipeg Telephone Directory, were first sent an introductory letter describing the purpose of the study, what was involved in participation and who was coordinating the study as well as informing them that a telephone call would follow in a week to recruit participants for the study (Appendix A). The refusal rate has been shown to decrease by sending an introductory letter prior to contacting by phone (Tyebjee, 1979) and was required by the MHSC.

To facilitate data collection, subjects were sorted by postal code. Interviewers were assigned geographical regions dictated by the postal code areas near their residences and therefore were not randomly assigned to subjects. This allowed the interviewers to be more efficient with scheduling interviews, making appointments with participants and get to and from appointments, as well as decrease interviewer time.

A subset of subjects were randomly selected within each postal code for each interviewer. When all subjects were contacted then another subset of subjects were selected. This procedure was used until the required number of subjects was achieved. All postal codes had a minimum of one subset of subjects selected. Some postal codes utilized all subjects.

One week after the letter was sent, a phone call, by either the author or a trained interviewer, was made to the parents to screen and recruit subjects for the study. A subject was declared a "no-contact" when there were eight attempts made to contact the person letting the phone ring a minimum of eight times while spacing the calls at

different time intervals of the day and on different days.

Once subjects were screened and agreed to participate, they were then asked demographic questions. The interviewers recorded the parents responses by hand on each questionnaire. Each telephone interview took approximately 20 minutes to complete.

The interviewers were trained to ask for the mother when conducting the telephone interviews as the mothers were thought to be more understanding of the needs of the study were assumed to provide the majority of the food for the child. Although, if a father requested to take part in the interview, then the interviewer conducted the interview as trained. The gender of the parent who participated in the interview on the telephone questionnaires was recorded.

At the end of the telephone interview with the parents, the interviewers set up arrangements with the parent to contact the caregiver. In order to standardize procedures, the interviewers were requested to contact the caregivers. However, some parents wanted to contact their caregivers directly which the interviewers then respected. The interviewer then called the caregiver to assure participation. Less than 10% of the participants had more than one caregiver on a regular basis. This meant that more than one caregivers and a parent would be recording what the preschool child ate during the days of record keeping for those children that had more than one caregiver.

An appointment was made with both the parent(s) and the caregiver(s) who would be keeping the record at the same time if possible, or at a convenient time in order to train participants. The first appointment was usually held at the caregiver's during the

pick-up time of the child so that both the parent(s) and the caregiver(s) would be present. This usually occurred between 3:00pm and 6:00pm, depending on the parents work schedule and the caregiver(s) schedule. Sometimes the first appointment was held in the parents' home with the caregiver(s) present, and on occasion the first appointment was held separately with the parents and the caregiver(s).

Interviewers were trained to attempt to have the first appointment with both the parent(s) and caregiver(s) present to standardize procedures across parents and caregivers, to increase motivation of participants and also to increase time efficiency for the interviewers. The subjects received both verbal and written instructions by the interviewer. At the first visit parents and caregivers were asked to keep an estimated food record (Appendix C) for three non-consecutive days with work and non-work days represented proportionately according to the parents work schedule as shown in Table 2.

The interviewers telephoned the subjects on some of the days of record keeping to provide encouragement, motivation and answer questions or solve problems that the parents or caregivers may have had. After the three days of record keeping the interviewer met with both the parent(s) and the caregiver(s) to gather the food records and check food items, amounts and the method of preparation of the foods in the diary, to increase validity (Steele et al., 1951). At this second home visit a date was set for doing the second food record approximately six weeks later with both the parents and the caregiver(s) and the vitamin/mineral supplement form was completed. The parents often had busy schedules that required rescheduling the second food recording time to a later date. This situation required that interviewers call parents and caregivers back.

If any records looked incomplete to the interviewers when they checked them in the second visit, and the information could not be retrieved during that visit, then they would indicate they would call the participants back. The interviewers contacted the author to check the food record to determine if the record was acceptable or not. If a food record was incomplete, attempts were made to complete the food record. If a food record could not be completed, then the participants were not asked to complete another food record.

At Time 2, subjects were randomly assigned to either Group 2, the weighed food record, or Group 1, the estimated food record. When the interviewers met with the parents and caregivers at Time 2, the subjects were then told the type of food record they were asked to complete (ie. estimated or weighed) (Appendix C and D). This procedure was used as it was thought there may be concern about completing a weighed food record. The face to face interaction between the interviewer and the parents and caregivers could provide encouragement and motivation for completing the weighed record, and the interviewers could demonstrate the weighing technique; all of which may increase the response rate of the subjects. The limiting factor for the number of subjects in each group was the number of scales available. Therefore, more subjects completed the estimated food record than the weighed food record.

All methods and procedures used at Period 2 were the same as in period 1, except that some participants completed weighed food records. Those subjects who completed weighed records were given verbal and written instructions on how to weigh foods. A brief demonstration on how to weigh solid foods and liquids was also provided to the

participants who were asked to complete a weighed food record.

The interviewers were the same for each subject at period 1 and 2 except that one interviewer was replaced. This sixth interviewer obtained full-time employment and thus two new part-time interviewers were trained. The second food record, like the first, involved three non-consecutive days, representing the proportionate number of work and non-work days (Table 2). The interviewers again telephoned participants during record keeping to motivate, determine progress and help solve any problems or answer questions. Upon completion of the second food record the interviewers once again collected and checked the records for completeness.

To motivate participation, all children were provided with a colorful growth chart at the end of Time 1. While at period 2, recipe booklets were given to parents and caregivers and a sticker given to the children. All parents were offered a nutrient analysis of their child's intake for the days of record keeping and the results of the study.

4.1.5 Quality Control Procedures

Quality control was maintained throughout data collection by the author having weekly individual meetings with the interviewers to discuss any difficulties, concerns or problems. At this time the author also made bi-weekly checks on the data collected by each interviewer which acted as a measure of quality control. The interviewers were also reassembled between period 1 and 2 to re-standardize their techniques and maintain the motivation and support amongst the interviewers for the second half of the study.

4.1.5.1 Control for Study Bias and Sources of Error

The measurement errors which result in study bias and other sources of errors can occur at any stage in the process of conducting a dietary survey (Gibson, 1987). Efforts were made to minimize the random measurement errors and remove systematic measurement errors. This was done to control for biases which affects the validity of the study and so that the intra-subject variation can be said to be due largely to intra-subject variation and not due to measurement error (Gibson, 1987).

Respondent biases were controlled by encouraging parents and caregivers to provide accurate information on what the child ate to provide a complete food diary so that the study could accurately account for what preschoolers are eating. therefore to not change their preschoolers' eating habits for the purpose of the study.

The interviewers were trained to recognize potential sources of bias and thus minimize respondent and interviewer biases. Their training involved learning how to accurately record respondent answers, increase the degree of rapport between the interviewer and the subject, ensure confidentiality and proper interview settings, to reduce the non-verbal cues given by the interviewer and to ensure that the subjects understood what the interviewer was asking them (Gibson, 1987). Bi-weekly meetings with the coordinator (the author) reinforced the reduction of these potential biases and random errors.

Nonresponse may bias the data collected if the sample loses its representativeness (Gibson, 1987). The study tried to decrease nonresponse throughout the study as

discussed in section 4.1.4 Implementation. The nonresponders also were compared to the responders to determine if there were differences as discussed in section 4.2.1 Demographic Data for Responders and Nonresponders.

The respondent memory lapses were controlled by the interviewers probing for missing or incomplete information in the food records and by making regular phone calls to motivate and ensure cooperation (Gibson, 1987). Incorrect estimations of portion size were also minimized by interviewers who trained subjects how to estimate food portions. The interviewers were trained to demonstrate how to estimate portion size using measuring cups and spoons and rulers or by scales for weighed records. Portion sizes were also checked by the author and the person who coded the food for reasonable portion sizes using portion size estimates from McNicol (1991). Incorrect estimations of portion size were minimized by the use of imperial household measures, by having provided the appropriate measuring tools, such as measuring cups and spoons or a scale (Soehnle 8003 04, Switzerland) which weighed in grams (where applicable) (Gibson, 1987, Gibson, 1990).

Coding errors such as the choice of codes used by the coders and the correct keying of the codes are acknowledged as potential sources of error. Every effort was made to reduce coding errors. The values were recoded for a sample of 15 subjects by the author. The check program in the nutrient analysis program was utilized after every subjects data was entered. The check program read the coded entries into legible foods, amounts, location, day and time of consumption which was compared to the original food record by the coder.

Computational errors such as those found in the analytical method used to obtain the nutrient analysis and computer errors are acknowledged as potential sources of error. To check for computational errors, a sample of 10 subjects' nutrients were calculated by hand to confirm the computerized nutrient output.

The errors associated with the use of food composition data base, the Canadian Nutrient File, are a reality in this study.

4.1.6 Interviewer Training

Six interviewers, including the author conducted the telephone questionnaires and home visits during period 1. The interviewers had four days of extensive training and had a previous degree in Foods and Nutrition. One interviewer became employed during period 2 which resulted in hiring two more part-time interviewers to cover the participants assigned to that particular interviewer. The two new interviewers were registered dietitians.

Interviewer training involved instruction and practice in conducting telephone interviews on actual subjects (subjects not in the study but had children of similar ages and characteristics to the actual subjects); and instruction in the estimated and weighed food records and practice with people. Training also included instruction in the best times of day to telephone, research etiquette and ethics, reducing respondent and interviewer bias, checking completed food diaries, and helpful hints on use of all instruments. The focus of the training was on how to motivate subjects to participate and to standardize procedures across all interviewers.

4.1.7 Pre-testing

The purpose of the pretest was to test all aspects of the procedures and to refine the tools and instruments for the larger study. The pretest was conducted by the author, therefore interviewers were not pretested. A random sample 218 names from the larger sample with telephone numbers were mailed the introductory letter. Ten subjects from 218 agreed to participated in the pretest.

The initial inclusion criteria were to accept only parents working 30 or more hours per week, Monday to Friday; 24 to 47 month old children; child cared for by a substitute caregiver who provided at least one meal per day while the parents were working; parents could speak English; child not on a therapeutic diet and had no medical problems which affected their growth or eating habits. The pretest identified difficulties in obtaining enough participants that met that criteria. Thus the criteria were modified to include parents working 15 or more hours per week regardless of the time or day work was scheduled.

Participants in the pretest were interviewed by telephone interview and asked to complete either an estimated or weighed food record as well as a vitamin and mineral supplement form. Both the three-day estimated food record and the three-day weighed food record were pretested but at only one time. Subjects in the pretest were randomly assigned using a random numbers table to one of the two methods.

The pretest led to changes in the instruments and study procedures such as the telephone questionnaire. For example, some questions from the telephone questionnaire were reworded after the pretest showed that the participants had difficulty understanding

the questions or because of the response they gave. The interviewers also felt that more fathers refused to participate than the mothers in the pretest. As a result, the interviewers in the final study, were trained to ask for the mother in the telephone interview.

During the pretest the subjects were asked to comment on the instructions given to them and on their difficulties in completing the food records. Their responses provided useful information on question-asking techniques, types of foods to use as examples when explaining the food records, food record instructions, and concerns that other parents and caregivers may have. This information prepared the author when training the interviewers and later conducting the interviews. Hence, the pretest greatly helped to further develop the questions in the telephone interview, the introductory letter to parents, the directions and layout of both the estimated and weighed food records, and the training protocol for the interviewers.

4.1.8 Data Coding

Upon completion of the data collection, two trained coders, one experienced coder and the author, coded all food records. The experienced coder coded two thirds of the food diaries of the same subjects in Group 1 and Group 2. The author coded the remaining diaries from both groups. The author cross checked her food codes with the experienced coder on a regular basis as well as re-coding 15 records of the experienced coder to check for consistency.

All food items in the food records were coded using the description of foods from

the Canadian Nutrient File 1988 (Health & Welfare, Ottawa, Ontario, Canada) plus additions made by the Department of Foods and Nutrition, University of Manitoba, from company and restaurant data. For a few mixed food items, data from a local hospital were used and were based on food composition data from Health & Welfare and industry sources. The Nutrient Analysis Program - Mainframe Version (Sevenhuysen and Schuppel, 1985) converted the food codes and amounts into nutrient amounts on the University of Manitoba mainframe computer. A few records were calculated by hand to compare to the Nutrient Analysis Program.

The demographic information from the telephone questionnaires and vitamin/mineral supplement forms were also coded and entered into a SAS file on the mainframe. The nonresponder questionnaire was coded and tabulated by hand.

4.2 Data Analysis

4.2.1 Demographic Data for Responders and Nonresponders

The demographic information for the participants and nonresponders was analyzed using frequency and averages for the variables of interest. Cumulative values and percentages were also calculated with these basic SAS functions. The participants and nonresponders were compared using Chi Square tests on percentages.

A nonresponder is a person who does not participate in a study but meets the study criteria for inclusion. When nonresponders exist in a random sample the representativeness of the participants in that sample to the population from which they were selected can be questioned (Gibson, 1990). Hence, nonresponse may bias the representativeness of the data.

This study collected information on nonresponders in an effort to compare them with the participants to see if there were differences and how they might differ. A nonresponder questionnaire was developed to obtain information on the hours parents worked each week and the time of day they worked; the job description and educational level of the mother and father; family income; and, the meals or snacks eaten by the preschooler at the caregivers (Appendix G). The biased introduced by nonresponse was determined by comparing responders and nonresponders and thus determine how representative the subjects were of eligible participants. The representativeness is also affected by those not contacted.

4.2.2 ANOVA

The results of the study using the split plot design were analyzed using the following analysis of variance (ANOVA) model.

$$Y_{ijkl} = \mu + G_i + S(G)_{j(i)} + P_k + GP_{ik} + PS(G)_{kj(i)} + D(PS(G))_{l(kj(i))}$$

where:

Y_{ijkl} is the nutrient intake for the jth subject on the lth day in the kth period in the ith group,
μ is the overall mean nutrient intake
G_i is the fixed effect for the study group i = 1,2,
$S(G)_{j(i)}$ is the random effect of the jth subject in the ith group,
P_k is the fixed effect for the period k = 1,2,
GP_{ik} is the fixed effect of the interaction of the ith group and the kth period,
$PS(G)_{kj(i)}$ is the random effect of the interaction of the kth period and the jth subject in the ith group, and
$D(PS(G))_{l(kj(i))}$ is the error term. It is the random effect of the lth days nested within the kth period for the jth subject in the ith group.

The ANOVA table (Table 3A) identifies the two factors, group and period, and two levels of experimental units, subjects and days, involved in the analysis. The random terms in Table 3A identify which variables were randomly selected. For example, subjects were randomly selected from the population and then randomly assigned into groups. As well the days were a random selection of days. The fixed variable terms indicate that both the groups and periods are predetermined. For example there are only two groups and two periods and each subject will be in one of the groups and complete both periods. The nature of whether the variable is random or fixed determines the nature of the expected mean squares and the form of the analysis.

Table 3A. ANOVA Table for the Split Plot Design

Source	Random or Fixed Variable	Expected Mean Squares
Group	fixed	$c_1\sigma_d^2 + c_2\sigma_{pxs}^2 + c_3\sigma_s^2 + Q(g,gxp)$
Subject(Group)	random	$c_4\sigma_d^2 + c_5\sigma_{pxs}^2 + c_6\sigma_s^2$
Period	fixed	$c_7\sigma_d^2 + c_8\sigma_{pxs}^2 + Q(p,pxg)$
Group*Period	fixed	$c_9\sigma_d^2 + c_{10}\sigma_{pxs}^2 + Q(pxg)$
Subject*Period(Group)	random	$c_{11}\sigma_d^2 + c_{12}\sigma_{pxs}^2$
Day(Period*Subject(Group))	random	σ_d^2

The Group and Subject(Group) terms comprise the main plot of the split plot design. The terms below these are the subplots of the split plot design. Using the form of the expected mean squares provides an estimate of the quantity of each source of variability of interest, as well as the specific F-ratio appropriate for assessing the significance of each term.

The bottom term, Day(Period*Subject(Group)) acts as the mean square error term in the ANOVA and is an unbiased estimate of the true day-to-day variability of those subjects within a particular period and group. Three days act as the replication within a subject.

The Subject*Period(Group) term estimates both the variability between subjects within a particular group and period as well as the associated day-to-day variability. This term isolates how consistent the effect of the period in a group is from subject to subject.

The Group*Period term assesses whether the effect of the period is the same for both groups. If the effect is the same for both groups then it is possible to test for an overall period effect and thus investigate the main plot of this experimental design. However, if the effect is different for both groups then the subplot must be investigated for each group separately because one overall effect of period is not appropriate.

The Period term assesses the effect of the period for both groups. This analysis is only appropriate if the Group*Period interaction term is not significantly different from zero.

The Subject(Group) term assesses the variability among subjects in a particular group. The last source, Group, assesses if there is an overall effect of group. This term is similar to the Period term as it only makes sense to perform this test if the Period*Group interaction term is not significantly different from zero. If there is a significant difference from zero, then the effect of group is dependent upon which period is examined.

4.2.3 Assumptions of ANOVA

The ANOVA model requires that the error terms have constant variance and are independent and normally distributed (Neter et al., 1990, p.609). In addition outliers should be checked (Neter et al., 1990, p.609). The assumptions of ANOVA were tested using residual plots and normal probability plots of the residuals. In addition outliers were checked manually. These results are discussed in the Results and Discussion Section 5.4.1.

4.2.4 The Reliability and Validity of the Three-day Estimated Record

The statistical design allowed for the test of the reliability and validity of the three-day estimated food record. If the group term was not significant ($p > .05$) and the period term was also not significant, then the method would be considered reliable and valid. However, if the effect of period was not the same in both groups, then the further analysis would determine if the method was unreliable or invalid.

The statistical comparisons were the same for both groups, however the dietary methods in each group determined whether the test was for reliability or validity. The reliability of the three-day estimated food record was tested in Group 1 while the validity of the three-day estimated food record was tested in Group 2. The split plot design was used as the experimental design in order to assess the sources of variation of interest.

Therefore, the ANOVA model was first used to determine the significance of the group by period interaction term, then by group, the significance of the period terms was determined. These period terms were determined comparing the difference between the mean energy and nutrient intakes for each period. The magnitude of the means was then determined as well as calculating the mean as a percentage of period 1 to assess the practical importance.

4.2.5 Confidence Intervals for the Difference Between Means

The Confidence intervals were calculated for the difference between period 1 and 2 means of each nutrient and energy (Appendix G). The standard deviation using three sources of variation (discussed in 4.2.6), was calculated for use in the construction of the confidence intervals. The standard errors for both the group and individual level of assessment were determined in order to provide 95% confidence intervals for both the group and individual level of assessment.

4.2.6 Inter- and Intrasubject Variation

The objectives of this study require the investigation of between-group and within-group variation. The inter- and intrasubject variation was determined to look at the magnitude of variation within and between subjects to provide a description of the differences found and the understanding of the reliability and validity of the method. The expected mean squares provided the form for the appropriate estimates of the standard deviation and appropriate variance ratios taking into account three sources of variability: day to day variability (the mean square error term, MSE, from the ANOVA table); subject to subject variability with respect to period (the mean square Subject*Period term from the ANOVA table minus MSE divided by the constant from the sums of squares table generated from SAS); and subject to subject variability over period and day (the

mean square Subject term from the ANOVA table minus the mean square Subject*Period term all divided by the constant from the sums of squares table generated by SAS). The magnitude of these three sources of variation were generated by hand using the above mean square values and appropriate constants. Calculations are shown in Appendix H.

4.2.7 Power Analysis of Sample Size and Measurement Days

An estimate of the sample size and number of measurement days was calculated based on the variation of energy and nutrients in each group and corrected standard deviation. The corrected standard deviation using three sources of variation (discussed in 4.2.6) was used in the power calculations. Sample size and the number of measurement days were calculated using JMP Version 2.0, SAS Inc. 1993 with power set at .80 and alpha=.05, to provide the expected magnitude of difference.

4.2.8 Statistical Significant Difference

For the present study a p-value equal to .05 was used to determine whether a difference between means was signficantly different from zero. Hence any difference with a p-value greater than .05 was considered not statistically different.

4.2.9 Practical Importance of Mean Differences

In addition to statistical criteria for reliability and validity, the magnitude of the difference between mean intakes for each nutrient were considered in terms of practical importance. If the magnitude of the difference and the upper and lower confidence bounds for the mean exceeded levels considered of practical importance, then the method was considered unreliable and/or invalid.

Practical importance was based on the comparison of mean nutrient intakes in terms of actual foods consumed to what difference would be considered practically important. In other words, using the amounts of foods to judge whether an amount of a nutrient is of practical importance. The criteria used in Table 3B indicates a practical difference considered to be important as suggested by subject matter experts from the Department of Foods and Nutrition who were not exposed to our results. The above criteria did not consider physiological importance of these differences in assessing the practical importance of the differences.

Table 3B was generated to formulate criteria for the difference between mean intakes considered of practical importance for preschool children. In other words, what magnitude reflected in food would be considered of practical importance? The difference between means in relation to the types of foods preschool children eat was examined to determine the practical importance. For example, approximately 1 cup of milk has 300mg of calcium, a difference considered of practical importance. Whereas, two slices of bread would reflect approximately .15 mg of thiamin. A difference between the

intakes of preschool children of two slices of bread was considered to be practically important.

Table 3B. Difference Between Mean Intakes Considered of Practical Importance for Energy and Selected Nutrients for Preschool Children.

Nutrient	Magnitude Considered of Practical Importance
Energy (kcal)	300
Protein (g)	15
Total Fat (g)	8
Carbohydrate (g)	25
Iron (mg)	1.5
Calcium (mg)	300
Vitamin C (mg)	35
Thiamin (mg)	0.15
Riboflavin (mg)	0.5
Niacin (NE)	3.0
Folate (mcg)	60

4.2.10 Nutrients Investigated

The following nutrients were investigated in this study: energy, protein, carbohydrate, total fat, iron, calcium, thiamin, riboflavin, niacin, vitamin C, folate and vitamin A. Vitamin A was not included in the original research proposal as the variation in vitamin A intakes are large and a reliable and valid estimate of vitamin A intake was not considered possible with the three-day estimated record. However, vitamin A was analyzed and is included in the tables throughout this document and the results are presented in Appendix J.

5.0 RESULTS AND DISCUSSION

5.1 Description of Participants

One hundred and forty six Winnipeg preschool children (72 females; 74 males) aged 36 $\pm$ 5.46 months (mean $\pm$ standard deviation) participated in the study. There were 62 two-year old and 84 three-year old who participated in the study. The characteristics of the children and their parents are shown in Table 4. The average father's age was similar to the average mother's age. Both mothers and fathers had a variety of working hours which met the criteria for the study of parents working greater than or equal to 15 hours per week. Fathers worked more hours/week than the mothers.

Table 4. Characteristics of the children and their families (n=146).

Variable	mean	range	standard deviation
Child's Age (months)	36.34	26-45	5.46
Family Size (# of adults and children)	4.04	3-8	0.78
Father's Age (years)	35.99	24-51	4.75
Mother's Age (years)	33.78	22-45	4.34
Father's Work (hrs/wk)	44	23-91	9.45
Mother's Work (hrs/wk)	35	15-78	8.77
Number of children (<6 years)	1.41	1-3	0.52

The parents' education, occupation and family income before taxes is shown in Figures 1-5. The pie charts indicate the distribution of responses for those who

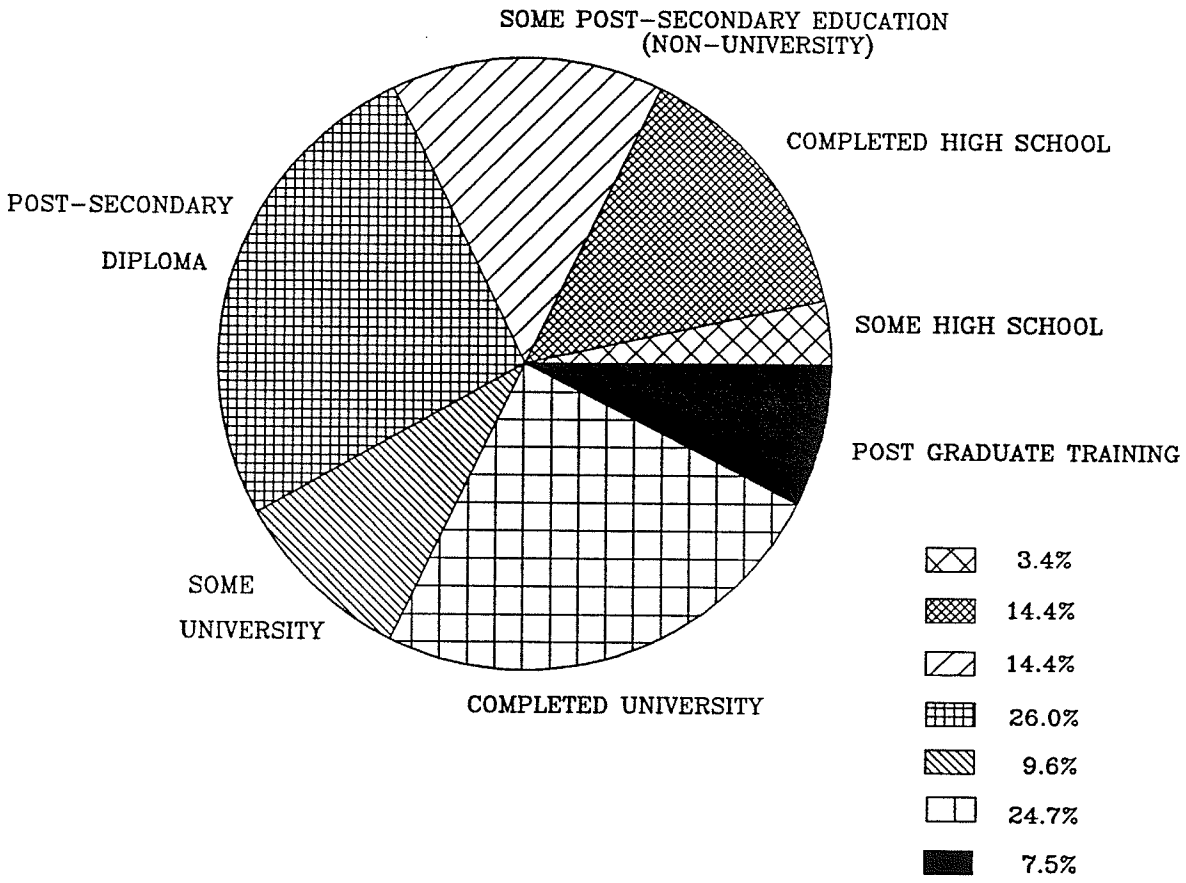

FIGURE 1

DISTRIBUTION OF MOTHER'S EDUCATION

(N=146)

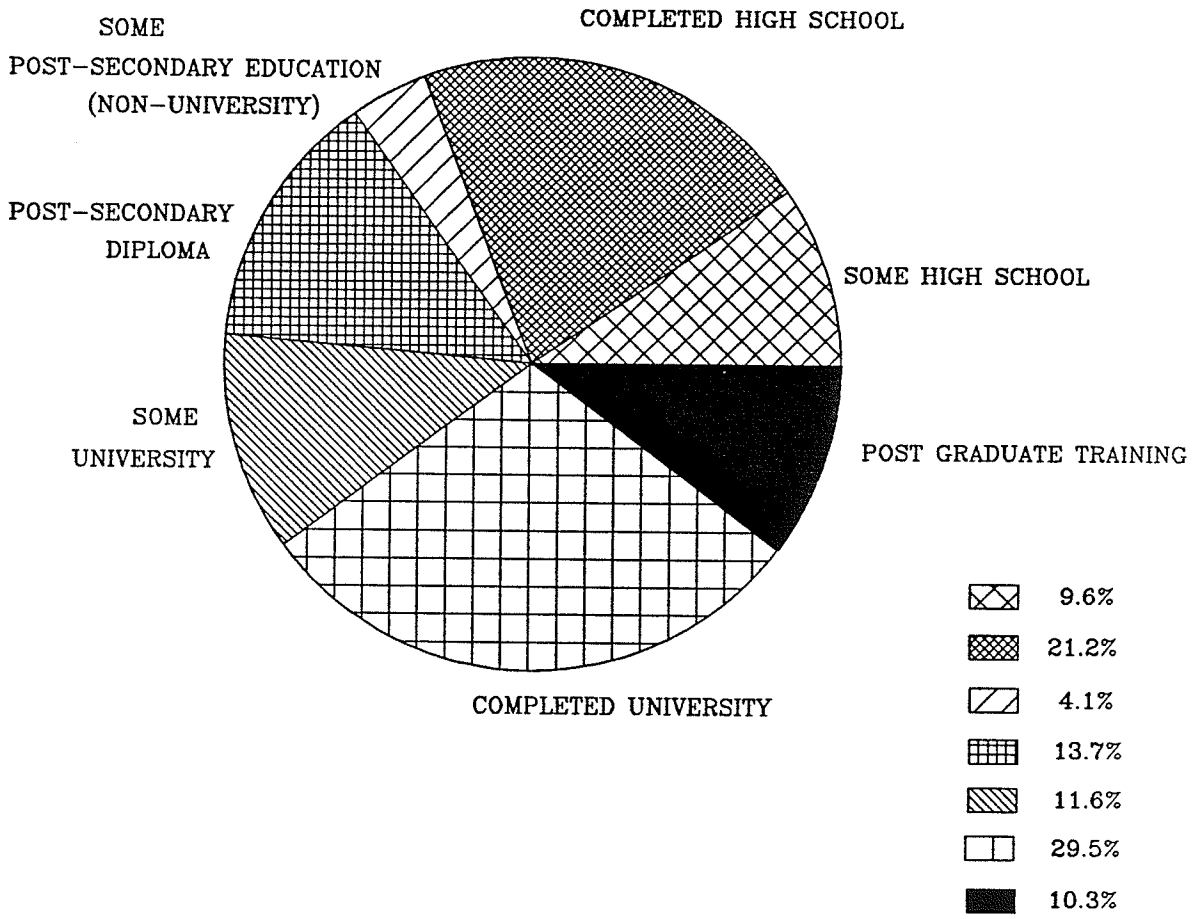

FIGURE 2

DISTRIBUTION OF FATHERS' EDUCATION

(N=146)

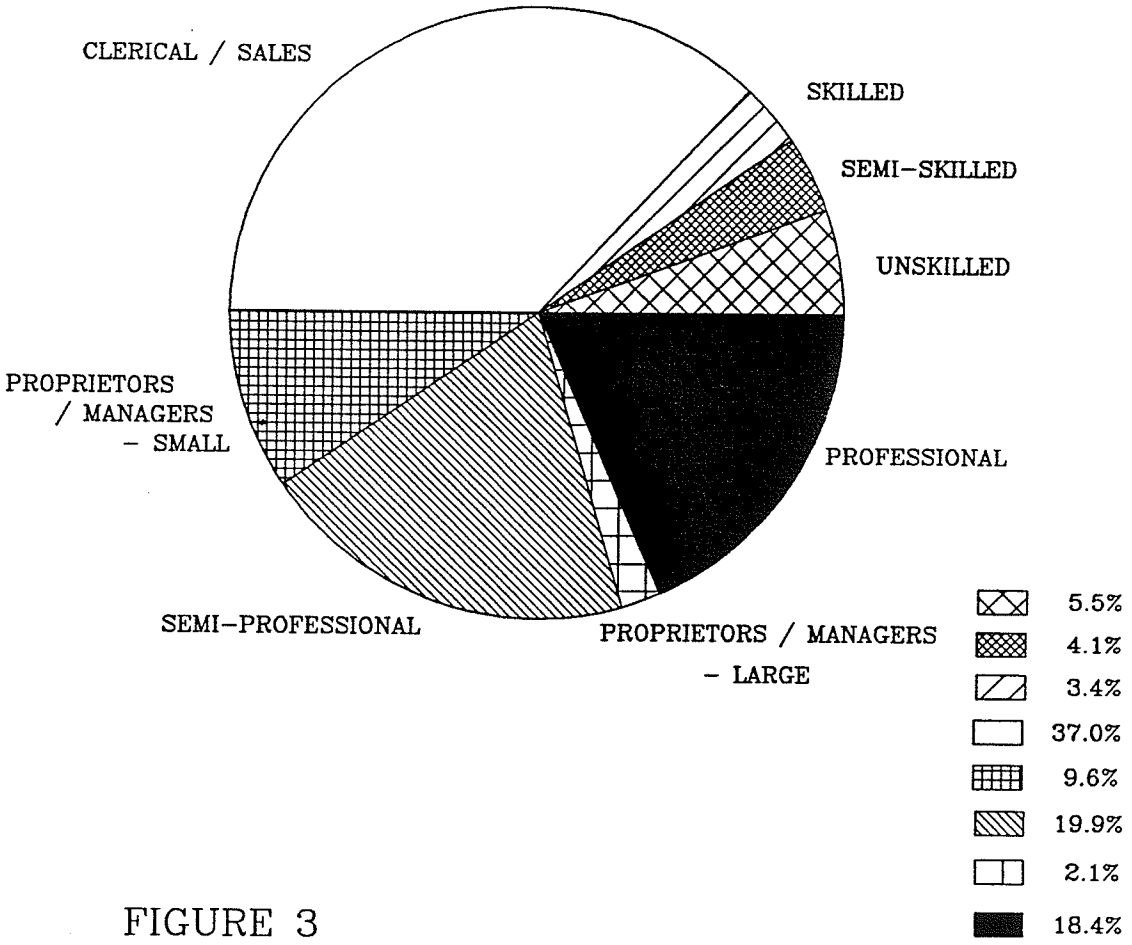

FIGURE 3

DISTRIBUTION OF MOTHERS' JOB DESCRIPTIONS

(N=146)

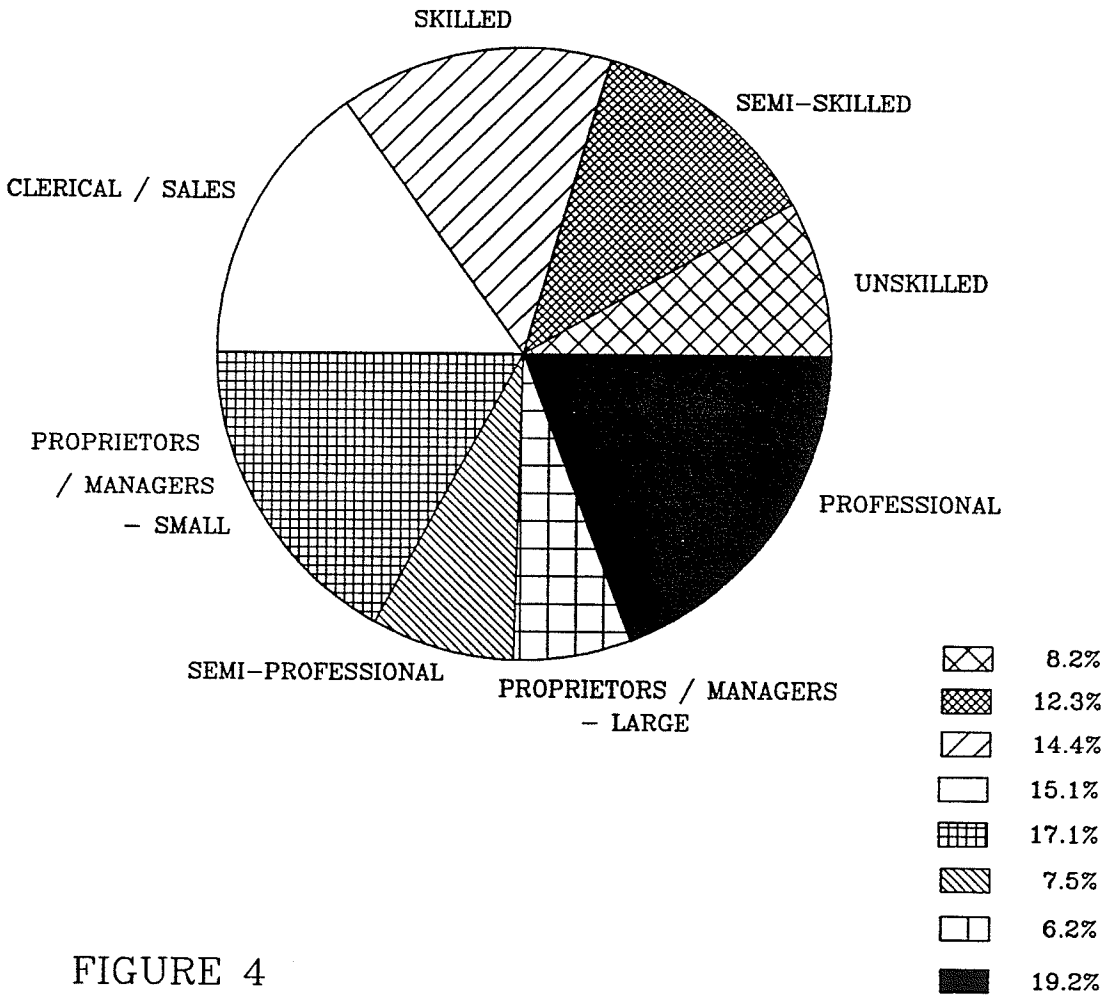

FIGURE 4

DISTRIBUTION OF FATHERS' JOB DESCRIPTIONS

(N=146)

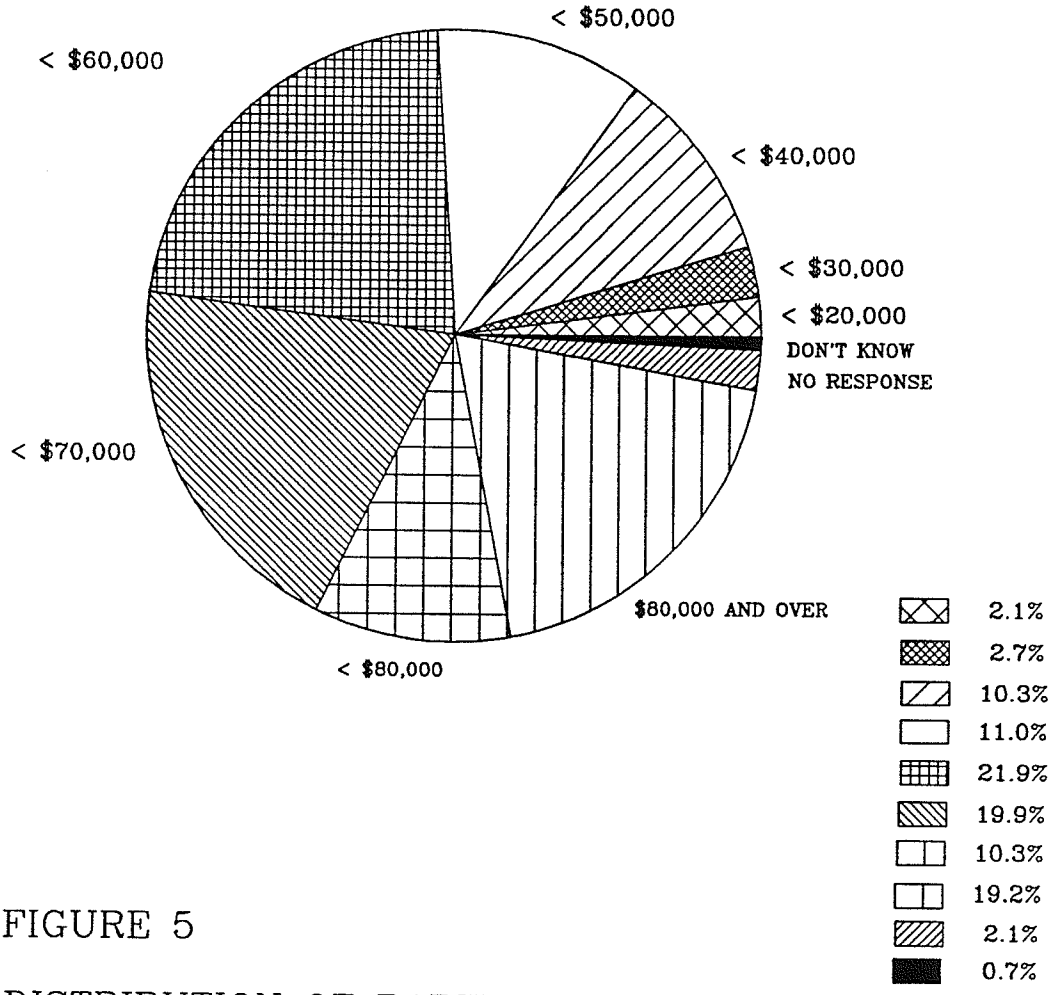

FIGURE 5

DISTRIBUTION OF PARTICIPANTS'

TOTAL FAMILY INCOME BEFORE TAXES

(N=146)

participated in the study. The mothers' education had the majority of the proportion of responses represented by those having a post-secondary diploma (26%) and those who completed university (24.7%). Fathers' education had the majority of the proportion of responses represented by those who completed university (29.5%) and those who completed high school (21.2%). The majority of mothers' jobs were described as clerical or sale positions (37%). In comparison, the fathers' jobs were more evenly proportioned for semi-skilled, skilled, clerical and sales, proprietors/managers - small and professional job descriptions (12.3-19.2%). The majority of parents indicated their total family income to be less than $60,000.00 (21.9%) or at least $80,000.00 (19.2%).

The average duration of the present child care arrangement was 18 months $\pm$ 11.84 (mean $\pm$ standard deviation). The average number of different child care arrangements that the preschool child had since the child was born was 1.8 $\pm$ .99 (mean $\pm$ standard deviation). The majority of child care arrangements were day care centers or private care in a home (Table 5).

The parents indicated that their preschoolers ate an assortment of meals and snacks with the caregivers. This usually was morning and afternoon snacks and a lunch. Of the children, 24.7% ate breakfast with the caregivers; 82.2% a morning snack; 97.9% a lunch; 87.7% an afternoon snack; 3.4% a supper; and 0% an evening snack.

Table 5. Type of child care arrangement of the children (n=146).

Type of Child Care	Frequency
Day Care Center	34.2%
Care in Own Home - by child's sibling	0%
Care in Own Home - by relative	8.9%
Care in Own Home - by non-relative	12.3%
Care in Someone Else's Home - by a relative	16.4%
Care in Someone Else's Home - by a non-relative	33.6%
Other	0.7%

5.2 Nutrient Intake

The preschool children in this study had comparable mean intakes of energy and nutrients to the RNI's for most nutrients and energy (Table 6). The mean intake of all nutrients was greater than the RNI's. Protein (44g), Vitamin C (129.09mg) and folate (117.31mcg) differed greatly. Further assessment of nutrient intake is required in order to determine the how they compared to the RNI's, such as determining the probability of nutrient deficiencies and the ability of the method to correctly classify individuals into quintiles.

Table 6. Six Day Mean Intake of Energy and Nutrients of Preschoolers (24-47 months) Compared to the Recommended Nutrient Intakes for Canadians (RNI) (n=146).

Nutrient	Mean ± Standard Deviation	RNI [1]
Energy (kcal)	1324.90 ± 299.46	1300
Protein (g)	44 ± 13.25	16
Iron (mg)	8.03 ± 2.70	6.0
Calcium (mg)	716.41 ± 270.33	550
Vitamin C (mg)	129.09 ± 68.62	20
Thiamin (mg)	.89 ± .35	0.6
Riboflavin (mg)	1.19 ± .36	0.7
Niacin (NE)	16.75 ± 5.75	9.0
Vitamin A (RE)	660.13 ± 595.91	400
Folate (mcg)	117.31 ± 53.12	50

[1] RNI values for 2-3 year old children.

5.3 Response Rate

Information pertaining to all potential participants was gathered in order to provide response rate information (Table 7). A successful contact was classified as a completed telephone questionnaire. An unsuccessful contact occurred when there was no answer, telephone line was not working or the family had moved. The category of "no answer" meant that a minimum of eight calls was made to each subject letting the phone ring eight times before terminating each attempt. Tyebjee (1979) showed that four calls, letting the phone ring eight times, and spacing the calls throughout the day were sufficient to minimize non-response due to no one at home.

Of those contacted, they were classified as eligible or ineligible. Of those who could be contacted by phone and were eligible to participate, 62.6% agreed to participate (# who agreed to participate/(# parents who refused + # caregivers who refused + # who agreed to participate)). Subjects were ineligible if there was no caregiver involved; a language problem; one parent not working or not married or living common law; child on a special diet or had medical problems; or refused to participate.

5.3.1 Nonresponse Rate

Nonresponse occurred at various points in the survey (Table 7). Of the eligible parents, 30% refused to participate (# parents who refused/# eligible parents) for reasons such as being "too busy". Parent non-participation was higher in this study of two-working parent families (30%) than that of a study on single parent families (17%) also looking at the eating habits of preschool children (Campbell et al., 1993, 1991). Some

Table 7. Response rate.

Description of Responses	Number
TOTAL # NAMES FROM MHSC	3500
# PHONE NUMBERS OBTAINED	2015
# LETTERS SENT FOR PRETEST	218
# LETTERS SENT FOR FINAL STUDY	1264
# LETTERS RETURNED/MOVED - FINAL STUDY	56
# NOT REACHED BY PHONE - FINAL STUDY	126
# CONTACTED BY PHONE - FINAL STUDY	1082
# ELIGIBILITY COULD NOT BE DETERMINED	37
# DID NOT MEET STUDY CRITERIA	743
# REFUSED TO PARTICIPATE	91
# AGREED TO PARTICIPATE BUT CAREGIVER REFUSES	22
# AGREED TO PARTICIPATE	189
TIME 1: # AGREED TO PARTICIPATE	189
# REFUSE TO PARTICIPATE/CONTINUE	4
# POOR RECORDS THAT ARE REJECTED	22
# PARENT RECORDS REJECTED	14
# CAREGIVER RECORDS REJECTED	6
# PARENT & CAREGIVER RECORDS REJECTED	2
TIME 2: # AGREED TO PARTICIPATE	146
# REFUSE TO PARTICIPATE -PARENTS	6
# REFUSE TO PARTICIPATE -CAREGIVER	2
# POOR RECORDS THAT ARE REJECTED	1
# PARENTS WHO ARE INELIGIBLE	8

possible reasons for the higher nonresponse rate may be due to male heads of the house influencing participation and two, three-day records were required. Caregiver refusal was also greater in the present study than the single parent study (Campbell et al., 1993).

There were 91 people who refused to participate in this study (Table 7). Of the 91, 20 refused to answer the screening questions, and 41 refused to answer the nonresponder telephone questionnaire (Table 7). In addition twenty-two caregivers refused to participate. Another component of the overall nonresponse was unacceptable records at Time 1 and 2. Unacceptable records were records that did not have three days of food intake or the record included non-typical days (eg. the child was sick or there was a special occasion on one of the three days). The parents and caregivers who provided unacceptable food records were asked to complete another food record on another day but not all did so. However, 12% of those who agreed to participate had unacceptable records (# of poor records that are rejected in Time 1 and Time 2/total # of those who agreed to participate at Time 1).

Nonresponder information which was gathered from the nonresponder telephone questionnaire was tallied and compared to participants using the Chi Square test. The nonresponder telephone questionnaire asked similar questions as the participant telephone questionnaire. It appeared that some characteristics (ie. income $p=.005$, mother's education $p=.007$ and fathers' job description $p=.03$) of the nonresponse group is different from the participants in the study (using $p<.05$). The mother's education is compared for the participants and the nonresponders in Figure 6. Income is also compared for the participants and the nonresponders in Figure 7. The differences indicate that the sample may not be representative of the target population (Table 8). Inferences can still be made to the population from which the sample was drawn because a random sample was used, although the inferences must be made cautiously because the

sampled population may differ in some respects from the target population.

The meals eaten at the caregivers by nonresponders were also compared to the participants (Table 9). There were significant differences between the two groups for all meals and snacks (using the Chi Square test and $p < .05$ significance). The frequency of morning and afternoon snacks as well as lunch eaten with the caregiver for the participants was greater than the nonresponders. The frequency of breakfast and dinner eaten with the caregiver for nonresponders was greater than the participants.

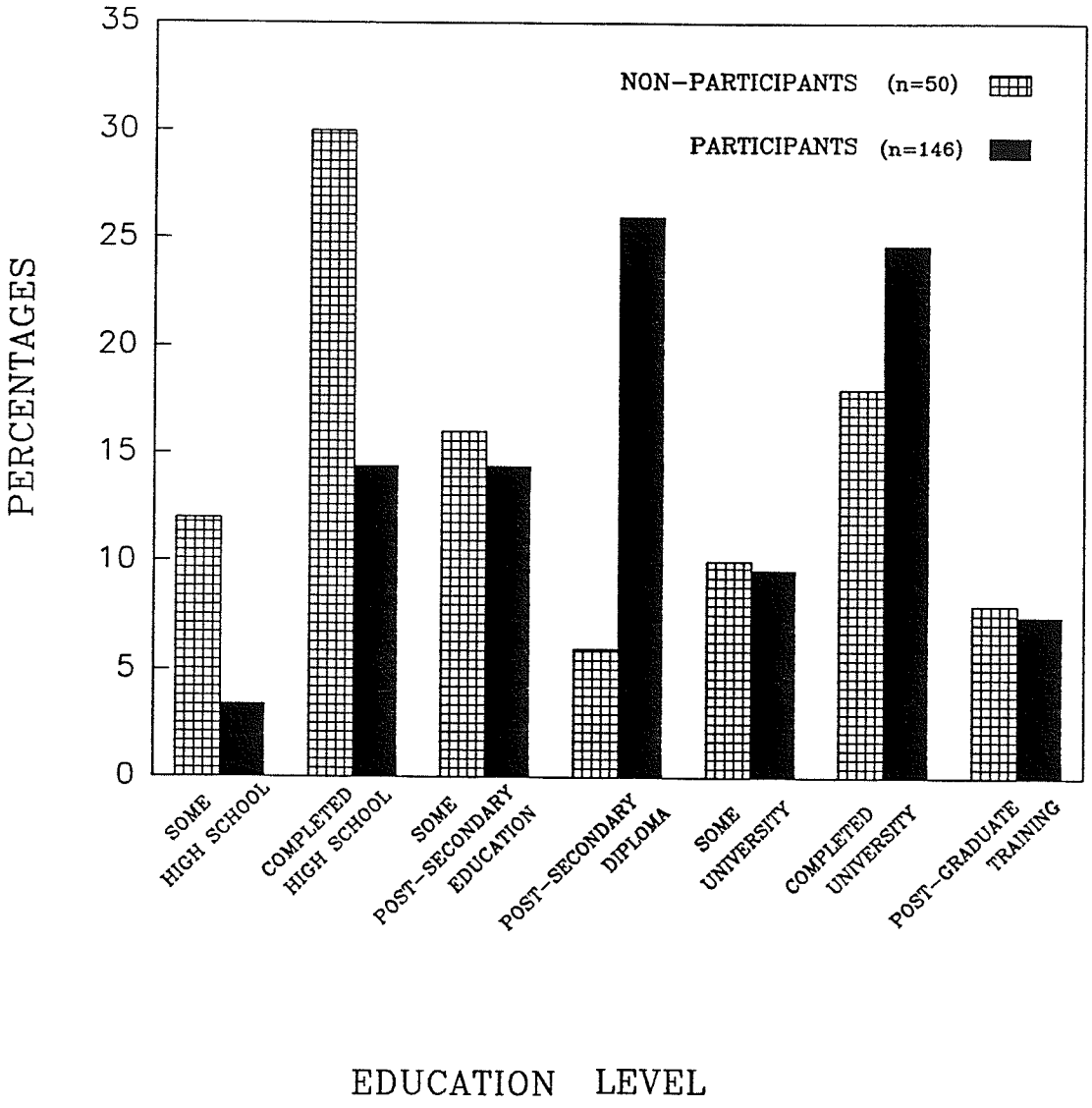

FIGURE 6

MOTHERS' EDUCATION OF PARTICIPANTS AND NON-PARTICIPANTS

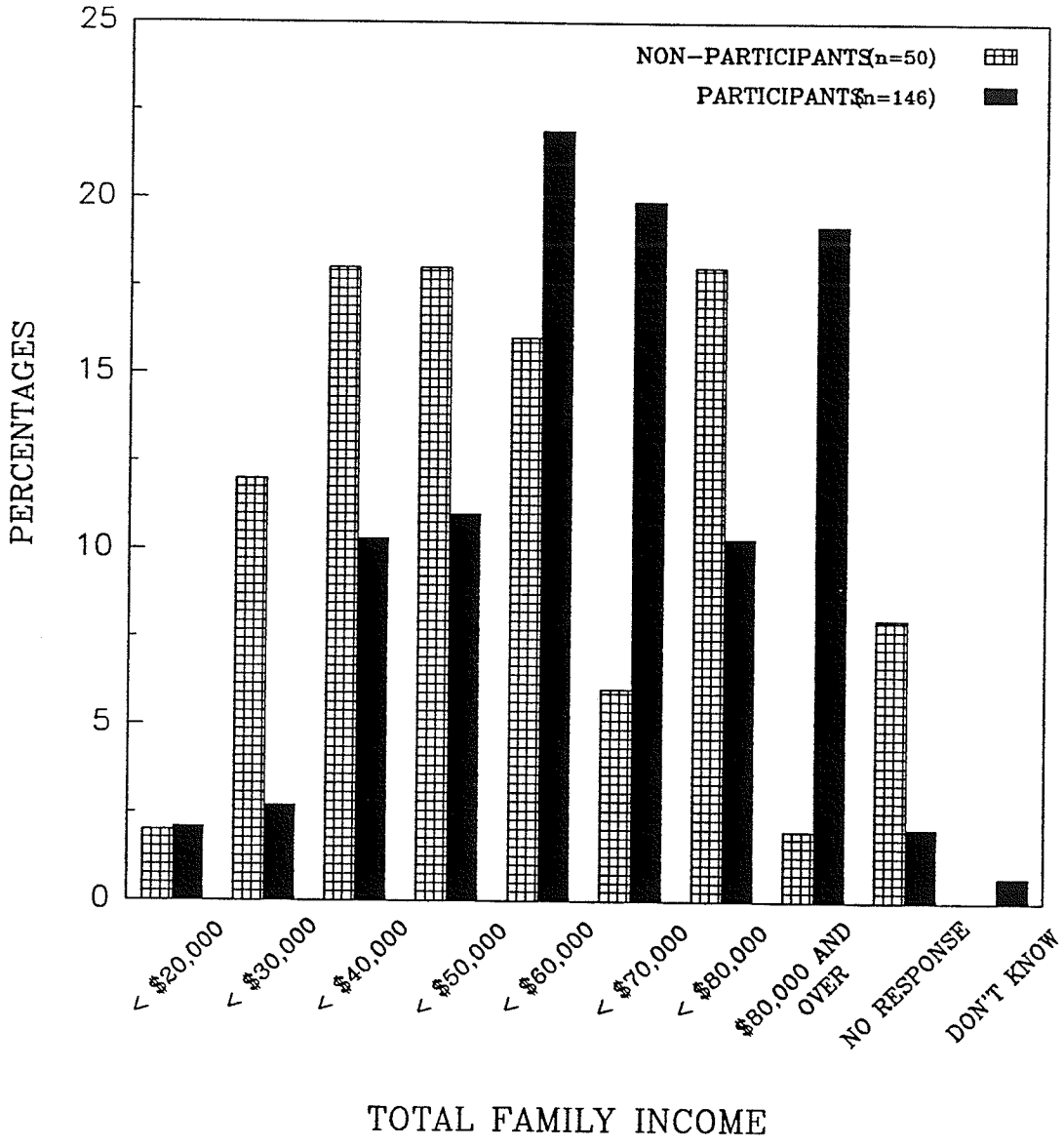

FIGURE 7

TOTAL FAMILY INCOME BEFORE TAXES OF PARTICIPANTS AND NON-PARTICIPANTS

Table 8a. Demographic comparison of nonresponders and participants.

Demographic Variable of Interest	Nonresponders (n=50) %	Participants (n=146) %
Education: mother		
some high school	12.0	3.4
completed high school	30.0	14.4
some post-secondary education (non-university)	16.0	14.4
post-secondary diploma	6.0	26.0
some university	10.0	9.6
completed university	18.0	24.7
post-graduate training	8.0	7.5
Chi square=17.8: p=.007		
Education: father		
some high school	8.0	9.6
completed high school	38.0	21.2
some post-secondary education (non-university)	12.0	4.1
post-secondary diploma	8.0	13.7
some university	10.0	11.6
completed university	16.0	29.5
post-graduate training	8.0	10.3
Chi square=11.9: p=.06		
Job Description: mother		
unskilled	6.0	5.5
semi-skilled	10.0	4.1
skilled	6.0	3.4
clerical/sales	44.0	37.0
proprietors/managers -small	2.0	9.6
semi-professional	6.0	19.9
proprietors/manager -large	0	2.1
professional	26.0	18.4
Chi square=12.6: p=.05		
Job Description: father		
unskilled	4.0	8.2
semi-skilled	28.0	12.3
skilled	18.0	14.4
clerical/sales	22.0	15.1
proprietors/managers -small	18.0	17.1
semi-professional	0	7.5
proprietors/managers -large	2.0	6.2
professional	8.0	19.2
Chi square=15.8: p=.03		

Table 8b. Demographic comparison of nonresponders and participants.

Demographic Variable of Interest	Nonresponders (n=50) %	Participants (n=146) %
Income before taxes:		
under $20,000	2.0	2.1
under $30,000	12.0	2.7
under $40,000	18.0	10.3
under $50,000	18.0	11.0
under $60,000	16.0	21.9
under $70,000	6.0	19.9
under $80,000	18.0	10.3
$80,000 and over	2.0	19.2
no response	8.0	2.1
don't know	0	0.7
Chi square=26.3: p=.005		

Table 9. Frequency of children eating meals and snacks at caregivers by nonresponders and participants.

Meals Eaten at Caregivers	Nonresponders (n=71) %	Participants (n=146) %
Breakfast:		
yes	33.8	24.7
sometimes	5.7	15.1
no	57.7	60.3
no response	2.8	0
Chi Square=16.4, p=.0009)		
AM Snack:		
yes	61.9	82.2
sometimes	8.5	15.8
no	26.8	1.4
no response	2.8	.7
Chi Square=49.6, p=.001)		
Lunch:		
yes	93.0	97.9
sometimes	1.4	1.4
no	2.8	.7
no response	2.8	0
Chi Square=12.6, p=.006)		
PM Snack:		
yes	66.2	87.7
sometimes	8.5	11.0
no	22.5	1.4
no response	2.8	0
Chi Square=43.8, p=.001)		
Dinner:		
yes	9.9	3.4
sometimes	7.0	8.2
no	80.3	88.4
no response	2.8	0
Chi Square=15.4, p=.002)		
Evening Snack:		
yes	2.8	0
sometimes	0	2.7
no	91.5	92.5
no response	5.7	4.8
Chi Square=13.0, p=.005)		

5.3.2 Distribution of Subjects

Table 10. Distribution of randomly assigned subjects.

Group	Number of Subjects	Period 1	Period 2
Group 1	86	Estimated Food Record	Estimated Food Record
Group 2	60	Estimated Food Record	Weighed Food Record

Table 10 shows the distribution of randomly assigned subjects into each group. Each group had the same subjects for both periods. Each group completed two food records, one at each Period. The type of food record was dependent on the group to which the individual was assigned. Group 1 had 86 subjects who completed the estimated food record during period 1 and period 2. Group 2 had 60 subjects who completed the estimated food record during period 1 and the weighed food record during period 2.

5.4 ANOVA

5.4.1 Assumptions of ANOVA model

The ANOVA model requires that the error terms have constant variance, are independent and have a normal distribution (Neter et al., 1990, p.609). In assessing if these requirements were met, any outliers were checked (Neter et al., 1990, p.609). The assumptions of ANOVA were tested using residual plots and normal probability plots of the residuals. Constant variability and independence were seen for the residuals for energy and each nutrient by using residual analysis in SAS. Any outliers were checked and a normal distribution was seen for the residuals for energy and each nutrient. Therefore the assumptions of the ANOVA model were met.

5.4.2 Coefficient of Determination and Coefficient of Variation

The model in this study explains approximately 50% of the total variability in the intake of energy and the nutrients of interest as indicated by the coefficient of determination (Table 11). The remainder of the variability is unexplained or the error term. In this case the day-to-day variation was the error term.

It is important to note that the unexplained day-to-day error may be due to factors beyond the day-to-day variation. As Gibson (1987) indicates, other sources of day to day variation may be due to day of the week, seasonal differences and/or training/sequence

Table 11. Results of whole and subplot ANOVA.

Nutrient		R^2 [1]	CV [2]	Mean [3]	Standard Deviation	Minimum	Maximum
Energy	Total[4]	.5085	.2260	1324.90	299.46	563.49	3518.91
	Grp 1[5]	.4958	.2265	1343.44	304.32	704.70	3518.91
	Grp 2[6]	.5223	.2252	1298.32	292.37	563.49	3323.60
Protein	Total	.4819	.3012	44.00	13.25	8.36	152.63
	Grp 1	.4400	.3056	45.63	13.94	9.98	152.63
	Grp 2	.5256	.2927	41.67	12.20	8.36	94.52
Carbohydrate	Total	.5146	.2455	191.54	47.01	71.78	517.09
	Grp 1	.5171	.2420	192.02	46.46	88.61	517.09
	Grp 2	.5111	.2504	190.86	47.80	71.78	506.06
Total Fat	Total	.4557	.3462	45.50	15.74	11.97	152.82
	Grp 1	.4576	.3445	46.57	16.04	12.24	152.82
	Grp 2	.4445	.3486	43.87	15.29	11.97	112.58
Iron	Total	.4628	.3361	8.03	2.70	1.57	27.72
	Grp 1	.4963	.3179	8.02	2.56	1.57	18.60
	Grp 2	.4204	.3605	8.05	2.90	1.64	27.72
Calcium	Total	.5408	.3773	716.41	270.33	50.06	2319.15
	Grp 1	.5169	.3565	761.34	271.40	88.16	1768.90
	Grp 2	.5446	.4122	652.01	268.78	50.06	2319.15
Vitamin C	Total	.5454	.5315	129.09	68.62	3.01	488.64
	Grp 1	.5918	.5278	126.02	66.52	3.01	488.64
	Grp 2	.4682	.5357	133.51	71.52	3.46	469.57
Thiamin	Total	.4698	.3947	.89	.35	.05	3.53
	Grp 1	.5263	.3641	.90	.33	.26	2.65
	Grp 2	.3963	.4355	.89	.39	.05	3.53
Riboflavin	Total	.5730	.3010	1.19	.36	.24	2.83
	Grp 1	.5641	.2836	1.25	.35	.24	2.65
	Grp 2	.5589	.3291	1.10	.36	.30	2.83
Niacin	Total	.4378	.3434	16.75	5.75	1.28	45.51
	Grp 1	.4185	.3440	17.18	5.91	5.31	45.51
	Grp 2	.4577	.3420	16.13	5.52	1.28	41.35
Vitamin A	Total	.3958	.9027	660.13	595.91	14.80	6056.04
	Grp 1	.4211	.8635	644.46	556.50	50.05	6056.04
	Grp 2	.3653	.9496	682.59	648.22	14.80	5418.92
Folate	Total	.4984	.4528	117.31	53.12	13.42	490.56
	Grp 1	.5071	.4686	115.57	54.15	23.03	490.56
	Grp 2	.4825	.4307	119.81	51.61	13.42	398.87

[1] coefficient of determination, [2] coefficient of variation, [4] Total(whole plot model), G1 and G2 calculated for six days(subplot model), [4] n=146, [5] n=86, [6] n=60

effects. These were controlled by using non-consecutive days to reduce the sequence effect and attempting to obtain data in one season to reduce seasonal effects. Some subjects did record in the beginning of the next season due delays related to work schedules and holidays. In this model the day-to-day variation is used as the error term in ANOVA because this was the bottom line observation as it was the replication within a subject.

The coefficient of variation is the standard deviation expressed as a percentage of the mean. It determines how consistent the nutrient and energy values are across people, days, periods and groups. The coefficient of variation is a useful calculation for comparison across the nutrients (Hassard, T., 1991, pp.81). The smaller the coefficient of variation the more consistent, or stable, the nutrient was in the study. Energy was the most stable (.23) while vitamin A had the highest coefficient of variation (.90) (Table 11). The macronutrients were also stable as the coefficient of variation ranged from .25 for carbohydrate to .35 for fat. The coefficient of variation for the micronutrients ranged from .34 for iron to .90 for vitamin A.

5.4.3 Whole plot of ANOVA

The main effects of the split plot design were investigated using the general linear model (SAS Version 6.0) for energy and each nutrient. The Group*Period interaction term was significant ($p<.05$) for energy ($p=.0003$) and most nutrients except iron ($p=.8183$) and vitamin C ($p=.2991$) (Table 12). This indicated that the main effects model of the split plot design was no longer applicable because the effect of the period

was not the same in the two groups for all nutrients except iron and vitamin C. Therefore, for the rest of the analysis, the subplots in the split plot design were investigated for energy and each nutrient.

Table 12. Significance level for terms in the main effects model for energy and nutrients.

Nutrient	SUBJECT* PERIOD (GROUP)	GROUP* PERIOD	PERIOD	SUBJECT (GROUP)	GROUP
Energy	.3777	.0003	NA	.0001	NA
Protein	.6115	.0001	NA	.0001	NA
Carbohydrate	.3311	.0164	NA	.0001	NA
Total Fat	.6465	.0020	NA	.0001	NA
Iron	.2694	.8183	.8688	.0001	.9105
Calcium	.8844	.0002	NA	.0001	NA
Vitamin C	.9810	.2991	.0001	.0001	.4276
Thiamin	.2573	.0045	NA	.0001	NA
Riboflavin	.1412	.0001	NA	.0001	NA
Niacin	.8762	.0013	NA	.0001	NA
Vitamin A	.9986	.0086	NA	.0001	NA
Folate	.9271	.0071	NA	.0001	NA

NA = not appropriate test given the significant GROUP*PERIOD interaction.

Subjects in the two groups, however, did have a similar intake of energy and nutrients at period 1. A two-sided t-test was performed to determine if the mean intake for energy and nutrients of Group 1 and Group 2 at period 1 were statistically different. The analysis showed that the two groups were similar, p-values ranged from .0685 for vitamin A to .8380 for thiamin. This indicated that the random assignment of the subjects

into the two groups did maintain group equality. Thus the two groups were comparable at the beginning of the study (period 1).

5.4.4 Subplot of ANOVA

The smaller effects of the subplots in the split plot design were investigated for energy and each nutrient of interest because the effect of the period was not the same in each group. The Subject term was significantly different from zero for energy and each nutrient in both groups using $p<.05$ (Table 13). The p-values were small ranging from .0001 to .004. Therefore the energy and nutrient intakes are variable for subjects among periods in both Group 1 and Group 2.

The Subject*Period term, however, was not significantly different from zero for energy ($p=.3777$) and each nutrient in both groups (Table 13). P-values ranged from a low of $p=.0772$ for protein to a high of $p=.9936$ for vitamin C (Table 13). This indicates that the effect of the period within a group was consistent from subject to subject. In the absence of a significant subject*period interaction, the effect of period was examined. This was done for the periods in each group.

Table 13. Significance level for terms in the subplot effects ANOVA model for energy and nutrients.

Nutrient	Group	SUBJECT*PERIOD	PERIOD	SUBJECT
Energy	1[1]	.7360	.0197	.0001
	2[2]	.1112	.0079	.0005
Protein	1	.9278	.0246	.0001
	2	.0772	.0011	.0013
Carbohydrate	1	.3771	.8580	.0001
	2	.3647	.0045	.0001
Total Fat	1	.8383	.0003	.0001
	2	.2679	.3016	.0085
Iron	1	.4291	.7385	.0001
	2	.2441	.9694	.0400
Calcium	1	.8084	.1418	.0001
	2	.7829	.0004	.0001
Vitamin C	1	.7297	.0102	.0001
	2	.9936	.0002	.0001
Thiamin	1	.0903	.1554	.0001
	2	.6360	.0137	.0138
Riboflavin	1	.2737	.0134	.0001
	2	.1651	.0003	.0001
Niacin	1	.9759	.0266	.0001
	2	.2921	.0253	.0042
Vitamin A	1	.8837	.0627	.0001
	2	.9988	.0573	.0001
Folate	1	.4263	.3142	.0001
	2	.8843	.0040	.0001

[1]n=86
[2]n=60

5.5 Reliability

Group 1 was analyzed to test the reliability of the 3-day estimated food record for energy and the nutrients of interest using the subplot ANOVA (Table 13). If the estimated record was reliable, it was expected that there would be no significant difference between mean intakes at period 1 and 2.

The overall mean intakes of Group 1 for energy and each nutrient is provided in Table 11. The difference between means in the two periods in Group 1 were not significantly different from zero for carbohydrate, iron, calcium, thiamin and folate (Table 13). This would indicate that the three-day estimated food record is reliable for measuring these nutrient intakes for a group of preschool children.

The difference between the means in the two periods in Group 1 which used the same method were statistically different from zero for energy ($p=.0197$), protein ($p=.0246$), fat ($p=.0003$), vitamin C ($p=.0102$), riboflavin ($p=.0134$), and niacin ($p=.0266$) (Table 13). The statistical differences may reflect an unreliable method or small differences that are detected with the power available in the study.

Nutrient intakes may change due to daily variations and therefore may not necessarily reflect an imprecise method (Block, 1982). The magnitude of these differences must be considered to determine if they are large enough to be practically important in conclusions about the reliability of the method. The magnitude of the difference between means will be discussed to determine if it is large enough to be considered of practical importance. The practical importance will be discussed in terms

of magnitude of the difference between means as a percentage of the mean differences between periods taken as a percentage of period 1. In addition, the width of the confidence intervals will be considered and the magnitude of the upper and lower bounds of the Confidence interval will be examined. The latter represent the smallest and largest hypothesized values of the true difference between means that would not be considered statistically different at the $p < .05$ level of significance.

The mean average intake of energy and each nutrient for each period in Group 1 is found in Table 14. Examination of the means for period 1 and period 2 in Table 14 shows that period 2 was greater than period 1 for energy and all nutrients but vitamin C where period 1 was greater than period 2.

The magnitude of the difference between the means in Group 1 is found in Table 14. These differences are less than those projected as the practical criteria for unreliability in Table 3B. In other words, if the magnitude of the difference found was greater than the magnitude of the difference considered of practical importance for energy and the nutrients in Table A, then the difference would be considered of practical importance for preschool children.

The differences between the two periods were measured as a percentage of the mean at period 1 for energy and all nutrients (Table 14). For those nutrients that were not significantly different from zero for the mean difference between the two periods (carbohydrate, iron, calcium, thiamin, and folate), the difference was 6% or less (Table 14). This supports the reliability of the three-day estimated record for these nutrients.

For the nutrients where the difference between means in the two periods was

Table 14. Three-day mean intake of energy and nutrients (± standard deviation) obtained by the estimated record at period 1 and period 2 and the absolute mean difference between the two periods with corresponding 95% confidence intervals for Group 1 (n=86).

Nutrient	Period 1 Mean (SD)[1]	Period 2 Mean (SD)	Mean Difference[2]	Percent[3] Difference	95% Confidence Intervals
Energy (kcal)	1313.38 (±327.77)	1373.50 (±369.61)	60.12	4.6	[7.61 : 112.64][4] [-426.88 : 547.12][5]
Protein (g)	44.39 (±15.31)	46.86 (±15.08)	2.47	5.6	[0.057: 4.87] [-19.85 : 24.77]
Carbohydrate (g)	191.64 (±54.24)	192.39 (±55.15)	0.75	0.4	[-7.46 : 8.96] [-75.39 : 76.89]
Total Fat (g)	44.15 (±16.16)	48.98 (±19.03)	4.83	10.9	[2.07 : 7.61] [-20.84 : 30.50]
Iron (mg)	7.98 (±2.95)	8.05 (±2.92)	0.07	0.9	[-0.37 : 0.52] [-3.36 : 4.89]
Calcium (mg)	744.97 (±313.84)	777.71 (±323.33)	32.74	4.4	[-14.09 : 79.58] [-401.59 : 467.07]
Vitamin C (mg)	133.30 (±89.11)	118.74 (±80.38)	-14.56	10.9	[-26.04 : -3.08] [-121.00 : 91.90]
Thiamin (mg)	0.87 (±.39)	0.92 (±.38)	0.05	5.8	[-0.017: 0.11] [-0.53 : 0.63]
Riboflavin (mg)	1.20 (±.42)	1.29 (±.45)	0.09	7.5	[0.018: 0.15] [-0.51 : 0.67]
Niacin (NE)	16.69 (±6.34)	17.67 (±6.31)	0.98	5.9	[-0.039: 2.00] [-8.48 : 10.44]
Vitamin A (RE)	602.97 (±479.99)	685.95 (±694.40)	82.98	13.8	[-13.05 : 179.02] [-807.60 : 973.56]
Folate (mcg)	113.12 (±60.13)	118.01 (±65.84)	4.89	4.3	[-4.58 : 14.36] [-82.90 : 92.66]

[1] SD=standard deviation
[2] Difference = Period 2 - Period 1
[3] difference between means as a percentage of the period 1 mean
[4] corrected for the paired difference between means, n=86
[5] corrected for the paired difference between means, n=1.

Table 15. Power analysis for 11 nutrients and energy.

Nutrient	Group	Power for 20% unit change	Standard Deviation[1]	80% Power to detect average change between two periods
Energy (kcal)	1[2] 2[3]	.99 .98	252.74 247.08	160 190
Protein (g)	1 2	.97 .86	10.79 10.26	7.0 7.5
Carbohydrate (g)	1 2	.99 .96	39.49 39.49	25 30
Total Fat (g)	1 2	.92 .83	12.43 11.23	8.0 8.5
Iron (mg)	1 2	.94 .84	2.08 2.03	1.3 1.5
Calcium (mg)	1 2	.83 .51	237.11 244.82	150 180
Vitamin C (mg)	1 2	.40 .38	66.55 60.34	42 45
Thiamin (mg)	1 2	.36 .74	.51 .26	.32 .20
Riboflavin (mg)	1 2	.93 .70	.33 .33	.20 .25
Niacin (mg)	1 2	.93 .83	4.50 4.11	2.75 3.0
Vitamin A (mg)	1 2	.29 .19	412.55 480.43	255 360
Folate (mcg)	1 2	.64 .55	45.04 42.84	28 32

[1] corrected from the covariance terms determined from the form of the expected mean squares reflecting the paired nature of the observed data, corrected standard deviation calculation found in Appendix H.
[2]n=86
[3]n=60

significantly different from zero (energy, protein, total fat, vitamin C, riboflavin, and niacin), the difference was 5-11% higher in period 2 than period 1 except for vitamin C which was 10% lower in period 2 than period 1. The smallest average difference between period 1 and 2 that can be detected with 80% power in this study is found in Table 15. These values are larger than the detected magnitude of the difference which indicates the power is strong to detect these small differences.

The true difference between the averages at period 1 and period 2 for the group level of assessment is between the boundaries provided for energy and each nutrient found in Table 14, 95% of the time. The confidence intervals for the difference between group means were narrow for energy and all nutrients.

Confidence intervals for the true difference between an individual's mean intake at period 1 and period 2 were wider than the confidence intervals for the difference in mean intakes for all children (Table 14). This indicates that the uncertainty of estimating the difference between periods for an individual is large.

There was good agreement between group mean intakes at period 1 and 2 obtained with the three-day estimated record. The three day estimated record kept by parents and caregivers can be considered a reliable method for assessing the mean intake of a group for energy and the nutrients studied. However, the three-day estimated record provided less precise estimates of the difference between individual mean intakes compared to group mean intakes of the nutrients studied due to the large intrasubject variation.

An example using the reliability criteria suggested in this study follows. The

difference in mean intakes of protein for each period in Group 1 appears to be statistically different from zero in Table 13. From Table 3B, any difference between means greater than 15g for protein would be considered of practical importance. The magnitude of the difference found in this study was 2.47 for Group 1. The confidence interval does not enclose 15g and indicates approximately 5g as the upper limit. These upper limits guided the determination of the practical importance of the method in terms of reliability. The three day estimated record appears to be a reliable method for a group of preschool children due to the criteria suggested for reliability when a comparison is made of the magnitude (2.5g) of the difference between means (Table 14) to those suggested in Table 3B, the smallest detectable difference with 80% power and the width of the confidence interval are considered.

These comparisons can also be repeated for each nutrient. However, the practical importance of the differences are subjective in nature. Using the criteria suggested in the previous example, the three-day estimated food record can be considered a reliable method of measuring the intake of energy and selected nutrients for a group of preschool children. However, it does appear to be an unreliable method of measuring small group differences for those nutrients found to be significant (energy, protein, total fat, vitamin C, riboflavin and niacin). These inferences must be made cautiously, as no other research has documented the reliability of the three-day estimated food record of food intake of preschool children provided by employed parents and caregivers.

In comparison to a study by Treiber et al. (1990) with 3-5 year old children, significant positive correlations were identified only for carbohydrate and calcium in

relation to the nutrients investigated in our study for the test-retest method of the 24-hour recall. The mean nutrient intake was slightly higher than the present study which may be explained by the increased age of the children. This evidence suggests that the daily nutrient intakes of preschool children fluctuates. Possible explanations for the variability in reported intakes may reflect the true variability within subjects, or reflect various sources of measurement errors such as motivation, duration between two methods, and parental recall (Treiber et al., 1990).

5.6 Validity

Group 2 was analyzed to test the validity of the 3-day estimated food record for energy and the nutrients of interest using the subplot ANOVA (Table 13). If the estimated record was valid, it was expected that there would be no significant differences between mean intakes at period 1 and 2 for Group 2.

The overall mean intakes of Group 2 for energy and each nutrient is provided in Table 13. The difference between means in the two periods in Group 2 which used different methods (estimated record at period 1 and the weighed record at period 2) were not statistically different from zero for total fat and iron (Table 13). This indicates that the three-day estimated food record is valid for measuring these nutrient intakes for a group of preschool children.

The difference between the means in the two periods in Group 2 were statistically

different from zero for energy (p=.0079), protein (p=.0011), carbohydrate (p=.0045), calcium (p=.0004), vitamin C (p=.0002), thiamin (p=.0137), riboflavin (p=.0003), and niacin (p=.0253) and folate (p=.0040) (Table 13). The significant differences may reflect an invalid method or small differences that are detected with the power available in the study.

The mean average intake of energy and each nutrient for each period in Group 2 is found in Table 16. Examination of the means for period 1 and period 2 in Table 16 shows that period 1 was greater than period 2 for energy and all the nutrients. The magnitude of these differences must be considered to determine if they are large enough to be practically important in conclusions about the validity of the method. The magnitude of the difference between the means in Group 2 is found in Table 16. These differences are less than those projected as the practical criteria for an invalid method in Table 3B.

The differences between the two periods were measured as a percentage of the mean at period 1 for energy and all nutrients (Table 16). For those nutrients that were not significantly different from zero for the difference between means in the two periods for total fat and iron, the difference was 4% (Table 16). This supports the validity of the three-day estimated food record for measuring the total fat and iron for a group of preschool children.

For the nutrients where the difference between means in the two periods was significantly different from zero for (energy, protein, carbohydrate, calcium, vitamin C, riboflavin, thiamin, folate and niacin), the differences were 7-16% higher in period 1

Table 16. Three-day mean intake of energy and nutrients (± standard deviation) obtained by the estimated record at period 1 and the weighed record at period 2 and the absolute mean difference between the two periods with corresponding 95% confidence intervals for Group 2 (n=60).

Nutrient	Period 1 Mean (SD)[1]	Period 2 Mean (SD)	Mean Difference[2]	Percent[3] Difference	95% Confidence Intervals
Energy (kcal)	1346.06 (±376.65)	1250.58 (±305.76)	-95.48	7.1	[-163.49 : -27.47][4] [-622.25 : 431.29][5]
Protein (g)	44.21 (±15.89)	39.13 (±12.45)	-5.08	11.5	[-7.97 : -2.18] [-27.49 : 17.35]
Carbohydrate (g)	198.53 (±58.49)	183.18 (±52.20)	-15.35	7.7	[-25.54 : -5.17] [-94.25 : 63.55]
Total Fat (g)	44.77 (±18.05)	42.98 (±15.40)	-1.79	4.0	[-5.13 : 1.57] [-27.73 : 24.17]
Iron (mg)	8.05 (±2.87)	8.04 (±3.36)	-0.01	0.1	[-0.65 : 0.63] [-4.97 : 4.95]
Calcium (mg)	701.19 (±333.21)	602.82 (±311.14)	-98.37	14.0	[-153.90 : -42.84] [-528.50 : 331.76]
Vitamin C (mg)	145.04 (±83.54)	121.97 (±75.16)	-23.07	15.9	[-37.85 : -8.30] [-137.53 : 91.39]
Thiamin (mg)	0.93 (±.43)	0.84 (±.84)	-0.09	9.7	[-0.18 : 0.02] [-0.72 : 0.52]
Riboflavin (mg)	1.18 (±.49)	1.02 (±.38)	-0.16	13.6	[-0.24 : -0.078] [-0.79 : 0.47]
Niacin (NE)	16.84 (±6.88)	15.43 (±5.19)	-1.41	8.4	[-2.61 : -0.21] [-10.71 : 7.88]
Vitamin A (RE)	729.74 (±673.27)	635.44 (±655.68)	-94.30	12.9	[-228.22 : 39.62] [-1131.62 : 943.06]
Folate (mcg)	126.97 (±59.76)	112.66 (±56.79)	-14.31	11.3	[-24.97 : -3.65] [-96.89 : 68.28]

[1] SD=standard deviation
[2] Difference = Period 2 - Period 1
[3] difference between means as a percentage of the period 1 mean
[4] corrected for the paired difference between means, n=60
[5] corrected for the paired difference between means, n=1.

than period 2. The smallest average difference between period 1 and 2 that can be detected with 80% power in this study is found in Table 15. These values are largerthan the detected magnitude of the difference which indicates the power is strong to detect these small differences.

The true difference between the averages at period 1 and period 2 for the group level of assessment is between the boundaries provided for energy and each nutrient found in Table 16, 95% of the time. The confidence intervals for the difference between group means were wider than those from Group 1 for all nutrients. This indicates greater variability in Group 2 and may be a reflection of the different dietary methods used in Group 2. The magnitude of the lower and upper confidence bounds for energy and nutrients was not practically large to conclude the three-day estimated record is invalid.

Confidence intervals for the true difference between an individual's mean intake at period 1 and period 2 were wider than the confidence intervals for the difference in mean intakes for all children (Table 16). This indicates that the uncertainty of estimating the difference between periods for an individual is large.

There was good agreement between group mean intakes at period 1 and 2 obtained with the three-day estimated and weighed records. Therefore, the three day estimated record kept by parents and caregivers can be considered a valid method for assessing the mean intake of a group for energy and the nutrients studied. However, the three-day estimated record indicated less precise estimates of the difference between individual mean intakes compared to group mean intakes of the nutrients studied due to

the large intrasubject variation which is reflected in the width of the confidence intervals.

An example using the validity criteria suggested in this study follows. The mean intake of carbohydrate for each period in Group 2 appears to be statistically different from zero (Table 13). From Table 3B, the accepted difference between means for carbohydrate was 25g. The magnitude of the difference found in this study was 15.35g for Group 2. The confidence interval does enclose 20g with approximately 25g as the upper limit. These upper limits guided the determination of the practical importance of the method in terms of validity. The three day estimated record appears to be a valid method for a group of preschool children due to the criteria suggested for validity when a comparison of the magnitude of the difference between means (15.35g) (Table 16) to those suggested in Table 3B, the smallest detectable difference with 80% power and the width of the confidence interval are considered.

These comparisons can also be repeated for each nutrient. However, the practical importance of the differences are subjective in nature. Using the criteria suggested in the previous example, the three-day estimated record is a valid method for measuring the intake of energy and all nutrient studied for a group of preschool children in dual-earner families when both the parents and caregivers are involved in reporting. However, it does appear to be an invalid method for measuring small group differences for those nutrients found to be significant (energy, protein, fat, carbohydrate, vitamin C, iron, calcium, thiamin, riboflavin, niacin and folate).

The Leiden Pre-School study investigated the validity of the 24-hour recall for

energy and 8 nutrient intakes for children four to 28 months (Horst et al., 1988). The reference method was chemically analyzed duplicate portions. Information from both methods provided only by the parents were compared using paired t-tests and found significant differences between both methods, except iron and sodium. The 24-hour recall yielded higher values for all nutrients compared to the reference method (Horst et al., 1988). Similar to the present study, the researchers also calculated the difference between means as a percentage of the test method. They found smaller percent differences between means than the present study, however, different test and reference methods were also utilized by Horst et al. (1988).

In another study, the mean differences found by comparing a one-day food record to chemically analyzed duplicate portions were larger than those found in the present study for energy, fat, calcium and iron for a group of 13-year old children (Persson et al., 1984). They also found the record mean to be higher than the duplicate portion means. Persson (1984) concluded that the two methods generally agreed well using paired t-tests.

Ercel et al. (1952) examined nutrient intakes in school children using estimated records and weighed records. Interestingly, this study found the average nutrient intakes in weighed records to be less than the estimated records for all nutrients, similar to the present study. Even the difference between means of a one day estimated record and one day weighed record kept by parents was larger than that found in the present study. The differences were considered significant at the five percent level for energy, fat, calcium vitamin A and riboflavin.

Other research has found the underestimation of food intake determined using weighed food records by obese and normal weight adults validated against an external marker of energy intake (doubly labelled water) (Livingstone et al., 1990; van Staveren and Burema, 1990). This suggests that the weighed food record may underestimate nutrient intakes, as found in this study.

5.7 Intra- and Intersubject Variation

The form of the expected mean squares resulting from the split plot model suggests the form of the estimate of the variability within and between subjects. Table 17 found in Appendix K, shows the percent variability within and between subjects identified by the split plot design. The day-to-day variability identifies the day-to-day fluctuations for a subject within a period in each group. It can also be thought of as within subject variability (intrasubject variation). Some period variability across subjects was zero in Table 17. In this case, the variance was negative for some terms and therefore the estimate was set to zero in further calculations. The smaller the period variability across subject, the more consistent subjects are over periods. The subject to subject variability within groups indicate the variability of nutrient intakes between subjects within a group. The calculations of variability can be found in Appendix H.

The majority of the variability for both groups is attributed to the day to day fluctuations of energy and each nutrient for a subject within a period (Figure 8 and 9 for

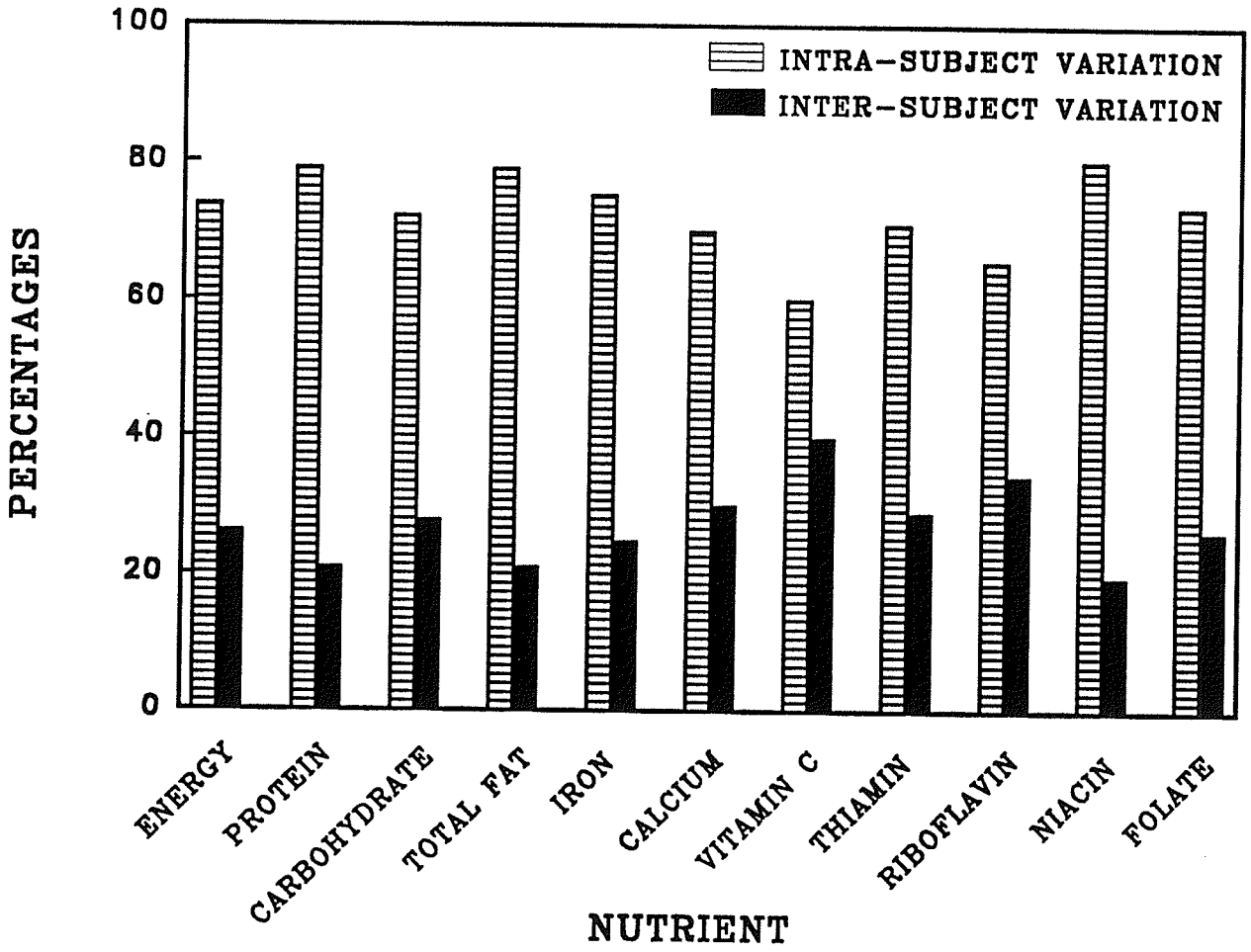

FIGURE 8. PROPORTION OF THE TOTAL VARIATION DUE TO INTRA- AND INTER-SUBJECT VARIATION IN GROUP 1

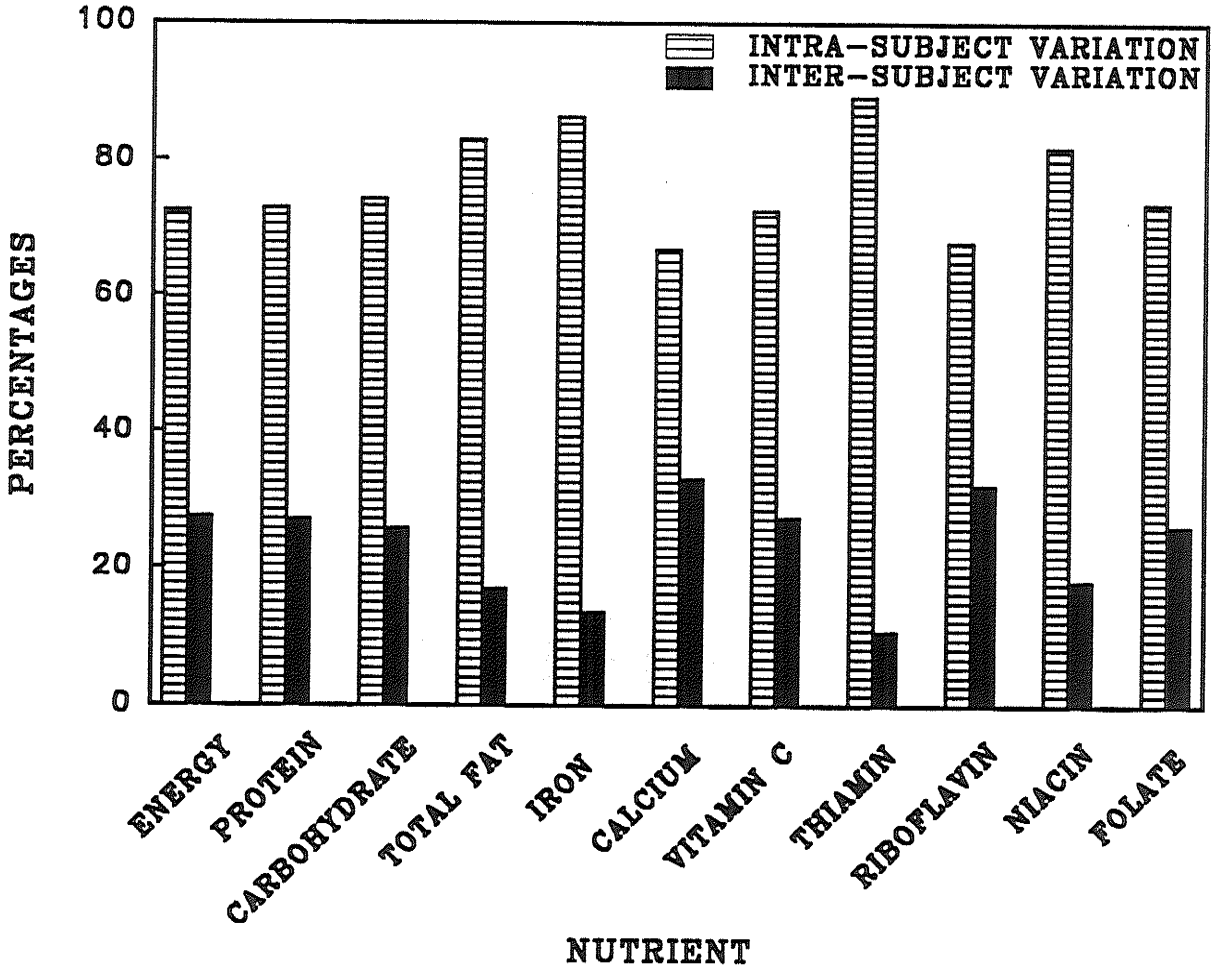

FIGURE 9. PROPORTION OF THE TOTAL VARIATION DUE TO INTRA- AND INTER-SUBJECT VARIATION IN GROUP 2

Group 1 and 2 respectively). The variability ranges from 60% for vitamin C in Group 1 to 89.2% for thiamin in Group 2 (Figure 8 and 9).

The variability of nutrient intakes between subjects within a group ranged from 0.5% for riboflavin in Group 2 to 40% for vitamin C in Group 1 (Table 17). This indicates that there was some variability in average energy and nutrient intake levels between subjects. Since the period variability across subjects is zero or very small (highest value of 7.7% for protein in Group 2) there is a very small amount of inconsistency for subjects over periods (Table 17). In other words the subjects are fairly consistent over periods. Period variability across subjects and variability of nutrient intakes between subjects (subject to subject variability within groups) are both components of between subject variation (inter-subject variation).

The intrasubject variation is greater than the intersubject variation for this preschool population. The intrasubject variation contributed the largest proportion of the total variation in intakes for both groups, ranging from 70-86% for most nutrients. The intersubject variation comprised a smaller proportion of the total variation ranging from 13-35% for most nutrients in both groups. Miller et al. (1991) also found the intra-subject variation to be greater than the inter-subject variation for energy and all nutrients for children (aged 5-14 years). Sempos et al. (1985) found intraindividual variation to be higher than interindividual variation in all nutrients for 151 women age 35 to 65 years.

The proportion of the total variation attributed to the three sources of variation was similar in Group 1 and Group 2 for energy and most nutrients with Group 1 having

a slightly higher proportion of intrasubject variation than Group 2. Only iron, thiamin and vitamin C had a considerably higher proportion of intrasubject variation in Group 2. This suggests that the proportion of variation was consistent in the two groups, even though different methods were used in Group 2, which strengthens the use of the three-day estimated food record as a valid and reliable instrument for measuring the intakes of energy and selected nutrients for preschool children.

Ratios of intrasubject:intersubject variation for energy and nutrients are shown in Table 18. The ratios of intra-/intersubject variation were similar to those of Miller et al. (1991) for energy and the macronutrients for 5-14 year old children in the United States. The ratios for the micronutrients were lower compared to those of Miller et al. (1991). Miller et al. (1991) obtained a range of food records (minimum 3 to a maximum of 23 records) throughout a two year period. Nelson et al. (1989) had slightly lower ratios for 1-4 year old children in Europe compared to those in the present study for energy and all nutrients. However, Nelson et al. (1989) obtained four, 7-day weighed records at 3, 6 and 12 month intervals using a different statistical model than the present study.

Despite a larger proportion of intra- to intersubject variation than Nelson et al.(1989), the subject term in the ANOVA model was significant ($p < .05$) for energy and all nutrients studied in Group 1 and Group 2 (Table 13). This suggests the ability to distinguish among subjects where only three measurement days of a food record were collected.

Table 18. Ratio of within-subject variation to between-subject variation for energy and nutrients.

Nutrient	Group	Within Subject Variation[1]	Between Subject Variation[2]	Within/ Between Ratio
Energy	1[3]	92607.65	33012.05	2.81
	2[4]	85481.92	32556.94	2.63
Protein	1	194.43	51.71	3.76
	2	148.80	55.62	2.68
Carbohydrate	1	2158.91	839.69	2.57
	2	2284.37	797.82	2.86
Fat	1	257.36	68.74	3.74
	2	233.91	48.11	4.86
Iron	1	6.49	2.15	3.02
	2	8.42	1.33	6.32
Calcium	1	73659.00	31668.31	2.33
	2	72240.90	35854.17	2.01
Vitamin C	1	4424.81	2954.63	1.50
	2	5115.56	1936.24	2.64
Thiamin	1	.11	.044	2.43
	2	.15	.018	8.28
Riboflavin	1	.12	.066	1.90
	2	.13	.063	2.10
Niacin	1	34.94	8.57	4.08
	2	30.44	6.77	4.50
Vitamin A	1	309695.33	66962.26	4.62
	2	420190.41	90749.61	4.63
Folate	1	2932.14	1051.35	2.79
	2	2663.28	947.97	2.81

[1] calculations for within subject variation found in Appendix H
[2] calculations for between subject variation found in Appendix H
[3] n=86
[4] n=60

5.8 Sample Size and Number of Measurement Days Required in Future Studies

5.8.1 Sample Size

The number of subjects needed in future studies to detect a difference between group means of a specific magnitude was estimated for energy and each nutrient based on the intra- and intersubject variability, setting alpha=.05 and power=.80. Sample size estimates for detecting a 10% change and for detecting a change considered of practical importance is found in Figure 10 and Figure 11 for Group 1 and Group 2, respectively. The sample sizes calculated with power set at .80 and alpha=.05 can be found in Table 19 (Appendix L).

A very large sample size is required for nutrients and energy if a 10% change is to be detected. However, the sample size was similar in Group 1 and Group 2 reflecting similar intra- and inter-subject variation (Table 19).

The differences estimated to be practically important were also used to determine the sample size (Figure 10 and 11, Table 19 in Appendix L) using a corrected standard error term (Appendix H), alpha=.05, and 80% power. The sample sizes generated vary greatly across nutrients for each group. For example, over 300 subjects would be required to detect a 10% change (or 76mg) between the mean intakes for calcium, whereas 20 subjects would be required to detect a difference of 300mg, that which is considered of practical importance. A 10% unit change was quite small compared to the difference considered to be of practical importance.

The sample size required to detect a change of 10% from the group mean intake

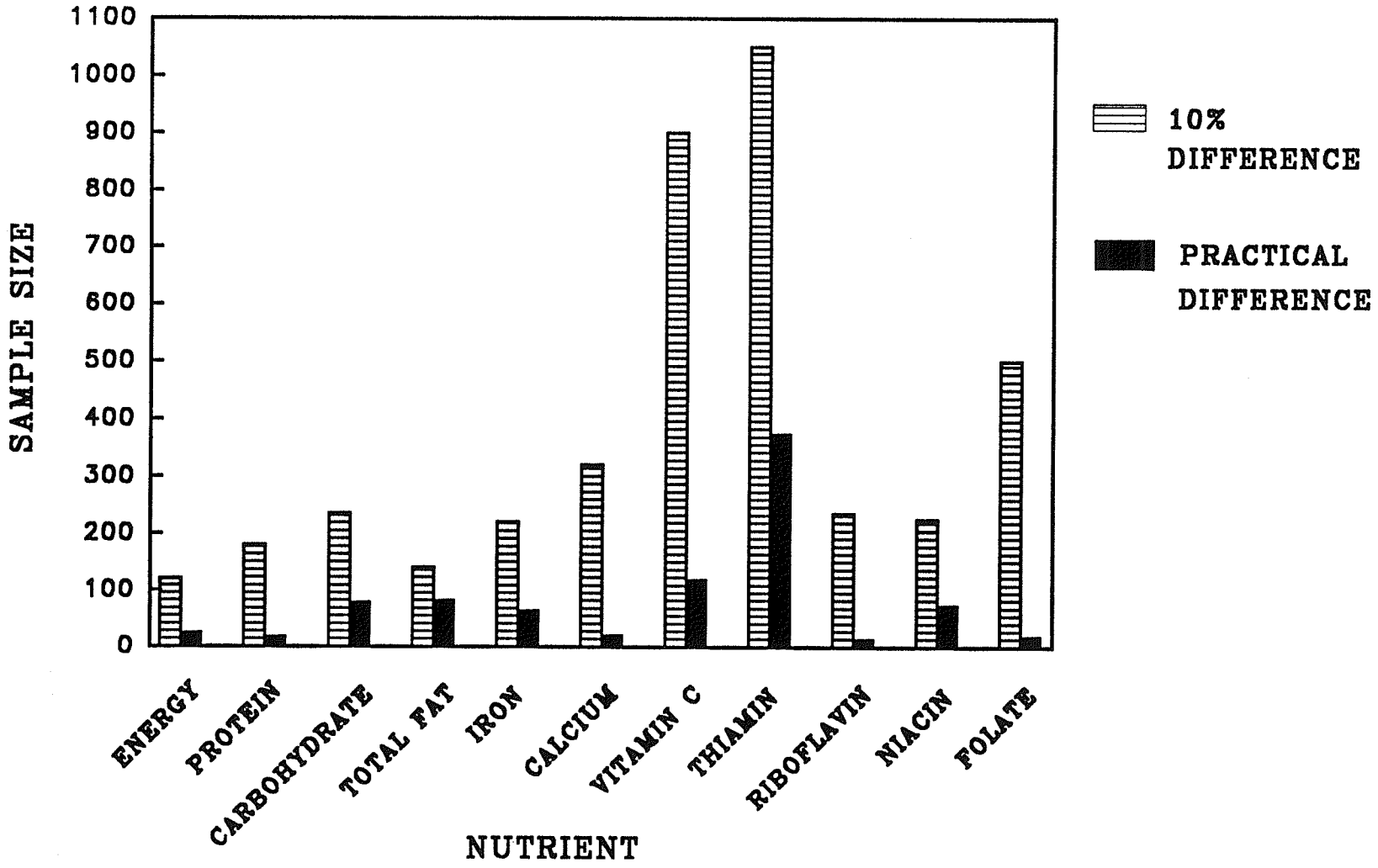

FIGURE 10. SAMPLE SIZE ESTIMATES FOR GROUP 1

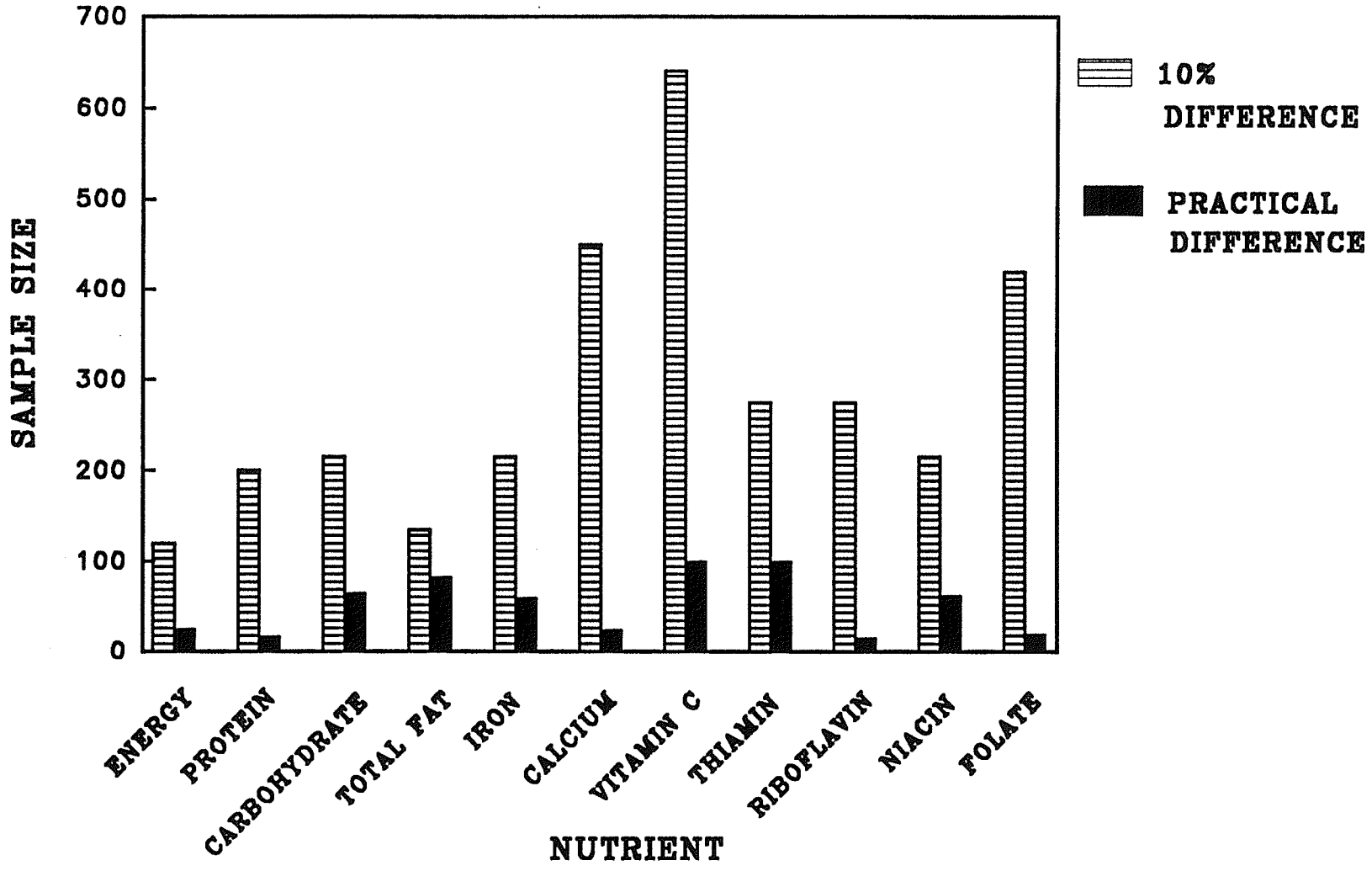

FIGURE 11. SAMPLE SIZE ESTIMATES FOR GROUP 2

for energy and each nutrient was very similar in Group 1 and 2. However, the sample size varied with the nutrient under consideration. The largest sample sizes would be needed for calcium (n=320 to 450), folate (n=420 to 500) and vitamin C (n=640 to 900) which indicated the largest sample size and also showed the largest variability. Whereas, the smallest sample sizes that would be required for energy (n=120) had the lowest variability (see CV in Table 11).

Treiber et al. (1990) also estimated the sample size necessary to detect change for a difference of 10%, 25% and 50% of the mean using 24-hour recalls and food frequency questionnaires for the intakes of three to five year old children (n=55). These researchers found similar sample sizes to detect a 10% change (energy 169, fat 385, carbohydrate 127, calcium 553 and protein 649) and slightly higher estimates of sample sizes than the present study using differences considered of practical importance (energy 29, fat 63, protein 106, carbohydrate 22 and calcium 91) (Treiber et al., 1990).

5.8.2 Number of Measurement Days

Three days of energy intake appear to be sufficient to detect the difference between group mean intakes as increasing the number of measurement days would decrease the standard error. This would permit subtle changes to be detected as found in Table 20. For example, with 80% power, five measurement days would allow the detection of a difference between means of 140 kcal for Group 1 and 165 kcal for Group 2 while three measurement days would detect a 160 kcal difference between means for Group 1 and 190 kcal for Group 2.

Increasing the number of measurement days from three to five was reflected in a 5-20% decrease in the magnitude of the difference between means that could be detected for energy and the selected nutrients. Little additional benefit is gained by increasing the number of measurement days from five to seven. Therefore, the additional magnitude of the difference between group mean intakes is small for energy and the nutrients of interest as the number of measurement days increases from three days.

The researcher needs to consider the time, cost and the respondent burden in relation to the size of the magnitude of the difference between the means desired and the number of measurement days required. For this study, three measurement days certainly appear to be sufficient as the respondent burden fell on both the caregivers and the parents. Information on the sample size and number of measurement days can be used to guide future research on this population using the three-day estimated food record.

Table 20. The estimated difference between mean intakes of energy and selected nutrients in Group 1 and Group 2 to be detected with 80% power and using three, five and seven measurement days[1].

Nutrient	Group	Three Days	Five Days	Seven Days
Energy (kcal)	1[2] 2[3]	160 190	140 165	133 158
Protein (g)	1 2	7.0 7.5	5.9 6.9	5.5 6.6
Total Fat (g)	1 2	8.0 8.5	6.8 7.3	6.4 6.7
Carbohydrate (g)	1 2	25 30	22 26	21 25
Iron (mg)	1 2	1.3 1.5	1.1 1.3	1.1 1.2
Calcium (mg)	1 2	150 180	135 168	127 161
Vitamin C (mg)	1 2	42 45	38 41	37 39
Thiamin (mg)	1 2	0.3 0.2	.3 .16	.3 .15
Riboflavin (mg)	1 2	0.2 0.3	.19 .22	.18 .21
Niacin (NE)	1 2	2.8 3.0	2.4 2.7	2.3 2.5
Vitamin A (RE)	1 2	255 360	225 315	207 290
Folate (mcg)	1 2	28 32	25 29	24 27

[1] Standard error using the three sources of variation suggested by the expected mean square terms in the ANOVA table, calculations found in Appendix H.
[2] n=86
[3] n=60

6.0 SUMMARY AND CONCLUSIONS

6.1 Reliability

The reliability of the three-day estimated food record was assessed by the statistical significance of the difference between means for energy and selected nutrients using $p < .05$ for Group 1. The practical importance of the differences found was further discussed in terms of the magnitude of the difference between means and the difference expressed as a percentage of the mean at period 1, as well by examining the width of 95% confidence intervals and the magnitude of the upper and lower confidence bounds.

Using the reliability criteria set in this study, the three-day estimated food record kept by parents and caregivers appears to be a reliable method using the reliability criteria for estimating the mean intake of energy and selected nutrients for a group of 24-47 month old preschool children in dual-earner families in the Winnipeg area. If future studies incorporated additional quality control measures to reduce random measurement errors and increased the sample size then the detection of more precise differences between group mean energy and nutrient intakes may be possible.

The three-day estimated food record does not appear to be as reliable for estimating individual mean energy and nutrient intakes for a preschool child in dual-earner families. This is reflected in the large intrasubject variation and the magnitude of the upper and lower confidence bounds at the individual level of assessment. In order to obtain more precise estimates, a large number of measurement days would be required

to decrease the intrasubject variation.

In comparison to other studies, there has been no documented report of the reliability of the three-day estimated food record with 24-47 month old children in dual-earner families involving substitute caregivers and parents in record keeping. Therefore, comparisons with other studies are difficult because the test-retest methods are different from those used in this study. In addition, the statistical analysis used differs, the number of measurement days and number of subjects vary, consecutive as well as non-consecutive days are used, the time between the test and retest method differs and the intrasubject variation differs depending on the season and the quality control of random measurement errors.

6.2 Validity

The validity of the three-day estimated food record was assessed by the statistical significance of the difference between means for the test and reference method for energy and selected nutrients using $p < .05$ for Group 2. The practical importance of the differences found was discussed in terms of the magnitude of the difference between means and the difference expressed as a percentage of the mean at period 1, as well by examining the width of 95% confidence intervals and the magnitude of the upper and lower confidence bounds.

The three-day estimated food record kept by parents and caregivers appears to be a valid method for estimating the mean intake of energy and selected nutrients for a group of 24-47 month old preschool children in dual-earner families in the Winnipeg

area. Incorporating additional quality control measures to reduce systematic errors would allow the detection of smaller differences between the two methods for group mean energy and nutrient intakes.

The three-day estimated food record does not appear to be as valid for estimating the mean energy and nutrient intakes for an individual preschool child in dual-earner families. This is shown by the magnitude of the upper and lower confidence bounds at the individual level of assessment and the large intrasubject variation. In order to obtain more precise estimates a large number of measurement days would be required.

Studies have not investigated the validity of the three-day estimated food record for preschool children in dual-earner families when both parents and caregivers record the food intake. Comparisons with other studies are also difficult because the reference methods are different, the statistical analysis used for the nutrients differs, the number of measurement days vary, consecutive as well as non-consecutive days are used and the intrasubject variation differs depending on the quality control of measurement errors, especially systematic errors.

The time the reference method was collected also affects validity measurements (Block, 1982; Gibson, 1990). The weighed record was not collected on the same days as the test method in this study. Hence, the relative validity of the estimated record was determined using the reference method for the same individual after a six week interval using the same days of the week. The study found lower intakes of nutrients at period 2 compared to period 1. The differences between the two periods may reflect the true variability of nutrient intakes between the two periods (time of reference method) or the

differences between methods (eg. the reliability and validity of each method).

It may also be possible that food intake was overestimated by the estimated record or underestimated by the weighed record. The weighed record may have increased respondent burden on both the parents and caregivers which led to underestimated food intake or the estimated record may have been overestimated by the use of household measures. However, information on whether one method over- or underestimated food intake is not available from this study.

6.3 Intra- and Intersubject Variation

Large intrasubject variation in the intake of energy and selected nutrients was found across all nutrients and energy for both Group 1 and Group 2. This indicates that either subjects had variable nutrient intakes from day to day or it reflects the error variance associated with the method. Measurement errors contribute in varying degrees to the total variation, however, quality control measures were utilized to control for measurement errors even though they cannot be eliminated. In comparison to other studies, researchers have also found a large intrasubject variation for children as well as similar intra-/intersubject variance ratios (Miller et al., 1991; Nelson et al, 1989). Energy and nutrient intakes are more variable in children than adults (Miller et al., 1991; Gibson, 1987).

Sources of variation contribute to the determination of the validity and reliability of the method. Similar proportions of variation were seen for energy and nutrients among both groups. This indicates that the periods in each group contribute the same

variation despite the method used the estimated or weighed three-day record. The similarity of the variation suggests that each group is able to detect similar proportions of variability even though each group comprises a different method, different sample sizes and a group of preschool children from dual-earner families.

6.4 Sample Size and Number of Measurement Days Required for Future Studies

The sample size calculations provide an estimate of the magnitude of the differences between group means expected from studies of this group of preschool children with a similar design. The smaller the magnitude of the mean differences to be detected, the greater the sample size and number of measurement days required which, in turn varied for each nutrient.

The number of measurement day calculations also provide an estimate of the magnitude of the differences between group means expected from studies of preschool children with a similar design and sample size similar to that of this study. Increasing the number of measurement days from three to five or seven does not appear to greatly reduce the expected magnitude of the difference between group means for either group. The number of measurement days affect individual means. However, the greater the number of measurement days increases the respondent burden on the parents and caregivers.

6.5 Limitations

The implementation of the study attempted to control for data collection in one season, however when families went on holidays, work schedules changed, or a record was repeated because of a non-typical day of food intake by the preschool child, the duration of the study lengthened into the next season. Differences in mean nutrient intakes between periods may have been reduced which may have decreased the number of significant differences found. Although the assumption of the study is that energy and nutrient intakes would be the same at the two time periods, this may be a limitation of this study.

The sample used in this study included preschool children from one family type-dual-earner families. Whether the results of the present study can be extrapolated to preschool children in dual-earner families for those who did not participate or preschool children in other family types needs to be determined.

6.6 Three-day Estimated Food Record as a Dietary Assessment Method for Preschool Children

Future research should consider the practical significance as well as the statistical significance of dietary intake data obtained from dietary assessment methods or state the criteria they use. The statistical models utilized need to be scrutinized to assure the appropriate test for the research question is being addressed. A clear example of this is

the inappropriate use of the correlation coefficient in determining the reliability and validity of dietary assessment methods (Hebert et al., 1991).

Future research may also consider other appropriate validity measures, such as a biological assessment of certain nutrients. This would provide a more accurate measure of the nutritional status for preschool children and is needed for epidemiological studies of diet-disease relationships.

The use of a crossover design for the same dietary assessment methods utilized in this study would compare the reference method to the test method on different collection times. For example, one group would complete the reference method first and the other group would complete the test method first. Both groups would have the same time interval between the two period, albeit different methods in each period. The present study had one group completing the reference method only during the second period. The purpose of the research indicates which method is most appropriate.

The three-day estimated food record appears to be an appropriate dietary assessment method for measuring the intakes of energy and the nutrient studied for a group of preschool children in dual-earner families. However, future studies should further investigate this method on this population using other random samples across the country to determine the generalizability of the results found in this study to those of Canadian preschool children.

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APPENDIX A

THE UNIVERSITY OF MANITOBA

FACULTY OF HUMAN ECOLOGY

DEPARTMENT OF FOODS AND NUTRITION

Winnipeg, Manitoba
Canada R3T 2N2

Tel: (204) 474-9554
Fax: (204) 275-5299

Spring, 1992

Dear parents/guardians,

In a week or so we will telephone you as part of a Winnipeg-wide study of preschool children with working parents. This important study is funded by Health and Welfare Canada. Its goal is to determine the food habits of children at home and with caregivers while parents are working. Surprisingly, there is very little information about this in Canada and yet there is an increasing number of families with both parents in the workforce.

Information about what children are eating will help government and others responsible for feeding children to plan diets that are based on the actual eating habits of preschoolers. The study will also be an opportunity for you to see the eating habits of your child and other children.

When our interviewer calls, she will invite you to participate in the study. Participation will involve two things:

1. Answering a few questions on the telephone about work, child care and your family. This call will take about 10 minutes.

2. Keeping a diary of what your child eats at home for three days on two occasions. When you are working, we would ask the caregiver to keep the diary for you. With both parents & caregivers involved, the diary won't take much time for anyone. To explain the diary, we would like to visit with you and the caregiver whenever it is convenient. This visit will only take about 20 minutes. After the diaries are completed, we would pick them up and answer any questions you have at that time.

Participation in the study is voluntary, however, I do hope you and your child can be part of the study. Your help in finding out what preschoolers are eating is essential to make realistic recommendations by government and others responsible for feeding children. We would greatly appreciate your help. All information you provide will be kept strictly confidential.

As a small note of thanks, we have a package of recipe booklets for you and a growth chart for your child. If you wish, we will also provide the results of the study, including an analysis of your child's diet.

Thank you for your time and consideration. We hope to see you in the study.

Sincerely,

Jan Trumble, B.Sc.
Project Coordinator

Marian Campbell, Ph.D.
Project Director

THE UNIVERSITY OF MANITOBA

FACULTY OF HUMAN ECOLOGY

DEPARTMENT OF FOODS AND NUTRITION

Human Ecology Building
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Canada R3T 2N2

(204) 474-9554
(204) 275-5299 FAX

Spring, 1992

Dear day care director,

I am writing to bring to your attention a study that will soon begin and to enlist your cooperation. The study is a Winnipeg-wide study of the food habits of preschool children with working parents. This important study is funded by Health and Welfare Canada. Its goal is to determine the food habits of children at home and with caregivers while parents are working. Surprisingly, there is very little information about this in Canada and yet there is an increasing number of families with both parents in the workforce. Information about what children are eating will help government, child care workers and others responsible for feeding children to make recommendations and plan diets that are based on the actual eating habits of preschoolers.

Parents of children selected for the study are initially contacted to invite their participation. If they agree, we ask them to provide the name of the caregiver. Caregivers (directors in the case of day care centres) will then be telephoned to explain the study and ask for their cooperation. Caregivers will be asked to keep a diary of what the child eats while in their care for one or two days on two occasions. Parents will keep the diary at home. To explain how to keep the diary, we would like meet with parents and a caregiver to explain the procedure. This meeting would take about 20 minutes.

It is unlikely that large numbers of children in any one centre will be involved since we will study only 160 children dispersed throughout Winnipeg in a variety of child care situations (centres, private homes, relatives, etc.). For any one child, the demands on a child care worker's time is kept to a minimum since we provide simple forms that are quick to complete.

The study will be conducted from March to June. Your cooperation during this time is crucial to obtaining a complete picture of children's food habits. The results of the study will be available to you and I hope you will find them useful in planning diets and programs for children in your centre.

Thank you very much for your time and attention to this request. If you have questions about the study, please contact me at the above address.

I look forward to your cooperation.

Sincerely,

Marian Campbell, Ph.D.
Associate Professor

APPENDIX B

TELEPHONE QUESTIONNAIRE TO PARENTS OF SELECTED CHILDREN

OFFICE USE ONLY
VAR/CARD/COL.

Subject Identification Number.....|_|_|_|_|_| ØØ1/1/1-4

Interviewer's Identification Number.....|_|_| ØØ2/1/5

PRECODED INFORMATION:

Child's age.....|_|_| ØØ3/1/6-7
Child's sex.....|_| ØØ4/1/8

Father's age.....|_|_| ØØ5/1/9-10

Mother's age.....|_|_| ØØ6/1/11-12

****

RECORD OF CALLS DATE TIME NOTES

1._____
2._____
3._____
4._____
5._____
6._____
7._____
8._____

****

Fate of the telephone interview:

*no contact -telephone not a working line.....01
-no answer after 8 calls.....02
-other (specify_____)....03
*ineligible -not working, not married or living common law, special diet, medical problems.....04
-language problems.....05
-no caregiver involved.....06
-other (specify_____)....07 ØØ7/1/13-14
*refusal to participate -"too busy".....08
-"don't like the idea".....09
-other (specify_____)..10
*complete telephone interview.....11
*complete telephone interview but refuse home visit on the phone.....12
*other(specify_____).....13

****

Interviewer Observations:

How cooperative was subject?
___not cooperative ___somewhat cooperative ___very cooperative

How well did the subject understand the questions?
___poor understanding ___fair understanding ___good understanding

Did the subject have any difficulty in speaking English?
___ yes ___no |_| ØØ8/1/15

How suspicious did subject seem about the study before the interview?
___not at all suspicious ___somewhat suspicious ___very suspicious

Overall, how great was the subject's interest in the interview?
___very high ___above average ___average ___below average ___very low

Other comments:

_____
_____
_____

Hello. Is this_____?
(MR/MS AND LAST NAME)

(IF YES, RECORD PARENT INTERVIEWED.)
MOTHER.....1
FATHER.....2 ØØ9/1/16

(IF NO.
May I speak with _____?)
(MR/MS AND LAST NAME)
(IF NO ONE BY THAT NAME AT THAT NUMBER.
The number I was calling is _____. Is this the correct number?)

(IF WRONG NUMBER, TERMINATE WITH, EG., I am sorry to have bothered you.)
(IF CORRECT NUMBER.
Has Mr. and Ms._____ ever lived there?)
_____YES _____NO

(IF NO. TERMINATE CALL.)
(IF YES. How can I get in touch with them?
_____(SPECIFY HOW AND THEN TERMINATE WITH, EG., Thank you for your help.)

This is _____ calling from the University of Manitoba. We are doing a Winnipeg-wide study of the food habits of preschool children with working parents.

1. Last week we sent you a letter explaining the study.
Did you receive it?

YES.....1
NO.....2 Ø10/1/17

(IF NO. I'm sorry yours didn't reach you. It was a brief letter we sent so people would know that we would be calling. EXPLAIN THE STUDY - USE LETTER AS GUIDE.)

In the letter we mentioned our interest in studying preschool children with two parents working outside the home. In order to find out if you fit these criteria I have a few questions to ask. They'll only take a few of minutes.

2. Are you now working outside the home for 15 or more hours per week?

YES.....1
NO.....2 Ø11/1/18

(IF NO. I'm sorry then, we are unable to include you in the study. We would like to include everyone in the study, however, this time we can only study preschoolers with both parents working at least 15 hour per week. However, if you have any questions about feeding children, I'd be happy to answer them. (PAUSE). If you would like information, contact the Provincial Department of Health.)

3. Is your spouse or partner working outside the home for 15 or more hours per week?

YES.....1
NO.....2 Ø12/1/19

(IF NO. I'm sorry then, we are unable to include you in the study. We would like to include everyone in the study, however, this time we can only study preschoolers with both parents working at least 15 hour per week. However, if you have any questions about feeding children, I'd be happy to answer them. (PAUSE). If you would like information, contact the Provincial Department of Health.)

4. When you and your spouse/partner are working, do you juggle the care of your preschool child or children between you, or does someone else provide the care?

PARENTS PROVIDE ALL CARE WHEN WORKING (SEE BELOW).....1
OTHERS PROVIDE CARE (GO TO 5).....2
NO RESPONSE (GO TO 5).....7

Ø13/1/20

(IF PARENTS PROVIDE ALL CARE: I'm sorry then, we are unable to include you in the study. We would like to include everyone in the study, however, this time we are only studying preschoolers with caregivers who are not parents. However, if you have any questions about feeding children, I'd be happy to answer them. (PAUSE). If you would like information, contact the Provincial Department of Health.)

5. When you are working, which meals and snacks does your preschool child or children usually eat <u>at</u> the caregiver's?

	YES	SOMETIMES	NO	NR	
Breakfast	1	2	3	7	Ø14/1/21
AM Snack	1	2	3	7	Ø15/1/22
Lunch	1	2	3	7	Ø16/1/23
Afternoon Snack	1	2	3	7	Ø17/1/24
Dinner	1	2	3	7	Ø18/1/25
Evening Snack	1	2	3	7	Ø19/1/26

(REJECT IF LESS THAN <u>ONE MEAL</u>. Since your preschooler does not eat at least one meal with the caregiver we are unable to include you in the study. We would like to include everyone in the study, however, this time we are only studying preschoolers who eat al least one meal at the caregivers. However, if you have any questions about feeding children, I'd be happy to answer them. (PAUSE). If you would like information, contact the Provincial Department of Health.)

6. And last, are you married, widowed, separated, divorced or living common law?

MARRIED (EXCLUDING SEPARATED) OR COMMON LAW.....1
DIVORCED/SEPARATED.....2
WIDOWED.....3
OTHER (SPECIFY_____).....4

Ø20/1/27

(IF DIVORCED, SEPARATED, OR WIDOWED. I'm sorry then, we are unable to include you in the study. We would like to include everyone in the study, however, we won't be including single parents at this time. However, if you have any questions about feeding children, I'd be happy to answer them. (PAUSE). If you would like information, contact the Provincial Department of Health.)

7. You meet all the criteria for the study. Are you willing to participate in the study described in the letter?

YES.....1
NO **(GO TO NON-RESPONDER QUESTIONS - #4)**.....2

Ø21/1/28

Thank you for agreeing to participate, we appreciate your help.

Now I'd like to ask a few questions about your family, your work and child care. They are general questions like how many people are in your family and the kind of work you do. They allow us to describe all the families we talk to. The questions should take about 10 minutes. Is this a convenient time, or may I call back?

CALL BACK_____(DATE AND TIME)

The first questions are about your family.

8. How many people live at your home, including yourself? /___/___/ (STATE NUMBER)

Ø22/1/29-30

9. How many are children under 18 years? /___/___/ (STATE NUMBER)

Ø23/1/31-32

10. How old are the children, starting with the youngest?

_____ (YEARS)
(REPEAT AGES TO PARENTS AS A CROSS CHECK)

/ / / NIT
Ø24/1/33-34
/ /
Ø25/1/35

11. In the letter we sent we mentioned that preschool children are the focus of this study. We are particularly interested in two and three year old children. Therefore, your ____ year old child will be the focus of the study.
What is his/her name?_____

IF MORE THAN ONE PRESCHOOL CHILD SAY: In the letter we mentioned that preschool children are the focus of this study. Since we are including only one child from each family, I have randomly selected your____ year old. What is his/her name? _____.

IF TWINS OR TRIPLETS: In the letter we mentioned that preschool children are the focus of this study. Since we are including only one child from each family, If you give me the names, I will flip a coin and choose one.
(NAME CHOSEN ON MASTER LIST)

12. Is she/he presently on a special diet prescribed by a doctor or dietitian?

YES (GO TO 13).....1
NO (GO TO 14).....2
NO RESPONSE (GO TO 14).....7
DON'T KNOW (GO TO 14).....8

Ø26/1/36

13. Why is the special diet needed? (CHECK ALL THAT APPLY)

	YES	NO	NR	DK	NA	
WEIGHT REDUCING	1	2	7	8	9	Ø27/1/37
DIABETIC	1	2	7	8	9	Ø28/1/38
HEART DISEASE	1	2	7	8	9	Ø29/1/39
ALLERGIES (SPECIFY TYPE_____)	1	2	7	8	9	Ø30/1/40
LOW BLOOD SUGAR	1	2	7	8	9	Ø31/1/41
HYPERACTIVITY-FEINGOLD	1	2	7	8	9	Ø32/1/42
OTHER (SPECIFY_____)	1	2	7	8	9	Ø33/1/43

Since she/he is on a special diet, I'm sorry but we are unable to include him/her in the study. We are interested in children who do not have special diet restrictions. However, if you have any questions about feeding children, I'd be happy to answer them. (PAUSE). If you would like information, contact the Provincial Department of Health.

14. Does she/he have any medical problems that affect his/her growth or make eating difficult?

YES (SPECIFY PROBLEM_____).....1
NO (GO TO 15).....2
NO RESPONSE (GO TO 15).....7
DON'T KNOW (GO TO 15).....8

Ø34/1/44

(IF YES. I'm sorry then, we are unable to include him/her in the study. We are interested in children who do not have medical problems that affect their growth or make eating difficult. However, if you have any questions about feeding children, I'd be happy to answer them. (PAUSE). If you would like more information, contact the Provincial Department of Health.)

15. **The next few questions are about your present job and that of your spouse/partner.**

What is your main occupation?_____
(NOTE: IF MORE THAN ONE JOB DISCUSS MAIN OCCUPATION.)

Can you tell me a little more about what you do? _____

_____

_____

(NOTE: GIVE JOB TITLE/CLASSIFICATION/RANK IF RELEVANT --EG. RN, ASSISTANT TO SUPERVISOR, UNIT DIRECTOR, CLERK I)

What kind of business, industry or service is that in?_____

_____

(NOTE: GIVE DESCRIPTION--EG., PAPER BOX MANUFACTURING, RETAIL FOOD STORE, SECONDARY SCHOOL, FINANCE DEPARTMENT OF GOVERNMENT, ETC.)

/ / /
Ø35/1/45-46

16. How long have you been in your present job?

____YEARS
OR
____MONTHS
OR
DESCRIBE:_____

/ / /./
Ø36/1/47-51

17. How many hours do you work at your job in the average week, including overtime?

____HOURS PER WEEK
OR
____PER _____
OR
DESCRIBE:_____

/ / /./
Ø37/1/51-54

18. Do you usually work the same hours each day?

IF YES:
What time do you usually begin work? (CIRCLE TIME)

And, what time do you usually end work? (CIRCLE TIME)

12—1—2—3—4—5—6—7—8—9—10—11—12—1—2—3—4—5—6—7—8—9—10—11—12
AM NOON PM

_____ works split shift or begins work more than once a day (SPECIFY START _____ AND STOP TIMES _____)

/
Ø38/1/55

IF NO:
Do you work on a rotating shift so your hours change at regular intervals, or what?

___rotating shift (SPECIFY START AND STOP TIMES FOR EACH SHIFT_____)

___other irregularities, (SPECIFY START AND STOP TIMES FOR EACH SHIFT___ _____)

19. How hard do you think it would be to get the hours you begin and end work changed permanently, if you wanted them changed? Would it be:

very hard.....4
somewhat hard.....3
not too hard.....2
not at all hard.....1

NO RESPONSE.....7
DON'T KNOW.....8

Ø39/1/56

20. In your present job, do you usually work the same days each week?

IF YES:	What days do you usually work?		
	___ MONDAY	OR	___ MON. TO FRI.
	___ TUESDAY		
	___ WEDNESDAY		
	___ THURSDAY		
	___ FRIDAY		
	___ SATURDAY		
	___ SUNDAY		

IF NO:	How many days a week do you usually work? ____days per week OR ____per_____ OR Describe:_____ _____

/___/
Ø40/1/57

21. How hard do you think it would be to get the days you work changed permanently if you wanted them changed? Would it be:

very hard.....4
somewhat hard.....3
not too hard.....2
not at all hard.....1

NO RESPONSE.....7
DON'T KNOW.....8

Ø41/1/58

22. How hard is it to take time off during your workday for personal or family matters? Is it:

very hard.....4
somewhat hard.....3
not too hard.....2
not at all hard.....1

NO RESPONSE.....7
DON'T KNOW.....8

Ø42/1/59

22. **Now for your spouse/partner:**

What is his/her main occupation?_____
(NOTE: IF MORE THAN ONE JOB DISCUSS MAIN OCCUPATION.)

Can you tell me a little more about what he/she does?_____
_____
_____
(NOTE: GIVE JOB TITLE/CLASSIFICATION/RANK IF RELEVANT --EG. RN, ASSISTANT TO SUPERVISOR, UNIT DIRECTOR, CLERK I)

What kind of business, industry or service is that in?_____
_____
(NOTE: GIVE DESCRIPTION--EG., PAPER BOX MANUFACTURING, RETAIL FOOD STORE, SECONDARY SCHOOL, FINANCE DEPARTMENT OF GOVERNMENT, ETC.)

/ / /
Ø43/1/60-61

23. How long has she/he been in her/his present job?

____YEARS
OR
____MONTHS
OR
DESCRIBE:_____

/ / /•/
Ø44/1/62-6

24. How many hours does your spouse or partner work at his/her job in the average week, including overtime?

____HOURS PER WEEK
OR
____PER _____
OR
DESCRIBE:_____

/ / /•/
Ø45/1/66-6

25. Does your spouse/partner usually work the same hours each day in his/her present job?

IF YES:
What time does he/she usually begin work? (PAUSE TO CIRCLE TIME)

And, what time does she/he usually end work? (PAUSE TO CIRCLE TIME)

12—1—2—3—4—5—6—7—8—9—10—11—12—1—2—3—4—5—6—7—8—9—10—11—12
AM NOON PM

_____ works split shift or begins work more than once a day (SPECIFY START _____ AND STOP TIMES_____)

/___/
Ø46/1/7Ø

IF NO:
Does he/she work on a rotating shift so their hours change at regular intervals, or what?

___rotating shift (SPECIFY START AND STOP TIMES FOR EACH SHIFT_____)

___other irregularities, (SPECIFY START AND STOP TIMES FOR EACH SHIFT_____)

26. How hard do you think it would be for him/her to get the hours he/she begins and ends work changed permanently, if she/he wanted them changed? Would it be:

very hard.....4
somewhat hard.....3
not too hard.....2
not at all hard.....1

NO RESPONSE.....7
DON'T KNOW.....8

Ø47/2/ 1

27. For your spouse/partner, does he/she usually work the same days each week?

IF YES: What days do you usually work?
___ MONDAY OR ___ MON. TO FRI.
___ TUESDAY
___ WEDNESDAY
___ THURSDAY
___ FRIDAY
___ SATURDAY
___ SUNDAY

/___/
Ø48/2/ 2

IF NO: How many days a week do you usually work?
____days per week
OR
____per_____
OR
Describe:_____
_____

28. How hard do you think it would be for her/him to get the days she/he works changed permanently if he/she wanted them changed? Would it be:

very hard.....4
somewhat hard.....3
not too hard.....2
not at all hard.....1

NO RESPONSE.....7
DON'T KNOW.....8

Ø49/2/ 3

29. How hard is it for him/her to take time off during his/her workday for personal or family matters? Is it

very hard.....4
somewhat hard.....3
not too hard.....2
not at all hard.....1

NO RESPONSE.....7
DON'T KNOW.....8

Ø5Ø/2/4

Now we have a few questions about child care.

30. Right now, who looks after _____(CHILD'S NAME) when you and your spouse/partner are working?

(PROBE: Is that in your home, in someone else's home, or at a day care centre?)

	YES	NO	
DAY CARE CENTRE (What is the name of the centre? _____ (GO TO 32)	1	2	Ø51/2/5
CARE IN OWN HOME			
- by child's siblings (GO TO 32)	1	2	Ø52/2/6
- by a relative (other than child's sibling) (GO TO 32)	1	2	Ø53/2/7
- by a non-relative (GO TO 32)	1	2	Ø54/2/8
CARE IN SOMEONE ELSE'S HOME			
- by a relative (GO TO 31)	1	2	Ø55/2/9
- by a non-relative (GO TO 31)	1	2	Ø56/2/1Ø
OTHER (specify_____) (GO TO 32)	1	2	Ø57/2/11
NO RESPONSE (GO TO 32)	1	2	Ø58/2/12
DON'T KNOW (GO TO 32)	1	2	Ø59/2/13

31. Is the home licensed for family day care?

YES.....1
NO.....2

NO RESPONSE.....7
DON'T KNOW.....8
NOT APPLICABLE.....9

Ø6Ø/2/14

32. When did you start using this type of child care for _____ (CHILD'S NAME)?

_____MONTH OF _____YEAR
NO RESPONSE.....77
DON'T KNOW.....88

/ / /
Ø61/2/15-

33. Overall, how satisfied are you with your present child care arrangement(s) for _____(CHILD'S NAME)? Are you

very satisfied.....1
satisfied.....2
dissatisfied.....4
very dissatisfied.....5
or neither satisfied nor dissatisfied.....3

NO RESPONSE.....7
DON'T KNOW.....8

Ø62/2/17

34. How many different child care arrangements have you used since (CHILD'S NAME) was born, including your present arrangement?

_____(SPECIFY NUMBER) (CHECK-INCLUDES PRESENT ARRANGEMENT)
_____(88) DON'T KNOW
_____(77) NO RESPONSE

/ / /
Ø63/2/18-1

35. Who prepares your child's meals and snacks when you and your spouse/partner are working?
(PROBE FOR SPECIFIC MEALS AND SNACKS)

	CAREGIVER	PARENT	BOTH	OTHER (SPECIFY)	NR	NA	
BREAKFAST	1	2	3	4(_____)	7	9	ϕ64/2/20
AM SNACK	1	2	3	4(_____)	7	9	ϕ65/2/21
LUNCH	1	2	3	4(_____)	7	9	ϕ66/2/22
AFTERNOON SNACK	1	2	3	4(_____)	7	9	ϕ67/2/23
DINNER	1	2	3	4(_____)	7	9	ϕ68/2/24
EVENING SNACK	1	2	3	4(_____)	7	9	ϕ69/2/25

NOTE: USE NA IF MEAL/SNACK NOT GIVEN/PREPARED

The last few questions are background questions. The first is about your education.

36. What is the highest grade in school or year at college you have completed? (DO NOT READ)

GRADE EIGHT OR LESS.....01
SOME HIGH SCHOOL.....02
COMPLETED HIGH SCHOOL.....03
SOME POST-SECONDARY TRAINING (NON-UNIVERSITY).....04
POST-SECONDARY CERTIFICATE OR DIPLOMA.....05 ϕ70/2/26-
SOME UNIVERSITY.....06
COMPLETED UNIVERSITY (HAS DEGREE).....07
POST-GRADUATE TRAINING.....08
NO RESPONSE.....77
DON'T KNOW.....88
DESCRIBE IF FOREIGN EDUCATION_____

37. And for your spouse, what is the highest grade in school or year at college he/she has completed? (DO NOT READ)

GRADE EIGHT OR LESS.....01
SOME HIGH SCHOOL.....02
COMPLETED HIGH SCHOOL.....03
SOME POST-SECONDARY TRAINING (NON-UNIVERSITY).....04 ϕ71/2/28-2
POST-SECONDARY CERTIFICATE OR DIPLOMA.....05
SOME UNIVERSITY.....06
COMPLETED UNIVERSITY (HAS DEGREE).....07
POST-GRADUATE TRAINING.....08
NO RESPONSE.....77
DON'T KNOW.....88
DESCRIBE IF FOREIGN EDUCATION_____

38. Were you born in Canada?

YES (GO TO 40).....1
NO (GO TO 39).....2 ϕ72/2/3ϕ
NO RESPONSE (GO TO 40).....7
DON'T KNOW (GO TO 40).....8

39. What year did you first move to Canada?
_____(STATE YEAR) IF EXACT YEAR IS NOT KNOWN, OBTAIN THE BEST ESTIMATE. / / / /
NO RESPONSE.....7777 ϕ73/2/31-3
DON'T KNOW.....8888
NOT APPLICABLE.....9999

40. To which ethnic or cultural group did you or your ancestors belong on first coming to this continent? (DO NOT READ -CHECK AS MANY AS APPLICABLE)

	YES	NO	NR	DK	
FRENCH	1	2	7	8	Ø74/2/35
ENGLISH (ie., ENGLAND)	1	2	7	8	Ø75/2/36
IRISH	1	2	7	8	Ø76/2/37
SCOTTISH	1	2	7	8	Ø77/2/38
GERMAN	1	2	7	8	Ø78/2/39
ITALIAN	1	2	7	8	Ø79/2/4Ø
UKRAINIAN	1	2	7	8	Ø8Ø/2/41
DUTCH (NETHERLANDS)	1	2	7	8	Ø81/2/42
POLISH	1	2	7	8	Ø82/2/43
JEWISH	1	2	7	8	Ø83/2/44
CHINESE	1	2	7	8	Ø84/2/45
NATIVE PEOPLE (INUIT, INDIAN, METIS)	1	2	7	8	Ø85/2/46
OTHER (SPECIFY_____)	1	2	7	8	Ø86/2/47

41. Was your spouse/partner born in Canada?

YES (GO TO 43)	1
NO (GO TO 42)	2
NO RESPONSE (GO TO 43)	7
DON'T KNOW (GO TO 43)	8

Ø87/2/48

42. What year did she/he first move to Canada?

_____(STATE YEAR) IF EXACT YEAR IS NOT KNOWN, OBTAIN THE BEST ESTIMATE.

NO RESPONSE	7777
DON'T KNOW	8888
NOT APPLICABLE	9999

/ / / /

Ø88/2/49-52

43. To which ethnic or cultural group did his/her ancestors belong on first coming to this continent? (DO NOT READ -CHECK AS MANY AS APPLICABLE)

	YES	NO	NR	DK	
FRENCH	1	2	7	8	Ø89/2/53
ENGLISH (ie., ENGLAND)	1	2	7	8	Ø9Ø/2/54
IRISH	1	2	7	8	Ø91/2/55
SCOTTISH	1	2	7	8	Ø92/2/56
GERMAN	1	2	7	8	Ø93/2/57
ITALIAN	1	2	7	8	Ø94/2/58
UKRAINIAN	1	2	7	8	Ø95/2/59
DUTCH (NETHERLANDS)	1	2	7	8	Ø96/2/6Ø
POLISH	1	2	7	8	Ø97/2/61
JEWISH	1	2	7	8	Ø98/2/62
CHINESE	1	2	7	8	Ø99/2/63
NATIVE PEOPLE (INUIT, INDIAN, METIS)	1	2	7	8	1ØØ/2/64
OTHER (SPECIFY_____)	1	2	7	8	1Ø1/2/65

44. What language is most frequently spoken in your home?
(DO NOT READ)

ENGLISH	1
FRENCH	2
GERMAN	3
ITALIAN	4
UKRAINIAN	5
OTHER (SPECIFY_____)	6
NO RESPONSE	7

1Ø2/2/66

45. The last question is about your family income. Adding up the income that you and your spouse/partner make from all sources, roughly what is the total yearly income before taxes of your immediate family - include your income and that of your spouse or partner, the wages of everyone else in the family who works, and income from any other sources such as investment income, income from roomers or boarders, and so on.

I will read several income categories. When I come to the category that best describes your family's total yearly income before taxes, please stop me

under $20,000.....01
under $30,000.....02
under $40,000.....03
under $50,000.....04
under $60,000.....05
under $70,000.....06
under $80,000.....07
$80,000 and over.....08
NO RESPONSE.....77
DON'T KNOW.....88

103/2/67-69

****

That completes the questions. The last thing I would like to do is discuss how the study will be organized.

As you know, we are interested to learn what preschoolers eat at home and with caregivers while parents are working outside the home. To do this we will ask the parents to keep track of what their child eats at home and ask the caregiver to do the same when both parents are working. We would like to meet with one or both parents and the caregiver to show you how to keep track of what _____(NAME OF CHILD) eats.

We would like to have the parent who is primarily responsible for feeding _____(NAME OF CHILD) to record what he/she eats at home when you are not working. Would you be that parent or would your spouse/partner or someone else in the household be primarily responsible for feeding _____(NAME OF CHILD)?

PERSON PROVIDING FOOD RECORD
MOTHER.....1
FATHER.....2
BOTH.....3
OTHER (SPECIFY_____).....4

L_/
104/2/69

We also need to contact the caregiver to arrange a meeting time. I'd be happy to do this if you could give me the name and telephone number of the caregiver or day care center. When I call the caregiver I will mention that you gave me her/his/their name.

NAME OF CAREGIVER / DAY CARE CENTRE:_____
IF DAY CARE CENTRE: What is the Director's name?_____
IF DAY CARE CENTRE: Which caregiver does your child know well?_____
PHONE NUMBER:_____
ADDRESS:_____

We will need to find a suitable time to meet with you and the caregiver. That meeting would take about 20 minutes. During the visit I'd like to show you both how to keep a list of what _____(NAME OF CHILD) eats. Would it be possible to meet when you pick up _____ (NAME OF CHILD) at the caregiver's place?

(IF UNABLE TO MEET AT THE CAREGIVER'S PLACE: Would it be more convenient to meet at your home?)

RECORD MEETING: LOCATION: _____
DATE:_____
TIME:_____

I will need contact the caregiver and get back to you. Is this a good time to contact you at home?
YES_____
NO. SPECIFY BEST TIME:_____

Thank you very much for helping us with this project. Please remember that any information you provide will be kept strictly confidential.

Do you have any questions before I go? (PAUSE)
If any questions come up, you can reach me at_____
(INTERVIEWER'S TELEPHONE NUMBER).

TELEPHONE INTERVIEW FOR CAREGIVERS

****

RECORD OF CALLS DATE TIME NOTES

1._____
2._____
3._____
4._____
5._____

****

Fate of telephone call to caregiver:
* agrees to participate.....1
* refuses to participate (reason_____)...2
* other (specify _____)...3

105/2/70

****

Interviewer Observations:

How cooperative was the caregiver?
___not cooperative ___somewhat cooperative ___very cooperative

How well did the understand what was being asked of them?
___poor understanding ___fair understanding ___good understanding

Did the caregiver have any difficulty in speaking English?
___ yes ___no

106/2/71

How suspicious did the caregiver seem about the study before the interview?
___not at all suspicious ___somewhat suspicious ___very suspicious

Overall, how great was the caregiver's interest in the study?
___very high ___above average ___average ___below average ___very low

Other comments:

_____
_____
_____

****

IF A DAY CARE CENTRE:

Hello, is this _____(NAME OF DAY CARE DIRECTOR)?

IF NO. May I speak with_____?
(DIRECTOR OF DAY CARE CENTRE)

IF NO. When would be a good time to reach her/him?
RECORD BEST TIME TO CALL:_____

This is _____ calling from the University of Manitoba. Your name was given to me by Mr. and Mrs. (PARENTS SURNAME) who have a child, (CHILD'S NAME), in your care.

(CHILD'S NAME)'s parents have agreed to participate in a study funded by Health and Welfare Canada. The study is looking at the food habits of preschool children. We particularly want to study preschool children with two working parents, because of the increasing number in the work force.

The study involves keeping a food diary of what (CHILD'S NAME) eats while in your care for one or two days on two occasions. Her/his parents have agreed to keep the diary at home.

We would like to ask if someone at the centre would record what (CHILD'S NAME) eats while in your care. The forms are easy and quick to fill out, and only require a few minutes to complete. (CHILD'S NAME) parents have suggested that _____ (RECOMMENDED CAREGIVER) might be the best person to record what (CHILD'S NAME) eats.

Would this person, or someone else in your centre, be able to record what (CHILD'S NAME) eats while in your care?

IF NO. TRY TO MOTIVATE AND CONVINCE CAREGIVERS TO PARTICIPATE.

IF YES. To explain how to keep the diary we would like to visit with this person and one of the parents for about 20 minutes. After the diary is completed, we would pick it up whenever it is convenient for the worker and the parents.

When would be a good time to meet? The parents have suggested that we could all meet when they pick up _____(CHILD'S NAME). Would this be an appropriate time? We will need to meet with the person who will be recording for (CHILD'S NAME). Would their schedule allow us to meet them on _____(DAY) at _____(TIME -USE PARENTS RECOMMENDED TIME). Or would it be best to set this up with _____(CAREGIVER'S NAME).

RECORD MEETING: LOCATION _____
DATE _____
TIME _____

I will call the parents to confirm this time and then get in touch with you for confirmation.

We really appreciate your help in finding out what preschoolers eating habits are.

If you would like, I'll leave my name and phone number with you.

IF NO: END INTERVIEW.

IF YES: REPEAT YOUR NAME AND PHONE NUMBER. END INTERVIEW.

****

IF NOT A DAY CARE CENTRE:

Hello, is this _____(NAME OF CAREGIVER)?

IF NO. May I speak with _____(NAME OF CAREGIVER)?

IF NO. When would be a good time to reach her/him?
RECORD BEST TIME TO CALL:_____

This is _____ calling from the University of Manitoba. Your name was given to me by Mr. and Mrs. (PARENTS SURNAME) who have a child, (CHILD'S NAME), that you look after while they are working.

(CHILD'S NAME)'s parents have agreed to participate in a study funded by Health and Welfare Canada. The study is looking at the food habits of preschool children. We particularly want to study preschool children with two working parents, because of the increasing number in the work force.

The study involves keeping a food diary of what (CHILD'S NAME) eats while in your care for one or two days on two occasions. Her/his parents have agreed to keep the diary at home.

We would like to ask if you would record what (CHILD'S NAME) eats while in your care. The forms are easy and quick to fill out, and only require a few minutes to complete.

IF NO. TRY TO MOTIVATE AND CONVINCE CAREGIVERS TO PARTICIPATE.

IF YES. To explain how to keep the diary we would like to visit with you and one of the parents for about 20 minutes. After the diary is completed, we would pick it up whenever it is convenient for you and the parents.

I wonder when would be a good time to meet? The parents have suggested we could all meet when they pick up _____(CHILD'S NAME). Would this be an appropriate time? Would your schedule allow us to meet on _____(DAY) at _____(TIME -USE PARENTS RECOMMENDED TIME).

RECORD MEETING: LOCATION _____
DATE _____
TIME _____

I will call the parents to confirm this time and then get in touch with you for confirmation.

We really appreciate your help in finding out what preschoolers eating habits are.

If you would like, I'll leave my name and phone number with you.

IF NO: END INTERVIEW.

IF YES: REPEAT YOUR NAME AND PHONE NUMBER. END INTERVIEW.

APPENDIX C

HOW TO KEEP A DIARY OF YOUR CHILD'S FOOD INTAKE - TIPS FOR PARENTS

The **most important** thing you will be doing is writing down the name of everything your child eats or drinks (except water) at home or away from home. Be sure to include foods your child eats between meals, while watching TV or playing with friends, even small snacks like fruit, crackers, candy, soft drinks, etc. We would be grateful if you would keep a Food Diary for three days:

DAY 1:_____
DAY 2:_____
DAY 3:_____
INTERVIEWER PICKS UP DIARY ON:_____

Use the forms provided and follow these simple instructions:

1. **TIME COLUMN** - Note the time of day when food is eaten in this column. Please write on the form at the time foods/beverages are eaten, or immediately afterwards.
2. **PLACE COLUMN** - Note where the food is eaten in this column. Use the following as a guide:
   - **H:** HOME (for food eaten at home)
   - **C:** CHILD CARE (for food eaten with the child's caregiver while you are working)
   - **AR:** AWAY-REST (for food eaten away from home in restaurants, snack bars, cafeterias, McDonald's, etc.)
   - **AH:** AWAY-HOME (for food eaten in another person's home but not at the child's caregiver)
3. **DESCRIPTION OF FOOD OR BEVERAGE** - Include the method of preparation and cooking, brand names (if applicable), etc.
   - What type of food is it? -If milk, is it skim, 1%, 2%, homogenized?
     -If bread, is it whole wheat, rye, white?
     -Is the food low fat, or calorie reduced? (eg. diet drinks)
   - Is it cooked, raw, canned, frozen or fresh?
   - Is it boiled, baked, roasted, fried, broiled, etc?
     -If fried, what type of fat? For example, are wieners boiled or fried in butter, margarine, oil, shortening, etc?
     -Is soup or cocoa made with water or milk?
   - What kind of beverage, if any, is eaten with the meal or snack?
   - State brand name and kind of fruit juices and drinks (eg. Wyler's orange crystals). State brand names for other foods, if applicable (eg. Ritz crackers).
   - For foods eaten together, like hamburgers, write down each food item (eg. hamburger bun, beef patty, tomato slice, cheese (state kind), ketchup, and pickle slices).
   - For **recipes** like spaghetti sauce, stews or casseroles please write recipe on back of Food Diary giving the amounts of each ingredient, number of servings for the recipe, and amount given to your child.

* Remember to record all the "little extras" that are added to or eaten with other foods such as
  -butter or margarine on vegetables, sandwiches, crackers; fat used for frying
  -salad dressing; gravy; sauces on vegetables, ice cream or yoghurt
  -sugar on cereal; jam, butter, peanut butter, syrup etc. on toast, pancakes, etc.

4. **AMOUNT SERVED COLUMN** - There are several ways you can record the amount eaten. Choose the one that is most appropriate for the food you are measuring.

   individual items - count the number (for example: 1 apple, 2 Ritz crackers, 1 150mL carton of milk, 1 $0.65 chocolate bar, or an $0.85 small bag of chips).
   - was it a small or large cracker, sausage, chocolate bar, bag of chips, McDonald's fries, etc.

   liquids - use cups, teaspoons or tablespoons; other foods can also be measured this way (for example: peas, mashed potatoes, spaghetti sauce, ice cream, cereal, etc.).

   pieces - for pieces of meat, cheese, cake, etc. note the length, width and depth with a ruler. For pizza or pie, record the portion (eg. 1/8 of a medium pizza).

5. **EXTRA SERVINGS** - Follow the above instructions for the AMOUNT SERVED COLUMN.

6. **AMOUNT UNEATEN COLUMN** - Measure any food left on your child's plate, bowl or glass, etc. and record it in this column. Remember, children don't always eat all that is offered to them.

7. **COMMENTS COLUMN** - Feel free to add any comments you have in this column (eg. on difficulties you experienced, or problems with recording foods).

****

HELPFUL HINTS

*__Foods with friends/relatives__ - tell them your child is participating in this study so they can tell you what food is eaten and how much.

*__Foods in restaurants__ - estimate the amount eaten and what was in the food. Please include the name of the restaurant in the "comments" section of the Food Diary.

*__Forgotten foods__ - as soon as you remember, record what your child ate, the approximate time and estimate the amount.

*__Packaged foods__ - wrappers or packages from candies or nuts can be saved and given to the interviewer. This makes recording easier for you.

SAMPLE FOOD DIARY:

PLACE: H=HOME
C=CHILDCARE
AR=AWAY-REST
AH=AWAY-HOME

SAMPLE FOOD DIARY

DAY: #1 #2 #3 (circle one)
DATE: Thursday, Jan. 16th

TYPE OF DAY: ___non-workday
_x_workday (left at 7:30 am)
child picked up at 5:00 pm)

ID# 10 13 16 10 1

TIME		DESCRIPTION OF FOOD OR BEVERAGE	AMOUNT SERVED	AMOUNT-EXTRA SERVINGS	AMOUNT UNEATEN	COMMENTS	OFFICE SPACE
7[00] am	H	Tang, orange juice	1/2 cup		2 tbsp.		
		Rice Krispies	1/2 cup				
		Milk, homo	1/2 cup				
		Sugar	1 tsp.				
5[30] pm	A-H	Oreo Cookies	2				
6[30] pm	A-R	Chicken wings - medium size, barbequed	2			Perkins	
		Peas, canned	3 tbsps.				
		Mashed Potatoes -	1/4 cup				
		with margarine	1/2 tsp.				
		Peaches, canned -	1/2 peach				
		with peach juice	2 tsps.				
		Milk, homo	1/2 cup	1/2 cup	1/4 cup		
8[00] PM	H	Chips - Salt & Vinegar	1-$0.80 bag				
		Chocolate Milk	1 cup			Store bought	

Is this day typical of the way your child usually eats? ____ Yes ____ No. If no, please explain why _____
Thank you for keeping your child's Food Diary.

If you have any questions about the Food Diary, please do not hesitate to call me,_____, at_____ during the day. You can also call Jan Trumble (Project Coordinator), at 474-6874 during the day.

Thank you for keeping your child's Food Diary. We appreciate your help.

All information you provide will be kept strictly confidential.

Have fun keeping the diary!

FOOD DIARY

ID# / / / / /

PLACE: H=HOME
C=CHILD CARE
AR=AWAY-REST
AH=AWAY-HOME

DAY: #1 #2 #3 (circle one)
DATE:_____

TYPE OF DAY:____ non-workday
____ workday (left at_____,
child picked up at_____)

TIME	DESCRIPTION OF FOOD OR BEVERAGE	AMOUNT SERVED	AMOUNT-EXTRA SERVINGS	AMOUNT UNEATEN	COMMENTS *	OFFICE SPACE

REMINDER: HAVE YOU RECORDED EVERYTHING EATEN AND HOW MUCH WAS EATEN?

Is this typical of the way your child usually eats?_____yes _____no If no, please explain why_____

Thank you for keeping your child's Food Diary.

HOW TO KEEP A DIARY OF A CHILD'S FOOD INTAKE - TIPS FOR CAREGIVERS

The **most important** thing you will be doing is writing down the name of everything _____ eats or drinks (except water) while in your care. Be sure to include even small snacks like fruit, crackers, candy and soft drinks. We would be grateful if you could do this for two days:

DAY 1:_____
DAY 2:_____
INTERVIEWER PICKS UP DIARY ON:_____

Use the forms provided and follow these simple instructions:

1. **TIME COLUMN** - Note the time of day when food is eaten in this column. Please write on the form at the time foods/ beverages are eaten, or immediately afterwards.
2. **DESCRIPTION OF FOOD OR BEVERAGE** - Include the method of preparation and cooking, brand names (if applicable), etc.

* What type of food is it? -If milk, is it skim, 1%, 2%, homogenized?
  -If bread, is it whole wheat, rye, white?
  -Is the food low fat or calorie reduced? (eg. diet drinks)
* Is it cooked, raw, canned, frozen or fresh?
* Is it boiled, baked, roasted, fried, broiled, etc?
  -If fried, what type of fat? For example, are wieners boiled or fried in butter, margarine, oil, shortening, etc.?
  -Is soup or cocoa made with water or milk?
* What kind of beverage, if any, is eaten with meals or snacks?
* State brand name and kind of fruit juices and drinks (eg. Wyler's orange crystals). State brand names for other foods, if applicable (eg. Ritz crackers).
* For foods eaten together, like hamburgers, write down each food item and amount given to the child (eg. hamburger bun, beef patty, tomato slice, cheese (state kind), ketchup, and pickle slices).
* For **recipes** like spaghetti sauce, stews or casseroles please write recipe on back of Food Diary giving the amount of each ingredient, number of servings for the dish, and the amount given to the child.
* Remember to record all the "little extras" that are added to or eaten with other foods such as
  -butter or margarine on vegetables, sandwiches, crackers; fat used for frying
  -salad dressing; gravy; sauces on vegetables, ice cream or yoghurt
  -sugar on cereal; jam, butter, peanut butter, syrup etc. on toast, pancakes, etc.
* If a Day Care Center, DO NOT RECORD WHAT IS ON THE PRINTED MENU. Instead record what is actually eaten.

4. **AMOUNT SERVED COLUMN** - There are several ways you can record the amount eaten. Choose the one that is most appropriate for the food you are measuring.

   individual items - count the number (for example: 1 apple, 2 Ritz crackers, 1 150mL carton of milk, 1 $0.64 chocolate bar, or an $0.85 small bag of chips).
   - was it a small or large cracker, sausage, chocolate bar, bag of chips, McDonald's fries, etc.

   liquids - use cups, teaspoons or tablespoons; other foods can also be measured this way (for example: peas, mashed potatoes, spaghetti sauce, ice cream, cereal, etc.).

   pieces - for pieces of meat, cheese, cake, etc. note the length, width and depth with a ruler. For pizza or pie, record the portion (eg. 1/8 of a medium pizza).

5. **EXTRA SERVINGS** - Follow the above instructions for the AMOUNT SERVED COLUMN.

6. **AMOUNT UNEATEN COLUMN** - Measure any food left on the child's plate, bowl or glass, etc. and record it in this column. Remember, children don't always eat all that is offered to them.

7. **COMMENTS COLUMN** - Feel free to add any comments you have in this column (eg. on difficulties you experienced, or problems with recording foods).

****

HELPFUL HINTS

*Food on outings - if food or beverages are consumed during an excursion, estimate the amount eaten and what was in the food. Record the item in the Food Diary. Include the name of the place the food was eaten in the "comments" section of the Food Diary.

*Packaged foods - wrapper or packages from candies or nuts can be saved and given to the interviewer. This makes recording easier for you.

*Forgotten foods - as soon as you remember, record what the child ate, the approximate time and estimate the amount.

SAMPLE FOOD DIARY:

ID# /0 /3 /6 /0 /

FOOD DIARY

DAY: #1 #2 (circle one)
DATE: Thursday, Jan, 16th

TIME	DESCRIPTIONOF FOOD OR BEVERAGE	AMOUNT SERVED	AMOUNT-EXTRA SERVINGS	AMOUNT UNEATEN	COMMENTS	OFFICESPACE
9:30 am	Crackers, Ritz, regular size	2			eaten dry, no spread	
	Apple, medium with skin	1/4				
	Milk, 2%	1/2 cup				
12:00 noon	Sandwich - white bread	1 slice			ate all	
	- margarine	1 tsp.				
	- ham, processed, Burns	1 slice			4" x 3" x 1/8"	
	- mustard	1/4 tsp.				
	Tomato Soup - canned, made with water	1/2 cup		2 tsps.		
3:00 pm	"Dad's" Chocolate Chip Cookies	2			2 1/2" diameter	
	Rise'n Shine Orange Crystals Drink	1/2 cup	1/4 cup			

If you have any questions the food diary, please do not hesitate to call me,_____,
at_____ during the day. You can also call Jan Trumble (Project Coordinator), at 474-6874 during the day.

Thank you for keeping this child's food diary. We appreciate your help.

All information you provide will be kept strictly confidential.

Have fun keeping the diary!

ID# / / / / /

FOOD DIARY

DATE:_____
DAY: #1 #2 (circle one)

TIME	DESCRIPTION OF FOOD OR BEVERAGE	AMOUNT SERVED	AMOUNT-EXTRA SERVINGS	AMOUNT UNEATEN	COMMENTS	OFFICE SPACE

REMINDER: HAVE YOU RECORDED EVERYTHING EATEN BY THE CHILD TODAY AND HOW MUCH WAS EATEN?

Is this day typical of the way the child usually eats?_____yes _____no If no, please explain why_____)

Thank you for keeping the child's Food Diary.

If you need more space, continue on back of sheet.

APPENDIX D

HOW TO KEEP A WEIGHED DIARY OF YOUR CHILD'S FOOD INTAKE - TIPS FOR PARENTS

The **most important** thing you will be doing for this second Food Diary is weighing and recording everything your child eats or drinks (except water) at home or away from home. Be sure to include foods your child eats between meals, while watching TV or playing with friends, even small snacks like fruit, crackers, candy, soft drinks, etc. We would be grateful if you would keep a weighed Food Diary for three days:

DAY 1:_____

DAY 2:_____

DAY 3:_____

INTERVIEWER PICKS UP DIARY ON:_____

Use the forms provided and follow these simple instructions:

1. **TIME COLUMN** - Note the time of day when food is eaten in this column. Please write on the form at the time foods/beverages are eaten, or immediately afterwards.
2. **PLACE COLUMN** - Note where the food is eaten in this column. Use the following as a guide:
   - **H:** HOME (for food eaten at home)
   - **C:** CHILD CARE (for food eaten with the child's caregiver while you are working)
   - **AR:** AWAY-REST (for food eaten away from home in restaurants, snack bars, cafeterias, McDonald's, etc.)
   - **AH:** AWAY-HOME (for food eaten in another person's home but not at the child's caregiver)
3. **DESCRIPTION OF FOOD OR BEVERAGE** - Include the method of preparation and cooking, brand names (if applicable), etc.
   - What type of food is it? -If milk, is it skim, 1%, 2%, homogenized?
     -If bread, is it whole wheat, rye, white?
     -Is the food low fat or calorie reduced? (eg. diet drinks)
   - Is it cooked, raw, canned, frozen or fresh?
   - Is it boiled, baked, roasted, fried, broiled, etc?
     -If fried, what type of fat? For example, are wieners boiled or fried in butter, margarine, oil, shortening, etc?
     -Is soup or cocoa made with water or milk?
   - What kind of beverage, if any, is eaten with the meal or snack?
   - State brand name and kind of fruit juices and drinks (eg. Wyler's orange crystals). State brand names for other foods, if applicable (eg. Ritz crackers).
   - For foods eaten together, like hamburgers, write down each food item (eg. hamburger bun, beef patty, tomato slice, cheese (state kind), ketchup, and pickle slices).
   - For **recipes** like spaghetti sauce, stews or casseroles please write recipe on back of Food Diary giving the amounts of each ingredient, number of servings for the recipe, and amount given to your child.

* Remember to record all the "little extras" that are added to or eaten with other foods such as
  -butter or margarine on vegetables, sandwiches, crackers; fat used for frying
  -salad dressing; gravy; sauces on vegetables, ice cream or yoghurt
  -sugar on cereal; jam, butter, peanut butter, syrup etc. on toast, pancakes, etc.

4. **AMOUNT SERVED COLUMN** - Follow the instructions below for weighing either FOODS or LIQUIDS.

WEIGHING FOODS

1. press "on" button on front of scale
2. wait until a "0" appears on the screen
3. place a dish on the scale
4. press the "on" button again, wait until it reads "0"
5. place one food item on the dish, **read and record** the weight shown (in grams) on the screen
6. check the numbers on the screen to your recorded value
7. press the "on" button and wait until the screen reads "0"
8. **repeat #5-#7 until all food items are weighed**
9. serve your child the dish containing all the weighed foods

WEIGHING LIQUIDS

1. do #1 and #2 above for WEIGHING FOODS
2. place a glass or mug on the scale
3. press "on" button, wait until it reads "0"
4. pour the liquid into the glass, **read and record** the weight shown (in grams) on the screen

5. **EXTRA SERVINGS** - Follow the above instructions for the AMOUNT SERVED COLUMN.
6. **AMOUNT UNEATEN COLUMN** - Weigh any food left on your child's plate, bowl or glass, etc. and record it in this column. Remember, children don't always eat all that is offered to them.

WEIGHING LEFTOVERS

1. use a new plate, bowl, glass or mug
2. follow steps #1-#8 for foods or #1-#4 for liquids
   -continue until all the food your child did not eat is weighed individually
   -remember to weigh all leftovers, including bones, apple cores, potato skins, etc.
3. **read and record** each item in the AMOUNT UNEATEN COLUMN

7. **COMMENTS COLUMN** - Feel free to add any comments you have in this column (eg. on difficulties you experienced, or problems with recording foods).

****

HELPFUL HINTS

*__Foods with friends/relatives__ - tell them your child is participating in this study so they can tell you what food is eaten and how much.

*__Foods in restaurants__ - estimate the amount eaten and what was in the food. Please include the name of the restaurant in the "comments" section of the Food Diary.

*__Forgotten foods__ - as soon as you remember, record what your child ate, the approximate time and estimate the amount.

*__Packaged foods__ - wrappers or packages from candies or nuts can be saved and given to the interviewer. This makes recording easier for you.

****

INSTRUCTIONS FOR THE DIGITAL SCALE

* KEEP SCALE ON FLAT SURFACE
* ALWAYS PRESS "ON" BUTTON AND WAIT FOR 0 (ZERO) TO APPEAR ON THE SCREEN BEFORE WEIGHING ANY FOODS OR BEVERAGES
* SCALE SHOULD BE KEPT AWAY FROM WET AND EXCESSIVE HOT OR COLD AREAS

****

PLACE:
H=HOME
C=CHILDCARE
AR=AWAY-REST
AH=AWAY-HOME

SAMPLE FOOD DIARY

DAY: #1 #2 #3 (circle one)
DATE: Thursday, Jan. 16th

TYPE OF DAY: ___non-workday
X workday (left at 7:30 am)
child picked up at 5:00 pm)

ID# 10 13 16 10 1

TIME		DESCRIPTIONOF FOOD OR BEVERAGE	AMOUNT SERVED (g)	AMOUNT-EXTRA SERVINGS (g)	AMOUNT UNEATEN (g)	COMMENTS	OFFICESPACE
7[00] am	H	Tang, orange juice	104 g		7 g		
		Rice Krispies	15 g				
		Milk, homo	130 g				
		Sugar	13 g				
5[30] pm	A-H	Oreo Cookies	22 g				
6[30] pm	A-R	Chicken wings - medium size, barbequed	82 g			Perkins	
		Peas, canned	48 g				
		Mashed Potatoes -	55 g				
		with margarine	8 g				
		Peaches, canned - with peach juice	131 g				
		Milk, homo	130 g	130 g	65 g		
8[00] PM	H	Chips - Salt & Vinegar	20 g				
		Chocolate Milk	264 g			Store bought	

If you have any questions about the Food Diary, please do not hesitate to call me,_____, at_____ during the day. You can also call Jan Trumble (Project Coordinator), at 474-6874 during the day.
Thank you for keeping your child's Food Diary. We appreciate your help.
All information you provide will be kept strictly confidential.

Have fun keeping the diary!

PLACE: H=HOME
C=CHILD CARE
AR=AWAY-REST
AH=AWAY-HOME

FOOD DIARY

DAY: #1 #2 #3 (circle one)
DATE:_____

ID# /__/__/__/__/__/

TYPE OF DAY:____ non-workday
____ workday (left at_____,
child picked up at_____)

TIME	DESCRIPTION OF FOOD OR BEVERAGE	AMOUNT SERVED (g)	AMOUNT-EXTRA SERVINGS (g)	AMOUNT UNEATEN (g)	COMMENTS	OFFICE SPACE

REMINDER: HAVE YOU RECORDED EVERYTHING EATEN AND HOW MUCH WAS EATEN?

Is this typical of the way your child usually eats?_____yes _____no If no, please explain why_____

Thank you for keeping your child's Food Diary.

IF YOU NEED MORE SPACE CONTINUE ON BACK OF SHEET.

HOW TO KEEP A WEIGHED DIARY OF A CHILD'S FOOD INTAKE - TIPS FOR CAREGIVERS

The **most important** thing you will be doing for this second Food Diary is weighing and recording everything _____ eats or drinks (except water) while in your care. Be sure to include even small snacks like fruit, crackers, candy, soft drinks, etc. We would be grateful if you would keep a weighed Food Diary for two days:

DAY 1:_____
DAY 2:_____
INTERVIEWER PICKS UP DIARY ON:_____

Use the forms provided and follow these simple instructions:

1. **TIME COLUMN** - Note the time of day when food is eaten in this column. Please write on the form at the time foods/ beverages are eaten, or immediately afterwards.
2. **DESCRIPTION OF FOOD OR BEVERAGE** - Include the method of preparation and cooking, brand names (if applicable), etc.

* What type of food is it? -If milk, is it skim, 1%, 2%, homogenized?
  -If bread, is it whole wheat, rye, white?
  -Is the food low fat or calorie reduced? (eg. diet drinks)
* Is it cooked, raw, canned, frozen or fresh?
* Is it boiled, baked, roasted, fried, broiled, etc?
  -If fried, what type of fat? For example, are wieners boiled or fried in butter, margarine, oil, shortening, etc.?
  -Is soup or cocoa made with water or milk?
* What kind of beverage, if any, is eaten with meals or snacks?
* State brand name and kind of fruit juices and drinks (eg. Wyler's orange crystals). State brand names for other foods, if applicable (eg. Ritz crackers).
* For foods eaten together, like hamburgers, write down each food item and amount given to the child (eg. hamburger bun, beef patty, tomato slice, cheese (state kind), ketchup, and pickle slices).
* For **recipes** like spaghetti sauce, stews or casseroles please write recipe on back of Food Diary giving the amount of each ingredient, number of servings for the dish, and the amount given to the child.
* Remember to record all the "little extras" that are added to or eaten with other foods such as
  -butter or margarine on vegetables, sandwiches, crackers; fat used for frying
  -salad dressing; gravy; sauces on vegetables, ice cream or yoghurt
  -sugar on cereal; jam, butter, peanut butter, syrup etc. on toast, pancakes, etc.
* If a Day Care Center, DO NOT RECORD WHAT IS ON THE PRINTED MENU. Instead record what is actually eaten.

4. **AMOUNT SERVED COLUMN** - Follow the instructions below for weighing either FOODS or LIQUIDS:

WEIGHING FOODS

1. press "on" button on front of scale
2. wait until a "0" appears on the screen
3. place a dish on the scale
4. press the "on" button again, wait until it reads "0"
5. place one food item on the dish, **read and record** the weight shown (in grams) on the screen
6. check the numbers on the screen to your recorded value
7. press the "on" button and wait until the screen reads "0"
8. **repeat #5-#7 until all food items are weighed**
9. serve the child the dish containing all the weighed foods

WEIGHING LIQUIDS

1. do #1 and #2 above for WEIGHING FOODS
2. place a glass or mug on the scale
3. press "on" button, wait until it reads "0"
4. pour the liquid into the glass, **read and record** the weight shown (in grams) on the screen

5. **EXTRA SERVINGS** - Follow the above instructions for the AMOUNT SERVED COLUMN.

6. **AMOUNT UNEATEN COLUMN** - Weigh any food left on the child's plate, bowl or glass, etc. and record it in this column. Remember, children don't always eat all that is offered to them.

WEIGHING LEFTOVERS

1. use a new plate, bowl, glass or mug
2. follow steps #1-#8 for foods or #1-#4 for liquids
   - -continue until all the food the child did not eat is weighed individually
   - -remember to weigh all leftovers, including bones, apple cores, potato skins, etc.
3. **read and record** each item in the AMOUNT UNEATEN COLUMN

7. **COMMENTS COLUMN** - Feel free to add any comments you have in this column (eg. on difficulties you experienced, or problems with recording foods).

****

HELPFUL HINTS

*__Food on outings__ - if food or beverages are consumed during an excursion, estimate the amount eaten and what was in the food. Record the item in the Food Diary. Include the name of the place the food was eaten in the "comments" section of the Food Diary.

*__Packaged foods__ - wrapper or packages from candies or nuts can be saved and given to the interviewer. This makes recording easier for you.

*__Forgotten foods__ - as soon as you remember, record what the child ate, the approximate time and estimate the amount.

****

INSTRUCTIONS FOR THE DIGITAL SCALE

* KEEP SCALE ON FLAT SURFACE
* ALWAYS PRESS "ON" BUTTON AND WAIT FOR 0 (ZERO) TO APPEAR ON THE SCREEN BEFORE WEIGHING ANY FOODS OR BEVERAGES
* SCALE SHOULD BE KEPT AWAY FROM WET AND EXCESSIVE HOT OR COLD AREAS

****

ID# /0/3/6/0/ SAMPLEFOOD DIARY DAY: #1 #2 (circle one)
DATE: Thursday, Jan. 16th

TIME	DESCRIPTIONOF FOOD OR BEVERAGE	AMOUNT SERVED (g)	AMOUNT-EXTRA SERVINGS (g)	AMOUNT UNEATEN (g)	COMMENTS	OFFICESPACE
9:30 am	Crackers, Ritz, regular size	6 g			eaten dry, no spread	
	Apple, medium with skin	34 g				
	Milk, 2%	129 g				
12:00 noon	Sandwich - white bread	28 g			ate all	
	- margarine	8 g				
	- ham, processed, Burns	27 g				
	- mustard	5 g				
	Tomato Soup - canned, made with water	129 g		8 g		
3:00 pm	"Dad's" Chocolate Chip Cookies	24 g				
	Rise'n Shine Orange Crystals Drink	116 g	58 g			

If you have any questions the food diary, please do not hesitate to call me,_____,
at_____ during the day. You can also call Jan Trumble (Project Coordinator), at 474-6874 during the day.
Thank you for keeping this child's food diary. We appreciate your help.
All information you provide will be kept strictly confidential.

Have fun keeping the diary!

ID# / / / / /

FOOD DIARY

DAY: #1 #2 (circle one)
DATE:_____

TIME	DESCRIPTION OF FOOD OR BEVERAGE	AMOUNT SERVED (g)	AMOUNT-EXTRA SERVINGS (g)	AMOUNT UNEATEN (g)	COMMENTS	OFFICE SPACE

REMINDER: HAVE YOU RECORDED EVERYTHING EATEN BY THE CHILD TODAY AND HOW MUCH WAS EATEN?

Is this day typical of the way the child usually eats?_____yes _____no If no, please explain why_____)
Thank you for keeping the child's Food Diary.

If you need more space, continue on back of sheet.

APPENDIX E

CONSENT FORM - PARENTS/GUARDIANS

I have read the attached letter which describes the responsibilities of parents/guardians in the proposed study. My child and I agree to participate in the study as described in the letter and further explained in a telephone call and during this visit. I understand that the dietary information I provide will be kept entirely confidential. I also understand that I may refuse to do any part of the study or withdraw from the study at any time.

I have had the project explained and my child and I agree to participate.

Signature of parent/guardian _____

Date _____

Signature of interviewer _____

CONSENT FORM - CAREGIVERS

I have read the attached letter which describes the responsibilities of the child's caregiver in the proposed study. I agree to participate in the study described first in a telephone call and then further explained during this visit. I understand that the dietary information I provide will be kept entirely confidential. I also understand that I may refuse to do any part of the study or withdraw from the study at any time.

I have had the project explained and I agree to participate.

Signature of caregiver _____

Date _____

Signature of interviewer _____

OATH OF CONFIDENTIALITY

This is to certify that I, _____ , take an oath of confidentiality regarding all data related to the study of WORKING PARENTS AND PRESCHOOL CHILD NUTRITION. I understand such confidentiality refers to any information collected as part of this study and that the penalty for violation of this oath is subject to university discipline and dismissal procedures.

Signature_____

Date_____

APPENDIX F

VITAMIN AND MINERAL SUPPLEMENT FORM ID#/ / / / /

1. Do you give (CHILD'S NAME) a vitamin or mineral supplement?

YES (GO TO 2).....1
SOMETIMES (GO TO 2).....2
NO (END INTERVIEW - DISCUSS SECOND VISIT).....3
NO RESPONSE (END INTERVIEW - DISCUSS SECOND VISIT).7

2. What type of supplement does he/she get? (CHECK LABEL)

	YES	NO	NR	DK	NA
MULTIVITAMINS	1	2	7	8	9
MULTIVITAMINS + IRON	1	2	7	8	9
MULTIVITAMINS + MINERALS	1	2	7	8	9
IRON ONLY	1	2	7	8	9
VITAMIN C ONLY	1	2	7	8	9
VITAMIN D ONLY	1	2	7	8	9
OTHER (SPECIFY_____ _____)	1	2	7	8	9
COMBINATION OF TIMES	1	2	7	8	9
NO RESPONSE	1	2	7	8	9
DON'T KNOW	1	2	7	8	9
NOT APPLICABLE	1	2	7	8	9

3. How often does (CHILD'S NAME) receive a supplement?

	YES	NO	NR	DK	NA
ONCE A DAY	1	2	7	8	9
FEW TIMES A WEEK	1	2	7	8	9
ONCE A WEEK	1	2	7	8	9
FEW TIMES A MONTH	1	2	7	8	9
WINTER ONLY	1	2	7	8	9
DURING ILLNESS	1	2	7	8	9
OTHER (SPECIFY_____ _____)	1	2	7	8	9

4. Why do you give him/her a supplement? (CHECK ALL THAT APPLY)

	YES	NO	NR	DK	NA
RECOMMENDED BY DOCTOR/NUTRITIONIST	1	2	7	8	9
FUSSY EATER, DOESN'T EAT PROPERLY/ENOUGH	1	2	7	8	9
EXTRA INSURANCE; NOT GET ENOUGH FROM FOOD	1	2	7	8	9
SUGGESTED BY FAMILY, FRIEND OR RELATIVE	1	2	7	8	9
TO PREVENT COLDS	1	2	7	8	9
OTHER (PLEASE SPECIFY_____)	1	2	7	8	9

5. Were vitamin or mineral supplements taken during the three days of your child's food diary?

YES (GO TO 6).....1
NO (GO TO NEXT STEP OF HOME VISIT).....2
NOT APPLICABLE.....3

6. How often each day?_____
How many each day?_____
What is the brand name:_____
(INTERVIEWER CHECKS BOTTLE)

7. The study is interested in a few of the more common vitamins and minerals found in supplements. I'd like to write down the amounts found in the supplement, if you don't mind. (CHECK LABEL. RECORD AMOUNT IN EACH PILL)

___ vitamin C...../ / / /mg
___ thiamin...../ /./ / /mg
___ riboflavin...../ / /./ / /mg
___ niacin...../ / /./ / /NE
___ folic acid...../ / / /ug
___ iron...../ / /./ /mg
___ calcium...../ / / /mg

END INTERVIEW AND DISCUSS SECOND VISIT.

TIME 2: VITAMIN AND MINERAL SUPPLEMENT FORM

ID#/ / / / /

FROM QUESTION #1 ON VITAMIN AND MINERAL SUPPLEMENT FORM (TIME 1):

IF YES (**GO TO 1**).....1

IF SOMETIMES (**GO TO 1**).....2

IF NO (**END INTERVIEW**).....3

IF NO RESPONSE (**END INTERVIEW**).....7

1. Were vitamin or mineral supplements taken during the three days of your child's food diary?

   YES (**GO TO 6**).....1
   NO (**GO TO NEXT STEP OF HOME VISIT**).....2
   NOT APPLICABLE.....3

2. How often each day?_____

   How many each day?_____

   What is the brand name:_____
   (**INTERVIEWER CHECKS BOTTLE**)

3. The study is interested in a few of the more common vitamins and minerals found in supplements. As we discusses in our last visit, I'd like to write down the amounts found in the supplement, if you don't mind. (**CHECK LABEL. RECORD AMONT IN EACH PILL**)

   ___ vitamin C.....//// mg
   ___ thiamin.....//.// mg
   ___ riboflavin.....//.// mg
   ___ niacin.....//.// NE
   ___ folic acid.....//// ug
   ___ iron.....//.// mg
   ___ calcium.....//// mg

END INTERVIEW.

APPENDIX G

ID #:/ / / / /

NON-RESPONSE QUESTIONS

I understand that you do not wish to participate in the study. However would you be willing to answer a few background questions instead? We use this information to make sure that the parents we talk to represent all parents in Manitoba. It will only take a couple of minutes.

****

1. How many hours do you work at your job in the average week, including overtime? / / 101 Ø37/1/ 51-54

_____ HOURS/WEEK (IF LESS THAN 15 HOURS, END INTERVIEW)
_____ NO RESPONSE

2. And your spouse/partner, how many hours does she/he work at his/her job in the average week, including overtime? / / 101 Ø45/1/ 666969

_____ HOURS/WEEK (IF LESS THAN 15 HOURS, END INTERVIEW)
_____ NO RESPONSE

3. What time do you and your spouse/parnter usually begin and end work? (CIRCLE TIME)

FOR SELF:

12—1—2—3—4—5—6—7—8—9—10—11—12—1—2—3—4—5—6—7—8—9—10—11—12
AM NOON PM

_____ works split shift or begins work more than once a day (SPECIFY START _____ AND STOP TIMES _____) / Ø38/1/ 55

FOR SPOUSE:

12—1—2—3—4—5—6—7—8—9—10—11—12—1—2—3—4—5—6—7—8—9—10—11—12
AM NOON PM

_____ works split shift or begins work more than once a day (SPECIFY START _____ AND STOP TIMES _____) / Ø46/1/ 7Ø

4. Are you married, widowed, separated, divorced or living common law? Ø2Ø/1/ 27

MARRIED (EXCLUDING SEPARATED) OR COMMON LAW.....1
DIVORCED/SEPARATED (END INTERVIEW).....2
WIDOWED (END INTERVIEW).....3
OTHER (SPECIFY_____) (END INTERVIEW).....4
NO RESPONSE.....7

****

5. What is the highest grade in school or year at college you have completed? Ø7Ø/2/ 26-27

(DO NOT READ)

GRADE EIGHT OR LESS.....01
SOME HIGH SCHOOL.....02
COMPLETED HIGH SCHOOL.....03
SOME POST-SECONDARY TRAINING (NON-UNIVERSITY).....04
POST-SECONDARY CERTIFICATE OR DIPLOMA.....05
SOME UNIVERSITY.....06
COMPLETED UNIVERSITY (HAS DEGREE).....07
POST-GRADUATE TRAINING.....08
OTHER (SPECIFY_____).....09
NO RESPONSE.....77
DON'T KNOW.....88
DESCRIBE IF FOREIGN EDUCATION_____

6. And for your spouse or partner, what is the highest grade in school or year at college he/she has completed? (DO NOT READ)

GRADE EIGHT OR LESS.....01
SOME HIGH SCHOOL.....02
COMPLETED HIGH SCHOOL.....03
SOME POST-SECONDARY TRAINING (NON-UNIVERSITY).....04
POST-SECONDARY CERTIFICATE OR DIPLOMA.....05
SOME UNIVERSITY.....06
COMPLETED UNIVERSITY (HAS DEGREE).....07
POST-GRADUATE TRAINING.....08
OTHER (SPECIFY_____).....09
NO RESPONSE.....77
DON'T KNOW.....88
DESCRIBE IF FOREIGN EDUCATION_____

Ø71/a/ 28-29

7. What kind of work do you do? (SPECIFY_____
_____)

(PROBE FOR OCCUPATION, WHAT IS DONE IN THE JOB, KIND OF BUSINESS OR INDUSTRY IT IS IN, GIVE JOB TITLE IF POSSIBLE.)

(NOTE: IF MORE THAT ONE JOB, DISCUSS MAIN OCCUPATION)

L L /
Ø35/1/ 45-46

8. What kind of work does your spouse or partner do? (SPECIFY_____
_____)

(PROBE FOR OCCUPATION, WHAT IS DONE IN THE JOB, KIND OF BUSINESS OR INDUSTRY IT IS IN, GIVE JOB TITLE IF POSSIBLE.)

(NOTE: IF MORE THAT ONE JOB, DISCUSS MAIN OCCUPATION)

L L /
Ø43/1/ 60-61

7. The last question is about your family income. Adding up the income that you and your spouse/partner make from all sources, roughly what is the total yearly income before taxes of your immediate family -- include your income and that of your spouse or partner, the wages of everyone else in the family who works, and income from any other sources such as investment income, income from roomers or boarders, and so on.

I will read several income categories. When I come to the category that best describes your family's total yearly income before taxes, please stop me

under $20,000.....01
under $30,000.....02
under $40,000.....03
under $50,000.....04
under $60,000.....05
under $70,000.....06
under $80,000.....07
$80,000 and over.....07
NO RESPONSE.....77
DON'T KNOW.....88

Ø73/a/ 67-68

That completes the questions.

Thank you very much for answering them. I really appreciate your time.

APPENDIX H

The following calculations were derived for each nutrient:

VARIATION:

VARIANCE:

(NOTE: MSE, MS_{SxP}, AND MS_S WERE OBTAINED FROM THE ANOVA TABLE)

$$\sigma_{DAYS(SUBJECTxPERIOD)}^2 = \sigma_\varepsilon^2 = MSE$$

$$\sigma_{SUBJECTxPERIOD}^2 = \sigma_{SxP}^2 = \frac{MS_{SxP} - MSE}{3}$$

$$\sigma_{SUBJECT}^2 = \sigma_S^2 = \frac{MS_S - MS_{SxP}}{6}$$

$$\sigma_{TOTAL}^2 = \sigma_D^2 + \sigma_{SxP}^2 + \sigma_S^2$$

PERCENT VARIATION:

$$\text{DAY TO DAY VARIABILITY} = \frac{\sigma_D^2}{\sigma_{TOTAL}^2}$$

$$\text{PERIOD VARIABILITY ACROSS SUBJECTS} = \frac{\sigma_{SxP}^2}{\sigma_{TOTAL}^2}$$

$$\text{SUBJECT TO SUBJECT VARIABILITY} = \frac{\sigma_S^2}{\sigma_{TOTAL}^2}$$

VARIANCE RATIO:

$$\frac{\text{WITHIN-SUBJECT VARIATION}}{\text{BETWEEN-SUBJECT VARIATION}} = \frac{\sigma_D^2}{\sigma_{SxP}^2 + \sigma_S^2} = \frac{S_W^2}{S_B^2}$$

STANDARD ERROR:

CORRECTED FOR THE PAIRED DIFFERENCE BETWEEN MEANS

GROUP LEVEL OF ASSESSMENT:

FOR n_i: i = 1 = GROUP 1 (n=86)
= 2 = GROUP 2 (n=60)

STANDARD ERROR = SE = $[2\ ((\sigma_{SxP}^2/n_i) + (\sigma_D^2/3n_i))\ ]^{1/2}$

INDIVIDUAL LEVEL OF ASSESSMENT:

FOR n_i: i = 1 = GROUP 1 (n=1)
= 2 = GROUP 2 (n=1)

STANDARD ERROR = SE = $[2\ ((\sigma_{SxP}^2/n_i) + (\sigma_D^2/3n_i))\ ]^{1/2}$

95% CONFIDENCE INTERVAL:

(NOTE: THE ESTIMATES OF THE CHANGE BETWEEN PERIODS WILL BE THE SAME FOR THE GROUP OR INDIVIDUAL LEVEL OF ASSESSMENT, HENCE, THE DIFFERENCE WILL BE THE WIDTH OF THE CONFIDENCE INTERVALS)

$\alpha = 0.05$

GROUP LEVEL OF ASSESSMENT:

$(Y_{i.2.} - Y_{i.1.}) \pm z_{\alpha/2}\ [2\ ((\sigma_{SxP}^2/n_i) + (\sigma_D^2/3n_i))\ ]^{1/2}$

i= 1,2
$n_1 = 86$, $n_2 = 60$
$z_{\alpha/2} = 1.96$

INDIVIDUAL LEVEL OF ASSESSMENT:

$(Y_{i.2.} - Y_{i.1.}) \pm z_{\alpha/2}\ [2\ ((\sigma_{SxP}^2) + (\sigma_D^2/3))\ ]^{1/2}$
i = 1,2
$z_{\alpha/2} = 1.96$

APPENDIX I

ANOVA FOR THE MAIN PLOT OF ENERGY

SOURCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE ERROR	F VALUE[1]
GROUP	1	431691.929	431691.929	1.5912
SUBJECT(GROUP)	144	39068292.348	271307.586	2.9143
PERIOD	1	64949.224	64949.224	0.6977
GROUP*PERIOD	1	1283525.054	1283525.054	13.7873
SUBJECT*PERIOD(GROUP)	144	13405615.547	93094.552	1.0381
DAY(PERIOD*SUBJECT (GROUP))	584	52372693.751	89679.270	

[1]F VALUES:

SOURCE = GROUP
ERROR = MS(SUBJECT(GROUP))

SOURCE = SUBJECT(GROUP)
ERROR = MS(SUBJECT*PERIOD(GROUP))

SOURCE = PERIOD
ERROR = MS(SUBJECT*PERIOD(GROUP))

SOURCE = GROUP*PERIOD
ERROR = MS(SUBJECT*PERIOD(GROUP))

SOURCE = SUBJECT*PERIOD(GROUP)
ERROR = MS(DAY(PERIOD*SUBJECT(GROUP)) (=MS(ERROR))

ANOVA FOR THE SUBPLOT OF ENERGY AND EACH NUTRIENT

ENERGY: GROUP 1

SOURCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE ERROR	F VALUE[1]
SUBJECT	85	23849015.024	280576.647	3.4007
PERIOD	1	466153.231	466153.231	5.6500
SUBJECT*PERIOD	85	7012870.676	82504.361	0.8909
DAY(PERIOD*SUBJECT (GROUP))	344	31857033.005	92607.654	

[1] F VALUES WERE GENERATED USING THE FORM OF THE EXPECTED MEAN SQUARES HENCE THE FOLLOWING F VALUES WERE CALCULATED IN EACH ANOVA TABLE IN THIS APPENDIX:

SOURCE: SUBJECT
ERROR: MS(SUBJECT*PERIOD)

SOURCE: PERIOD
ERROR: MS(SUBJECT*PERIOD)

SOURCE: SUBJECT*PERIOD
ERROR: MS(ERROR) OR MS(DAY(PERIOD*SUBJECT))

ENERGY: GROUP 2

SOURCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE ERROR	F VALUE
SUBJECT	59	15219277.324	257953.853	2.3807
PERIOD	1	820587.396	820587.396	7.5734
SUBJECT*PERIOD	59	6392744.870	108351.608	1.2675
DAY(PERIOD*SUBJECT (GROUP))	240	20515660.745	85481.919	

PROTEIN: GROUP 1

SOURCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE ERROR	F VALUE
SUBJECT	85	39072.111	459.672	3.0764
PERIOD	1	782.892	782.892	5.2395
SUBJECT*PERIOD	85	12700.700	149.420	0.7685
DAY(PERIOD*SUBJECT (GROUP))	344	66885.162	194.434	

PROTEIN: GROUP 2

SOURCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE ERROR	F VALUE
SUBJECT	59	25665.113	435.002	2.2160
PERIOD	1	2315.657	2315.657	11.7966
SUBJECT*PERIOD	59	11581.655	196.299	1.3192
DAY(PERIOD*SUBJECT (GROUP))	240	35712.190	148.801	

CARBOHYDRATE: GROUP 1

SOURCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE ERROR	F VALUE
SUBJECT	85	602814.227	7091.932	3.1324
PERIOD	1	72.932	72.932	0.0322
SUBJECT*PERIOD	85	192444.049	2264.047	1.0487
DAY(PERIOD*SUBJECT (GROUP))	344	742665.373	2158.911	

CARBOHYDRATE: GROUP 2

SOURCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE ERROR	F VALUE
SUBJECT	59	408546.180	6924.512	2.8483
PERIOD	1	21223.850	21223.850	8.7300
SUBJECT*PERIOD	59	143437.380	2431.142	1.0643
DAY(PERIOD*SUBJECT (GROUP))	240	548247.622	2284.365	

FAT: GROUP 1

SOURCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE ERROR	F VALUE
SUBJECT	85	53358.220	627.744	2.9159
PERIOD	1	3017.848	3017.848	14.0180
SUBJECT*PERIOD	85	18299.088	215.283	0.8365
DAY(PERIOD*SUBJECT (GROUP))	344	88530.889	257.357	

FAT: GROUP 2

SOURCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE ERROR	F VALUE
SUBJECT	59	29108.683	493.368	1.8753
PERIOD	1	285.722	285.722	1.0860
SUBJECT*PERIOD	59	15521.990	263.084	1.1247
DAY(PERIOD*SUBJECT (GROUP))	240	56137.871	233.908	

IRON: GROUP 1

SOURCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE ERROR	F VALUE
SUBJECT	85	1633.966	19.223	2.8884
PERIOD	1	0.746	0.746	0.1122
SUBJECT*PERIOD	85	565.709	6.655	1.0250
DAY(PERIOD*SUBJECT (GROUP))	344	2233.653	6.493	

IRON: GROUP 2

SOURCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE ERROR	F VALUE
SUBJECT	59	898.451	15.228	1.5839
PERIOD	1	0.014	0.014	0.001484
SUBJECT*PERIOD	59	567.241	9.614	1.1416
DAY(PERIOD*SUBJECT (GROUP))	240	2021.154	8.421	

CALCIUM: GROUP 1

SOURCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE ERROR	F VALUE
SUBJECT	85	21496650.965	252901.776	4.0212
PERIOD	1	138283.382	138283.382	2.1987
SUBJECT*PERIOD	85	5345810.290	62891.886	0.8538
DAY(PERIOD*SUBJECT (GROUP))	344	25338697.179	73659.003	

CALCIUM: GROUP 2

SOURCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE ERROR	F VALUE
SUBJECT	59	16278790.182	275911.698	4.5390
PERIOD	1	870940.634	870940.634	14.3278
SUBJECT*PERIOD	59	3586413.807	60786.675	0.8414
DAY(PERIOD*SUBJECT (GROUP))	240	17337815.028	72240.896	

VITAMIN C: GROUP 1

SOURCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE ERROR	F VALUE
SUBJECT	85	1843069.897	21683.175	5.4819
PERIOD	1	27340.754	27340.754	6.9123
SUBJECT*PERIOD	85	336209.132	3955.402	0.8939
DAY(PERIOD*SUBJECT (GROUP))	344	1522132.923	4424.805	

VITAMIN C: GROUP 2

SOURCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE ERROR	F VALUE
SUBJECT	59	859114.728	14561.267	4.9464
PERIOD	1	47922.137	47922.137	16.2789
SUBJECT*PERIOD	59	173684.986	2943.813	0.5755
DAY(PERIOD*SUBJECT (GROUP))	240	1227734.815	5115.56	

THIAMIN: GROUP 1

SOURCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE ERROR	F VALUE
SUBJECT	85	29.257	0.344	2.5876
PERIOD	1	0.273	0.273	2.0548
SUBJECT*PERIOD	85	11.307	0.133	1.2448
DAY(PERIOD*SUBJECT (GROUP))	344	36.760	0.107	

THIAMIN: GROUP 2

SOURCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE ERROR	F VALUE
SUBJECT	59	14.597	0.247	1.7860
PERIOD	1	0.896	0.896	6.4644
SUBJECT*PERIOD	59	8.173	0.139	0.9223
DAY(PERIOD*SUBJECT (GROUP))	240	36.047	0.150	

RIBOFLAVIN: GROUP 1

SOURCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE ERROR	F VALUE
SUBJECT	85	42.983	0.506	3.6822
PERIOD	1	0.876	0.876	6.3771
SUBJECT*PERIOD	85	11.673	0.137	1.1012
DAY(PERIOD*SUBJECT (GROUP))	344	42.902	0.125	

RIBOFLAVIN: GROUP 2

SOURCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE ERROR	F VALUE
SUBJECT	59	28.286	0.479	3.0219
PERIOD	1	2.317	2.317	14.6041
SUBJECT*PERIOD	59	9.361	0.159	1.2073
DAY(PERIOD*SUBJECT (GROUP))	240	31.538	0.131	

NIACIN: GROUP 1

SOURCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE ERROR	F VALUE
SUBJECT	85	6448.319	75.862	3.1050
PERIOD	1	124.498	124.498	5.0956
SUBJECT*PERIOD	85	2076.753	24.432	0.6992
DAY(PERIOD*SUBJECT (GROUP))	344	12020.873	34.944	

NIACIN: GROUP 2

SOURCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE ERROR	F VALUE
SUBJECT	59	3996.728	67.741	2.0074
PERIOD	1	177.723	177.723	5.2666
SUBJECT*PERIOD	59	1990.955	33.745	1.1086
DAY(PERIOD*SUBJECT (GROUP))	240	7305.561	30.440	

FOLATE: GROUP 1

SOURCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE ERROR	F VALUE
SUBJECT	85	778885.046	9163.353	3.0453
PERIOD	1	3083.864	3083.864	1.0249
SUBJECT*PERIOD	85	255766.107	3009.013	1.0262
DAY(PERIOD*SUBJECT (GROUP))	344	1008654.750	2932.136	

FOLATE: GROUP 2

SOURCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE ERROR	F VALUE
SUBJECT	59	456502.448	7737.330	3.7753
PERIOD	1	18427.960	18427.960	8.9915
SUBJECT*PERIOD	59	120919.625	2049.485	0.7695
DAY(PERIOD*SUBJECT (GROUP))	240	639187.447	2663.281	

VITAMIN A: GROUP 1

SOURCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE ERROR	F VALUE
SUBJECT	85	55373578.288	651453.862	2.6092
PERIOD	1	888264.721	888264.721	3.5576
SUBJECT*PERIOD	85	21222824.148	249680.284	0.8062
DAY(PERIOD*SUBJECT (GROUP))	344	106535193.919	309695.331	

VITAMIN A: GROUP 2

SOURCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE ERROR	F VALUE
SUBJECT	59	44686895.576	757405.010	3.5574
PERIOD	1	800326.740	800326.740	3.7590
SUBJECT*PERIOD	59	12561534.512	212907.365	0.5067
DAY(PERIOD*SUBJECT (GROUP))	240	100845697.497	420190.406	

APPENDIX J

VITAMIN A

The differences between vitamin A intakes in the two periods were not statistically different in both groups ($p=.0627$ for Group 1, and $p=.0573$ for Group 2). For vitamin A, the large difference may be due to its large standard deviation and the low power to detect other than large differences between vitamin A intakes (Table 15). The upper confidence bound for vitamin A was considered to be large enough to be of practical importance. The percent difference of the period 1 mean was between 13-14% in each group.

Future studies should investigate the possible alternatives to measure vitamin A intake in a more valid and reliable way. However, vitamin A is known to be a highly variable nutrient even in the adult population.

APPENDIX K

Table 17. Percent of total variation in intakes of energy and nutrients attributed to variation within and between subjects.

Nutrient	Group	Day to Day Variability	Period Variability across subjects	Subject to Subject Variability
		%	%	%
Energy	1[1]	73.7	0	26.3
	2[2]	72.4	6.5	21.1
Protein	1	79.0	0	21.0
	2	72.8	7.7	19.5
Carbohydrate	1	72.0	1.2	26.8
	2	74.1	1.6	24.3
Total Fat	1	78.9	0	21.1
	2	82.9	3.4	13.7
Iron	1	75.1	.6	24.3
	2	86.3	4.1	9.6
Calcium	1	69.9	0	30.1
	2	66.8	0	33.2
Vitamin C	1	60	0	40
	2	72.5	0	27.5
Thiamin	1	70.9	5.8	23.3
	2	89.2	0	10.8
Riboflavin	1	65.5	2.2	32.3
	2	67.8	4.7	27.5
Niacin	1	80.3	0	19.7
	2	81.8	3.0	15.2
Vitamin A	1	82.2	0	17.8
	2	82.2	0	17.8
Folate	1	73.6	0.6	25.8
	2	73.7	0	26.3

[1]n=86
[2]n=60

APPENDIX L

Table 19. Sample size required with 80% power using the corrected standard error term[1].

Nutrient	Group	10% Difference Between Means	Sample Size	Practical Difference Between Means	Sample Size
Energy (kcal)	1[2] 2[3]	134 130	120 120	300 300	25 25
Protein (g)	1 2	4.6 4.2	180 200	15 15	19 17
Total Fat (g)	1 2	4.7 4.4	235 215	8 8	80 65
Carbohydrate (g)	1 2	19.2 19.1	140 135	25 25	83 83
Iron (mg)	1 2	0.8 0.8	220 215	1.5 1.5	65 60
Calcium (mg)	1 2	76.1 65.2	320 450	300 300	22 24
Vitamin C (mg)	1 2	12.6 13.4	900 640	35 35	120 100
Thiamin (mg)	1 2	0.09 0.09	1050 275	.15 .15	375 100
Riboflavin (mg)	1 2	0.12 0.11	235 275	.5 .5	15 15
Niacin (NE)	1 2	1.7 1.6	225 215	3.0 3.0	75 62
Folate (mcg)	1 2	64 68	500 420	60 60	20 19

[1] Corrected standard error term uses the three sources of variance suggested by the expected mean square terms in the ANOVA table, n=86 for Group 1 and n=60 for Group 2, calculations found in Appendix H.
[2]n=86
[3]n=60