

# **UNDERSTANDING FOOD CHOICE BEHAVIORS OF PEOPLE WITH TYPE 2 DIABETES**

By

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Requirements for the Degree of

Master of Science

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*"It's hard but you need to take good care of yourself. I have a lot to live for and I want to live. I want to dance at my granddaughter's wedding so therefore I can do this..."*

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## Abstract

The ways in which patients with diabetes use information to make food choices are not well described. Although some factors that influence food choice are known, it is not known how these factors act in combination to influence the dietary patterns of patients with diabetes.

The research questions included:

1. What are the major ways of thinking that people with type 2 diabetes use in food choice behavior?
2. Does the perceived importance of information from health services associate with better dietary patterns?
3. Does the perceived importance of information from health services associate with better weight management?

The respondents were a self-selected patient group with type 2 diabetes attending the education programs of the Diabetes Education Center (DEC), Health Sciences Centre, Winnipeg. Each respondent completed a demographic questionnaire and a 45-minute in-depth interview. During the interview, each respondent created a record of food related activities during a typical day, and discussed the reasons for these activities.

Using content analysis, the frequencies with which combinations of reasons for behavior, mentioned by respondents, were recorded. The combinations of reasons were used as variables in cluster analysis. The seven dominant variables included in cluster analysis were attitude, health service information, knowledge, physical factor, resource access, obligation and internal control. Each group of patients resulting from the cluster



analysis was characterized by a unique way of thinking about food choice. Eight groups were identified by seven of the most frequently occurring variables, which answers research question 1.

The results showed that groups of patients who perceived information from health services as important also reported eating an appropriate diet ( $p < 0.05$ ), and reported successful weight management ( $p < 0.05$ ), more often than other groups. In addition, subjective norms were associated with low use of information.

The DEC played an important role in passing on nutrition knowledge to the patients. Seventy percent of the total health information that patients used was from the DEC. People who wanted to learn more about the disease would usually seek out their own information from a variety of sources, such as medical journals and internet searches. Many patients used a combination of knowledge from different sources and applied them in their daily life.

The findings point to the need for further research into the role of cognitive constructs in decision-making.

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# Introduction

## 1.1 Problem addressed

Type 2 diabetes management includes diet management, medication, and exercise. The goal of management is to reduce the risk of complications from the disease. Education is part of the process to achieve this goal. The utility of diabetes education depends in part on the motivation of patients to follow the recommended food choices and health behaviors.

The food choice behaviors of patients with type 2 diabetes are part of a patient's self-care. Many factors influence food choice and self-care in general. Such factors include: perceptions of risk, severity of symptoms, extent of social support, and psychological experiences as well as elements from the physical and social environments (Aljasem et al, 2001; Littlefield and Craven, 1992; Swift, 1997; CDA, 1998).

Patients with type 2 diabetes are generally aware of the serious complications associated with the disease and the threat of permanent disability. The fear of complications could be a major motivating influence, but it is not the only one that determines compliance with plans of care on dietary instructions.

If health care professionals are to be successful in motivating patients to follow a plan of care of dietary instructions, a large range of determining factors need to be taken into account. However, the most effective approach to understand food choice behavior is not clearly established.

Comprehensive descriptions of the influences on food behavior can be obtained with food histories or food oriented in-depth interviews. Spencer and Shadick (1996)

highlighted the need for health professionals to understand food behavior for diabetes management. They conducted a survey on the continuing education needs of health care professionals providing diabetes self-care management and nutrition therapy to patients with type 2 diabetes in rural northern Wisconsin. Health care professionals reported that they did not feel that they were equipped enough with knowledge on understanding patients on their culture difference and patient team management. These health care professionals felt that they were most comfortable with the technical aspects of care, e.g., insulin administration and blood glucose monitoring. The results showed the need to understand the differing needs of patients and the factors that influence their diabetes management, beyond insulin administration and glucose monitoring aspects of self-care.

In daily counseling, talking about individual's personal experience usually requires more time than is available. The faster quantitative interviews, such as the recall of food eaten in the previous twenty-four hours or a normal day of eating, do not provide sufficiently comprehensive descriptions of the determinants of food choice.

Understanding the individual determinants of food choice behavior is important for diabetes management. The determinants of food choice among patients with type 2 diabetes may provide guidance to service providers in communicating recommended food choice and health behaviors. With this knowledge, service providers should be able to get client co-operation and participation in the plan of care, as well as make education programs more effective.

## 1.2 Research Objectives

- I. To document the reasons that people have for selecting their food choices.
- II. To document the relationships between the use of information from health services and both dietary and weight management outcomes.
- III. To document the sources of information that patients use to select their food.

## **Review Of Literature**

### **2.1 Type 2 diabetes and its management**

Diabetes Mellitus comprises a group of diseases characterized by abnormal glucose homeostasis, resulting in chronic hyperglycemia. Diabetes can cause complications such as kidney failure, amputation, heart disease, and others that directly affect patient's quality of life. Type 2 diabetes accounts for 90% of all cases of diabetes and is declared to be a major public health issue in Manitoba (Manitoba Health, 1998).

Type 2 diabetes management refers to a broad class of patient behaviors. This includes three types of lifestyle behaviors: a) diet management and exercise routines, b) medical self-care activities that include glucose monitoring and medication use, c) patient and health care provider interactions, such as receiving information and treatment from health professionals. Diet, exercise, blood glucose monitoring, and medication use are also referred to as diabetes self-care, self-management, compliance, or adherence (Ternulf, 1990; Meltzer et al, 1998).

Pharmacological treatment for diabetes has advanced relatively faster in recent years than the other areas of treatment, such as dietary therapy. Yet, dietary therapy is often seen as the cornerstone of diabetes management. It is widely believed that education and nutritional counseling lead to a reduction in health care cost (Spollett, 1997).

Eating is a basic need and patients have to manage their intakes in order to avoid food intake that may affect the development and progression of diabetes (Groop and

Tuomi, 1997). Many studies have shown that nutrition education interventions can result in better glycemic control and weight control (Doggrell, 2002; Anderson et al, 2002; Poppitt et al, 2002). It appears that health professionals, especially dietitians, play an important role in education and dietary management of diabetes.

## **2.2 Perceptions about diabetes management**

Diabetes education is a process that equips patients with knowledge and skill to manage their daily life with diabetes (Clement, 1995). The goals of nutrition education are to provide information about the disease, strategies for behavior change and a personally relevant context for making choices. The purpose of diabetes nutrition education is to achieve and maintain a desirable body weight, maintain glycemic control, reduce the risks for complications, and to improve quality of life (UK Prospective Diabetes Study Group, 1998). Type 2 diabetes has a huge impact on the individual and the health care system.

A survey of the prevalence of dietary control, exercise, and weight management among 733 patients with type 2 diabetes concluded that the prevalences were lower than expected and declining (Nothwehr and Stump, 2000). The study discussed the needs to understand the factors that affect personal decision-making towards disease management in order to achieve better results from interventions.

From a health education perspective, the effectiveness of strategies of behavior change depends on understanding the natural history of the target behavior; identifying modifiable cognitive and behavioral determinants of the target behavior; and designing and implementing effective strategies to modify those determinants.



In a survey of the continuing education needs of health care professionals who provide diabetes self-care management and nutrition therapy to patients with type 2 diabetes in rural northern Wisconsin, health care professionals reported that they did not feel that they were sufficiently equipped with an understanding of their patients culture differences and team management of the patients. These health care professionals felt that they were most comfortable with the technical aspects of care, e.g., insulin administration and blood glucose monitoring (Spencer et al, 1996).

The concerns reported by health care professionals participating in this survey may relate to the fact that patients with type 2 diabetes may have similar medical symptoms, but differ considerably in their life experiences and cultural communications in coping with diabetes. Standard education messages and channels may not affect every patient. Adapting the educational approach to different experiences and backgrounds may increase its effectiveness, and understanding of patient's personal experience of diabetes care would be necessary.

Therefore, health-related behavior is an important issue for providers for diabetes self-care. Understanding and being able to influence health behavior is essential if client co-operation and participation is to be obtained.

Diabetes management consists of making small changes continuously. Behavior change is affected by many factors in the patient's personal life and the behavior change may conflict with those factors. Support from family and the health care system is generally progressive and helpful in dealing with the problems that patients face in making behavioral changes. Nutrition educators need to understand their patient's daily

life experiences related to food, and help them to improve the eating patterns (Boyle and O'Connor, 1998).

Lack of educator understanding of the motives influencing food selection is a major obstacle to modifying food behavior in the education work. For nutrition and other self-management programs to be effective, the program developer should understand the target population's food choice and health behaviors and their determinants. An understanding of reasons supporting these behaviors will improve the efficacy of programs tailored specifically to address the needs of a given community.

A study of the different perspectives held by patients and health care providers towards type 2 diabetes revealed two different perspectives (Hernandez et al, 1999). Patients were concerned about maintaining a normal daily life and feeling well physically. The health care providers were concerned about glucose control. Hence the providers focused on getting patients to make lifestyle changes by using instruction and motivation strategies. Some would include the use of fear of complications to motivate patients if the education was not effective.

Patients and educators may have different beliefs toward diabetes self-management. Effective diabetes education depends not only on the educator's knowledge of diabetes and effective teaching strategies, but also depends on the sensitivity of the educator to the learner as an individual, and to the context that the life experience of the learner's represents.

Current social learning-oriented education programs emphasize training patients in problem-solving, coping skills, and relapse prevention techniques. The services use knowledge about the patient group as a whole. However, the effectiveness of services

may be increased if knowledge about motivations and decision making of individual patients is used to design the communication strategies.

### **2.3 Food behavior in diabetes management**

Traditional diabetes education is experience-based. At present, educators are looking to incorporate behavior theories or models into programming. Several learning and behavior theories that provide guidance for educators have been tested and reported in the literature (Heather et al, 1996). However, the literature does not provide as much information about areas such as personal models, goal setting, and decision-making. More information is needed on the theoretical foundations of these areas and requires further study.

Compliance with dietary advice has been reported as the most difficult component of type 2 diabetes people's self-care management (Sullivan and Joseph, 1998). When compared to other chronic disease population, type 2 diabetes patients are more resistant to dietary change (Groop and Tuomi, 1997). The reasons for this observation are not clear, although it is suggested that dietary advice for diabetes management involves the larger proportion of foods in the diet and therefore patients with diabetes face more restrictions than other patient groups.

Patients with diabetes are generally aware of the serious complications associated with the disease. The fear of complications is not the only factor that motivates diabetes patients to follow dietary advice from health professionals. Individual patients use a much wider set of concerns and factors to explain their choices in relation to diabetes than the direct concerns about complications, discomfort and treatment. They also consider personal living conditions, social support from people important to them, their

ability to purchase services, their own health related knowledge, cultural norms, access to information from other sources, and other factors (Mitchell, 1996).

To understand how patients think about food choice, diabetes educators need to understand patient motivations. Without such understanding, the motivations of patients may be misunderstood, and resulting service strategies may lose effectiveness (Wierenga et al, 1990; Fitzgerald et al, 1997).

## **2.4 Influences on food behavior in diabetes management**

Type 2 diabetes people's eating pattern and food selection are influenced by behavioral, psychosocial, and environmental elements (Oltersdorf et al, 1999; Nestle et al, 1998). A previous study identified five central components affecting type 2 diabetes people's food behavior (Savoca and Miller, 2001): a) Previous eating history, b) Self-reported knowledge, c) Strategies for applying dietary guidelines to daily life, d) Barriers for following the guideline, e) Social support, time management, and self-efficacy were intermediate factors in applying knowledge to achieve behavioral change. Similarly, Albright (2001) identified factors that associated with self-care behaviors, such as patient demographic characteristic, personal stress, doctor-patient relationship, and family support.

### **2.4.1 Culture and religion**

Strong religious views affect the acceptance of advice and potential dietary change (Greenhalgh et al, 1998). In this context, instructions to follow dietary recommendations appeared to be perceived as a personal duty by the patient.

Culture is another factor that affects diabetes self-management. A study on a treatment model for Hispanic women showed that established health behavior models

were not adequate to explain the needs of this population, especially for women who held strong traditional religious and culture beliefs (Oomen et al, 1999).

An individual's cultural background is a key determinant to that person's health-related beliefs and behaviors. The beliefs are usually learned over a lifetime and tend to be resistant to change. The learner's social support system and home environment can also inhibit or enhance effective self-management (CDA, 1998).

#### **2.4.2 Personal preferences**

Personal food preference is a factor that influences people's food choice behavior. A previous study showed that food pleasure is an important factor for people to select food (Westenhoefer and Pudal, 1993). Restricting a personal favorite food as part of dietary management can cause frustration (Savoca et al, 2001). It is logical to expect that a strong personal preference, which conflicts with dietary advice, can become a barrier to dietary change. This is confirmed by Swift (1997), who identified personal preference for food as a barrier for food selection and menu planning.

Sullivan (1998) studied the barriers for diabetic behavior changes by using focus groups. The result indicated that none of the behavioral expectations were easy to adopt. The clients also expressed that maintaining recommended diets was difficult because it interfered with normal activities and it was boring.

#### **2.4.3 Social support**

A study on the health beliefs related to type 2 diabetes between two Ontario First Nation populations showed that social relationships and physical factors influenced adherence with components of the diabetes management regimen. (Cosby and Houlden, 1996). In addition, all the Aboriginals interviewed expressed the belief that the increased

prevalence of diabetes on their reserves was related to the loss of traditional lifestyle. Adherence with glucose-lowering medication was reportedly enhanced if it relieved physical symptoms. Subjects were less likely to attend diabetes education programs if they had a strong faith in the competence of their physician.

Patient compliance related to many aspects of personal living conditions rather than health beliefs. Social support is identified as a mediating variable for type 2 diabetes patients to apply knowledge to their daily food behavior (Savoca and Miller, 2001). Good compliance among adolescents was more effective when parental views were perceived as accepting. Young diabetics whose friends offered silent support were more likely to report good compliance. In contrast, the actions of physicians that could be described as routine or negligent, strong disciplinary controls by parents, and domination by friends, were linked with poor compliance. (Kyngas et al, 1998)

#### **2.4.4 Self-efficacy**

Self-efficacy is reported to be associated with the frequency of blood sugar monitoring, taking medicines, and control of binge eating (Aljasem et al, 2001; Littlefield and Craven, 1992). Self-efficacy reflects individual's belief about their ability to perform behaviors under particular circumstances (Bandura, 1982). It is the confidence an individual has that, "I can". Diabetes education programs are concerned with promoting independence and confidence in self-care. The extent to which individuals engage in recommended behaviors is determined by individual perception of self-efficacy. Previous studies reported that self-efficacy is a strong predictor of exercise behavior of type 2 diabetes patients but a weak predictor for dietary management and glucose

monitoring (Padgett, 1991; Grossman et al, 1987; McCaul et al, 1987; Kingery and Glasgow, 1989; Hurley and Shea, 1992).

#### **2.4.5 Summary of influences on food behavior**

Overall, patients may use a much wider set of concerns and factors than the direct concerns about complications, discomfort and treatment to make decisions on health care. In order to improve compliance with medical care and advice on health behavior, the full range of reasons that patient's experience needs to be taken into account in order to capture personally relevant motivations.

### **2.5 Methodologies to document food choice behavior**

There is a dearth specifically focused on determinants of type 2 diabetes people's food choice behavior. Both quantitative and qualitative research methods have been used in the past to identify factors that affect type 2 diabetes people's self-care management.

#### **2.5.1 Quantitative methods**

Quantitative methods are useful for measuring the severity of problems, the number of people affected and identifying risk factors of problems. The results help researchers to estimate the size and type of problems. For example, quantitative surveys have been used to document the responses of people to nutrition interventions. Some quantitative surveys among patients with type 2 diabetes have been used to measure psychosocial influences on diabetes management (Travis, 1997). Similarly, Glasgow (1996), who conducted a survey of 2056 diabetic adults in the US, reported on beliefs and behaviors related to diabetes management. Widely held beliefs included avoiding sweets and taking prescribed medicine. Frequently reported barriers to behavior change were diet restrictions, exercise expectations and glucose testing.

However, quantitative methods are not designed to document the relationships that the patient perceives between beliefs, behaviors and social environments. The complexity of the relationships is difficult to capture in question and answer sequences. For example, traditional dietary record of individual food intake does not provide personal reasons and perceptions for the dietary behavior (Lee et al, 1989). Quantitative methods typically measure situations or endpoints, whereas behavior is part of a process of handling information. The nature of the process is difficult to express in terms of discrete measurement points.

The quantitative data requires a rigid framework for interpretation and the results are reported as means of groups or group data. Commonly used analysis steps for quantitative data does not maintain the patterns that individuals have expressed, for example the relationship between personal experience and compliance with dietary restrictions. Frequently, the relationships seen by the patient are lost during analysis and not reported. Researchers then assume such relationships in order to explain the meaning of the data.

### **2.5.2 Qualitative methods**

In contrast, qualitative research methods are designed to document the relationships that patients perceive between individual behavior and the determinants of that behavior. Such methods can provide a description of the problem as perceived by the patient, together with patient perceptions about appropriate responses and the reasons for those responses.

Qualitative research expresses an interest in understanding how people perceive their world and the experiences they gained from the world. Qualitative data is



descriptive and explanatory, and the use of content analysis with qualitative data enables the researcher to gain a contextual understanding of health behaviors and program results (Steckler et al, 1992). Interventions based on such results may be helpful to empower individuals to make health behavior change.

Compared to quantitative research, which separates a phenomenon into component parts, qualitative research can reveal how the parts function together to form a whole. Qualitative methods are therefore suited to describing the effect of multiple determinants on behavior and document the unique patterns that affect the responses on different patients.

The most common approach used in studies of diabetic health behavior is in-depth interviews and focus group interviews. Individual narratives data obtained by a qualitative approach can capture the complexity and diversity of the topic discussion of in the participant's own words, which provide deeper understanding of the participant's personal perception of the topic (Miles et al, 1994).

### **2.5.3 Limitation of qualitative studies**

The first limitation of qualitative studies is that data collection is often expensive and time-consuming and has a high respondent burden. As a result, the number of patients that can be interviewed in a given time is less than that can be surveyed in a quantitative survey and hence qualitative study sample sizes are smaller.

Another limitation stems from the individual orientation of qualitative research. Results for individual patients are unique and difficult to combine in a single theoretical statement. The qualitative methodologies that do generate such statements, such as Grounded Theory development, provide intuitive descriptions of differences between

people. Although such methods allow researchers to maintain the relationships between concepts that the patients perceive, it is difficult to use these results in statistical inference tests and operational planning of programs.

## **2.6 Theoretical framework for behavior research**

Food choice behavior is a complex behavior that is affected by social, cultural, physical, and psychosocial factors in a person life environment (Lewis et al, 1989), and in this study qualitative data collection methods were used to describe the behavior. The analysis of the data used elements from theories in health behavior and decision-making.

Decision-making theories provide explanations for determinants that lead to behaviors. A theory is a group of related constructs that describes how people make a decision by using several determinants (Albert, 1978). Some of the constructs used in the different health behavior and decision-making theories are the same. In this study constructs were used from primarily two theories to interpret the information provided by patients: Bandura's Social Learning Theory (1977) and Ajzen and Fishbein's Theory of Reasoned Action (1980).

### **2.6.1 The Theory of Reasoned Action**

The Theory of Reasoned Action identifies and defines key variables that affect a person's intention to act. It also identifies the sequence of variables, and their relationships, that predict the behavioral intention.

The assumptions of this theory are: 1) Human beings are rational and make systematic use of information available to them; 2) People consider the implication of their actions before they decide to engage or not engage in certain behaviors.

The theory can be used to explain virtually any behavior over which an individual has volitional control (Ajzen and Fishbein, 1980; Ajzen, 1986). The theory assumes that behavioral intention is the immediate determinant of behavior and that all other factors that influence behavior are mediated through intention. Behavioral intention is an indication of how hard people are willing to perform a behavior. It is influenced by three components: person's attitude toward performing the behavior, the perceived social pressure, also called subjective norm, and perceived behavioral control.

Attitude is a determinant of behavioral intention. It is an individual's positive or negative belief about performing a specific behavior. Attitudes are determined by the individual's beliefs about the consequences of performing the behavior (behavioral beliefs), weighted by his or her evaluation of those consequences (outcome evaluations).

Subjective norm refers specifically to the person's perceptions that important others desire the performance or non-performance of a specific behavior. Subjective norm may or may not reflect what the important others actually think the patient should do. Beliefs that underlie subjective norms are termed normative beliefs, which are beliefs about the social expectations for behavior, also called social norms.

The constructs of *internal* and *external control* are indicative of an individual's dependence or independence on environment and important others. Therefore, a person exhibiting an internal of control believes they have the ability and control over a given situation or event to command the desired outcome. However, a person with an external control believes the outcomes is controlled by an external other power such as fate, luck, or gods.

### **2.6.2 The Social Learning Theory**

Social Learning Theory uses the concept of observational learning to indicate that the environment provides models of behavior so a person may learn from others not only by receiving reinforcement from them but also from observing them. This theory explains human behavior in terms of continuous reciprocal interaction between cognitive, behavioral, and environmental influences (Bandura, 1977). A change in one aspect will imply changes in other aspects (Bandura, 1977; Perry et al, 1990).

The major construct used in this study taken from the Social Learning Theory was self-efficacy, which is defined as one's ability and confidence to perform a behavior. This may determine the effort invested in a given task, so repetition of a behavior indicates confidence in performing that task.

There are four main sources of self-efficacy. One is the sense of mastery that develops from experience. The second source is through vicarious experience by seeing other people succeed in their efforts, and believing that they have comparable capabilities. Third source is explanations from others that persuade people that they have the capabilities to master new activities. The fourth source is a positive mood that allows people to perceive the ability to carry out activities and which is associated with a reduction in stress reaction and negative emotions.

### **2.6.3 Application of Theory**

Constructs defined in the theories developed by Bandura, Ajzen and Fishbein represent some of the fundamental explanations of human behaviors. Selected constructs from the above theories can be used to analyze the data obtained from the respondent. To use constructs for transcript coding is the beginning of the content analysis (Miles et al,

1994). It is not necessary to use all the constructs to explain respondent behaviors. In addition, respondents may express concepts that are not explained by these constructs. New constructs would then have to be created, possibly using concepts reported in similar studies.

## **2.7 Gaps in knowledge**

An understanding of diabetes people's food choice behavior is important for effective education. People with type 2 diabetes may have several determinants for their food choice behavior. For example, personal preference, culture, and social support. Previous studies reported several important factors that might influence diabetes self-care management but little was done on food choice behavior. In addition, different people may be affected by different food choice determinants due to their personal life environment. Therefore, it is necessary to identify and document factors that influence type 2 diabetes people's food choice behavior in the community. By doing this, diabetes educators may design an education program more suitable to meet different needs among patients.

Whether type 2 diabetes people use information from health services in making food choice decisions was not clearly described. Patients may use other health information in their daily life. Therefore, it is necessary to document if patients actually use information from health services and have life style change achievements associated with the information use. Related to this issue, it is necessary to identify whether health service information is in fact a major information source.

## **Research Design**

### **3.1 Research Questions and Corresponding Hypotheses**

- 1 What are the major ways of thinking that people with type 2 diabetes use in food choice behavior?
- 2 Does the perceived importance of information from health services associate with better dietary patterns? Hypothesis: The perceived importance of information from health services associate with a more appropriate diet.
- 3 Does the perceived importance of information from health services associate with better weight management? Hypothesis: The perceived importance of information from health services associates with better weight management.

### **3.2 Respondents**

The sample frame for this study was people with type 2 diabetes who attended the education programs at the Diabetes Education Center (DEC) and identified by the DEC as follow-up patients. The patients were from Winnipeg and northern reserves.

The sample was a census sample of the patients that met pre-defined selection criteria. University of Manitoba Ethics Review Committee approved the procedures for contacting respondents (see Appendix A).

### **3.3 Data collection**

Data were collected with a demographic questionnaire and a Food Choice interview. The researcher has previous training to conduct the interview. Respondents signed a consent form (see Appendix B) before the interview started.

- i) The demographic questionnaire recorded height, weight, age, gender, and education level (see appendix).
- ii) Food Choice Map (FCM) interview, a semi-structured interview was used to capture personal experience of food choice behavior. Both a visual food map and interview conversation were obtained.

### **3.4 Data analysis**

Demographic data were used to compare the proportions of characteristics observed among the respondents and the Winnipeg population.

Weight and height were used to calculate Body Mass Index (BMI) (Gibson, 1990), which was categorized into underweight, recommended weight, overweight and obese according to Health Canada (Health and Welfare Canada, 1998)

The Food Choice Maps (FCM) were categorized into representing an appropriate diet or a non-appropriate diet according to the criteria for recommended diets in the Diabetes Food Guide and the Good Health Eating Guide for people with diabetes. The maps were used to calculate the frequency of consumption of vegetables, foods with added sugar, and the number of different foods reported.

The FCM interview transcripts were analyzed using content analysis (Holsti, 1969; Miles and Huberman, 1994). The analysis identified the constructs and reasons for the food choice behavior that were important to the individual. The constructs identified for each respondent were kept separate, and not pooled to form a larger model.

To answer the research question on describing major types of thinking towards food choice behavior, patients were grouped on the constructs identified for each individual. K-means cluster analysis was performed to identify sub-groups of people

with similar thinking towards food choice using Number Cruncher Statistical System (NCSS) 7.0 software.

To answer the research question on information and lifestyle choices, respondent comments on weight management were identified from the transcripts, which included comments related to intentional weight loss and attempts to maintain weight. The relationships between weight management and the use of health information were identified for respondents grouped by major types of thinking.



## Methods And Materials

### 4.1 Respondent Selection

The sampling frame for this study was people with type 2 diabetes who attended the education programs at the Diabetes Education Center (DEC) and were identified by the DEC as follow-up patients. A follow-up patient was a patient who attended at least one session after being referred from a physician in hospital or in private practice, and who returned to the DEC for monitoring of progress and further education after 2 months. The respondents were from Winnipeg and northern reserves. These respondents were involved with the DEC service for over 2 months.

The respondents represented type 2, follow-up diabetes patients at the DEC. Names of all follow-up patients identified from patient lists in four consecutive months were regarded as potential respondents. Patients who met the following criteria were contacted for the study:

- Must have attended at least one education session over 2 months (to allow time to apply knowledge from the DEC into daily life).
- Not pregnant (to avoid influence on dietary patterns).
- Able to read (to ensure patient can participate in recording the map).
- Able to communicate in English. (To be able to complete the interview)

Introductory letters (see Appendix A) explaining the study were sent to potential participants by DEC staff. In addition, nurses and dietitians at the DEC helped to distribute letters to follow-up patients when they had their follow-up appointments.

A week after the delivery of the letters, the secretary of the DEC telephoned all potential respondents to ascertain interest in participating. The sample was self-selected. The University of Manitoba Ethics Review Committee approved the procedures for contacting respondents.

One hundred contact letters were sent to potential participants. Respondents who agreed to participate made an appointment to meet the researcher. Forty-two participated in the study. Two respondents did not complete the interview. In total, 40 respondents completed the research study.

## **4.2 Data Collection**

Forty interviews were completed for this research. Two researchers each conducted 20 interviews separately. Interviews were taped following permission from the interviewee. Inter-interviewer reliability in eliciting constructs was 98%, established by comparing the construct codes in transcripts obtained from the two interviewers.

### **4.2.1 Demographic Data Collection**

At the beginning of the interview session, respondents were given 15 minutes to complete the demographic questionnaire. The interviewer was available to clarify any questions about the questionnaire. The questionnaire is found in Appendix C. The interview commenced after the respondents had completed the demographic questionnaire.

### **4.2.2 Food Choice Map (FCM) interview Data Collection**

The FCM interview is a semi-structured interview during which the respondent participates in creating a record of usual daily food related activities during a typical week (Sevenhuysen and Gross, 2002). The interview is carried out with an interview

question guide (see Appendix D). The question guide helped the interviewer to focus the conversation not only on food behavior but also on the reasons for these behaviors.

The visual food choice maps were reviewed. Each food was listed with associated consumption frequency, time of the day for consumption.

The summed frequencies of three types of foods reported were calculated: a) foods known to have a high content of simple sugars, such as sugar, jam, honey, b) foods defined as vegetables, such as lettuce, broccoli, cucumber, and c) foods known to have a high content of fat, such as processed meat and fast foods. The three frequencies were calculated for each respondent according to the foods recorded in the FCM.

The meal patterns for the 40 respondents were categorized into “appropriate diet” and “not appropriate diet”. The criteria were developed from the Canada Food Guide, Good Health Eating Guide, and Diabetes Food Guide.

A food choice map showing an “appropriate diet” was defined as meeting all of the following criteria:

- ◆ Restricting simple sugar (none or low frequencies of table sugar, jam, honey, etc.).
- ◆ The proportions of vegetable, starchy food and high-protein in weekly food frequencies are 45-55%, 20-30% and 20-30% respectively.
- ◆ Eating vegetables/fruit (frequency more than 5 times a day).
- ◆ Restricting high fat (fast food, processed meat and other products likely to be high in saturated fat and salt eaten less than 3 times per week).
- ◆ Eating carbohydrates with protein (more than 70% of meals show both types of food).

The total frequencies of all starchy food in a map were not used as criteria for an “appropriate diet”, because carbohydrate intake is related to body size, age, physical activities, and medication schedule. Therefore, the main focus of “appropriate diet” was trying to identify if a person was incorporating recommended foods groups into their diet.

Consumption of milk products was not used as a criterion because advice for patients with diabetes about calcium intake included foods other than dairy products. These alternative foods are not mentioned in Canada’s Food Guide as replacements for dairy products. Patients, who chose these alternative foods instead of dairy products for cultural reasons, would have their food choice maps judged as not balanced according to the Food Guide. To avoid possible bias, dairy products were not included in the criteria for an appropriate diet.

#### 4.2.2.1      *The Concept of FCM Interview*

After completing the demographic questionnaire, the respondent and the interviewer started the FCM interview, which requires 45 minutes to complete.

The FCM interview is designed to record food consumed at least once a week and perceptions of the importance of reported food in daily life. The interviewer asks for frequently eaten foods, so that foods that are important to the patient are recorded and appear on the map during the interview.

Explanations about the food choice are given in the context of personal experience of physical, social, economic, and culture environments. Therefore, the food choice map interview results in a visual display of food consumption and a conversation record that explains the reasons for food choice behavior. The combination of these two

records identifies the unique combinations of perceptions that each respondent uses to explain his or her food decisions.

Food behavior is a result of connected perceptions and beliefs. These connections can determine the choice of one food over another. The respondent provides these connections and it is very important to record these connections when the reasons for food choice are explored during the conversation. Both the Food Choice Map (Appendix E) and question guide are tools to maintain a focus on food choice and allow for connections to be elicited from the respondent.

Respondents may differ not only in their reports on using information from the DEC, but also in the reasons for using them. Interview questions related to the DEC education were only asked if a respondent states his use of the program without any prompts from the interviewer. No leading questions were asked to explore reasons.

#### 4.2.2.2 Preparation for FCM interview

Black and white line drawings of food were prepared. Most of the pictures were copied from the Good Health Eating Guide poster used in diabetes education. The pictures were easily recognized and identified by all respondents. The picture size was approximately 0.7" x 0.7", which is an appropriate size for pictures on the map. In addition, 1" by 0.5" white label stickers were used to write the names of any food items for which pictures were not available.

The map to record food choices is an 11" by 14" sheet of paper with horizontal and vertical grid lines (see Appendix E). The horizontal scale, numbered from one to seven, represents the frequency of consumption in a week. The vertical scale, which is not numbered, represents the time of day that a food is eaten. Meals or snacks eaten early

in the day are represented at or near the top of this scale, while the latest meals or snack eaten during the day are represented near the bottom. The respondent defines both the time structure and the names of the meals or snack times, which are written in the empty left-hand margin of the map.

A mini tape recorder was used to record the conversation in all interviews with permissions of the respondents. The taped conversation was transcribed to identify the associations between food items and the reasons for selecting the items. The verbatim record allowed the researcher to pay attention to the conversation and the map, rather than having to make detailed notes on the comments of respondents.

#### 4.2.2.3      *The FCM Interview*

The interview begins with questions about what foods were eaten most often. For each food mentioned, a food picture sticker was placed on the map. The time of the day and the relative frequencies about this food were asked. Reasons for eating this food or any connections to this food were encouraged by the interviewer. As the map develops, the respondent was allowed to change his mind about food items that were already on the map; the food pictures then were moved or removed.

The entire interview process was a conversation to record the environment and reasons for foods on the map and how respondents apply information from the DEC to daily food behavior. The interview data collection method was interactive and captured the interest of the respondents, which maintain the conversation flow. At the end of the interview the respondent checked the map to verify that the information was correct.

## **4.3 Data Analysis**

### **4.3.1 Demographic Data Analysis**

Demographic data were used to calculate respondent characteristics collected in the questionnaire. Comparisons of the sample with that in the general population allowed interpretation of the representativeness of the sample.

The Body Mass Index (BMI), see formula 1, was calculated from the self-reported weight and height data.

Formula 1

$$BMI = \frac{weight}{height^2}$$

The BMI was defined as weight in kilograms divided by height in meters squared (Gibson, 1990). The BMI values were categorized according to the cut-off points shown in Table 1. Overweight is currently defined as BMI = 25-29.9 and obesity defined as BMI >30.0 (WHO, 1998).

Table 1 BMI categories and associated health effects

BMI	Health Effects
< 20	May be associated with health problems for some people
20 - 25	Lowest risk of health problems for most people
25 - 27	May lead to health problems in some people
> 27	Increased risk of developing health problems

(Health Canada 2002)

### **4.3.2 Food Choice Map analysis**

The raw frequencies of consumption of vegetables, fat, and sugar containing foods were calculated by counting their respective food stickers on the map and were recorded in an Excel file. The frequency for each type of food was standardized by

dividing the sum of raw frequencies for that food in the map by the sum of frequencies of all foods reported in the map (Formula 2).

Formula 2

$$\text{Standardized Frequency} = \frac{\sum_{0-i} \text{freq}_i}{\sum_{0-x} \text{freq}_x} \quad \text{Where } \text{freq}_i \text{ is the frequency of one type of food}$$

$\text{freq}_x$  is the frequency of all foods reported

The researcher reviewed the frequencies in the food choice maps and made decisions on the meal pattern being balanced or not, by using the ‘appropriate diet’ criteria.

Weight management information was recorded from transcripts.

### **4.3.3 Transcript analysis**

#### **4.3.3.1 Content Analysis**

The researcher used the transcribed verbatim interview and food choice maps from each respondent for analysis. It was assumed that respondents provided valid and reliable information.

Content analysis was used to categorize the data so it could be compared and summarized. Holsti (1969) defined content analysis as a phase of information processing in which communication content is transformed through the objective and systematic application of categorization rules, into data that can be summarized and compared.

The categories in the content analysis were outcome behaviors and constructs. Outcome behavior is a type of behavior that fits the framework of the research questions. In this study, the outcome behavior of interest is food choice behavior. Constructs are defined as words, phrases, and sentences, which help the researcher categorize reasons for a behavior.



#### 4.3.3.2 Identifying Outcome Behaviors

Food choice behavior reflects an individual's decision to purchase or consume a food. This behavior is the individual's intention to perform the behavior, where intention is a belief that links the person with some action (Axelson et al, 1989). To identify food choice behavior, is to identify sentences in which this behavior is expressed, such as thoughts related to food preparation or related to blood sugar monitoring. Thoughts are a sequence of questions and answers that share a single idea about a behavior or context for a behavior.

Many thoughts related to food behavior were identified in each respondent's conversation transcript. The following excerpt shows two different food choice behaviors expressed in two thoughts. One was related to following advice from dietitians. The second one was about food accessibility and environment, family interaction. For example: [thought 1] "The dietitians said it's good for you so I get them, the whole wheat bread. [thought 2] "I usually go shopping with my husband at SuperValue, sometimes he picks up junk stuff and I pick the good ones."

Each independent thought in a transcript was identified. One transcript would be made up of many independent thoughts, which reflected all the reported food choice behaviors of that person.

#### 4.3.3.3 Identifying Constructs

Before the analysis, a number of constructs were defined. Constructs were selected from previous literature on health behavior models (Ajzen and Fishbein, 1980; Bandura, 1977; Kintsch, 1988; Perry et al, 1990). Each construct definition was expanded with a statement that described the function of the construct in explaining

health behavior, and with one or more examples of phrases people might use that expressed the construct in normal conversation.

The construct definitions, functions and examples (Appendix F) were used as rules and guidelines for recognizing constructs in the comments of respondents. Consistent application of the construct examples was seen as reducing the subjectivity of the coding process (Appendix F).

In order for the researcher to easily use and remember the constructs, a coding system using a set of letters was used to represent a construct (Gittelsohn, 1992). For example, the "information from health professionals" construct was coded as "info-hs"; and "internal control" construct was coded as "con-int".

The transcript text of every thought was reviewed. The wording was matched with one or more constructs where possible by comparing the wording or meaning of the comment with the definition and example of a construct, as shown in Example 1.

**Example 1:** "I don't drink a lot of milk because sometimes it doesn't agree with my stomach."

**Code:** (Beh-bel)

(Phys)

**Constructs:** Behavioral belief

Physical factor

For the drinking of milk in this example, the respondent used the constructs "behavioral belief" and "physical factor" to explain the behavior.

One transcript will reveal a selection of the predefined constructs and the predefined constructs that were not used would be deemed to have no importance in the decision-making of that individual. Conversely, expressions in the transcript may point to new constructs that are not defined at the start. New construct definitions were added to the list of constructs, together with function statements and examples of expression. By omitting predefined constructs that were not used in transcript analysis, and by adding

new construct definitions, the analysis creates a uniquely personal list of constructs for each individual.

#### 4.3.3.4 Identifying Variables

The combination of constructs that occurred in the same thought was used as an explanation of the food choice behavior mentioned in the thought. The combinations were seen as important in explaining respondent behavior because the respondent had used the combination to give reasons for the behavior, not the single constructs. Hence, construct combinations were maintained as entities during the analysis process.

Each construct combination was labeled as a variable. For each transcript, variables were entered in a separate Excel spreadsheet. Some variables appeared more frequently than others. Variable value was the frequency with which the variable occurred in the transcript. The greater the frequency, the more time the respondent spent talking about the constructs or the combination of constructs, and used these constructs more often than others in explaining the reasons for behaviors. Frequencies reflect the relative importance of the construct combinations for respondents, where high frequencies indicate high importance.

Variable values were standardized by dividing each frequency by the sum of frequencies of all variables identified in the transcript (See formula 3). Since some people talk more readily than others, non-standardized variable values cannot be compared between respondents. Yet the standardization did not change the relative importance of the variables for any one respondent.

Formula 3

$$Value = \frac{Frequency_i}{\sum_{0-i} Frequency_i}$$

Frequency<sub>i</sub> = the frequency of occurrence of one construct combination.  
 $\sum_{0-i}$  Frequency<sub>i</sub> = the sum of all frequencies in the transcript.

For each transcript, the data were arranged in an Excel spreadsheet with a descending rank of variable frequency (Table 2). Forty-eight different construct combinations were identified for respondent #27. The most frequently mentioned variable in the transcript is the construct combination “behavior belief” and “attitude behavior”, which was coded as “beh-bel, att-beh”.

Table 2 Example variables in the transcript of a respondent

ID	Variable sequence number	Construct codes in the variable	Variable value (frequency of occurrence in the transcript)	Variable value (standardized)
27	1	Beh bel, att-beh	7	0.15
27	2	Beh-bel, sub-nor	5	0.1
27	3	Beh-bel, con-bar, phys	3	0.06
27	4	Beh-bel, con-bar	2	0.04
27	5	..	..	..
			48 (total)	

#### 4.3.3.5 Identifying Dominant Variables

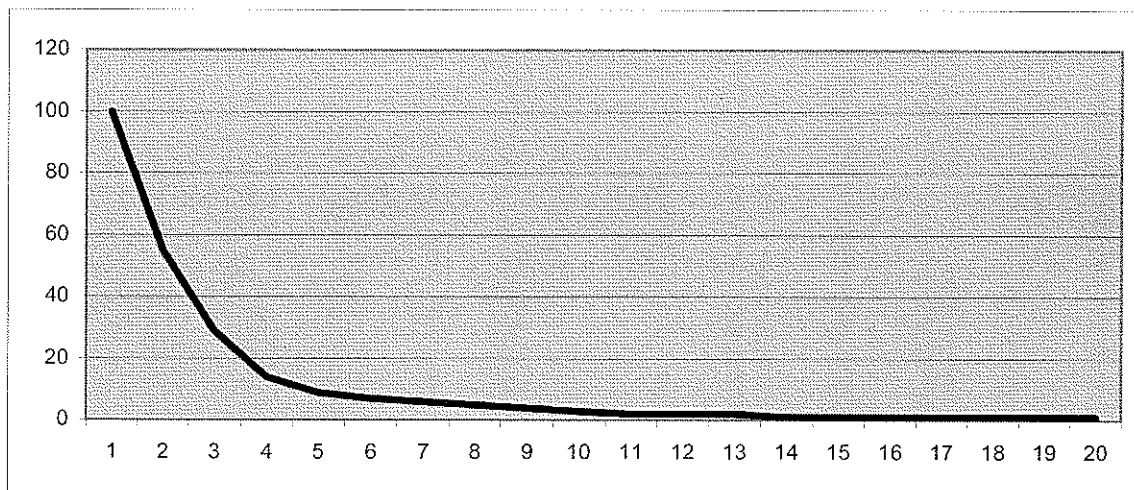
The variables and their frequencies identified in each of the 40 transcripts were entered into one Excel spreadsheet. Some variables occurred in all transcripts, while others occurred in only a few transcripts or were unique to one transcript. The frequencies associated with each variable in the transcripts where it occurred, were summed to give a total frequency of this variable in 40 transcripts.

The variables were sorted on their total frequencies in the 40 transcripts in descending order. After the sort, the variables occurring most frequently in all 40

transcripts were identified. A small number of high frequency variables occurred very often, while the majority of variables occurred only once or twice among the 40 transcripts.

Variables occurring very often were regarded as being the major influences on the behaviors of respondents. Hence, these variables were designated as dominant variables. The criterion for choosing dominant variables was that the moving average of the frequencies of four consecutive variables was not lower than one-tenth of the value of the average value of the four most frequently occurring variables.

Figure 1 Hypothetical variable frequency ranking



Previously collected data on the frequencies of variables suggest that the distribution of frequencies will be similar to the one shown in Figure 1 (Landauer et al, 1998; Lowe, 2001). A four-point moving average is used to ensure that all most frequently occurring variables are identified, even if the frequencies of some of them differ very little. Only the most frequently occurring variables were seen as representing common aspects in the process of making food choices. Given the large difference in frequencies between the most frequently occurring variables and infrequently occurring

variables, the value of one-tenth of the moving average was used to select only the most frequently occurring variables.

#### 4.3.3.6 Dominant Variable Definitions

After dominant variables were identified, the meaning of the construct combinations that they represented was determined. Respondent comments associated with each of the dominant variables were used to capture this meaning for each dominant variable. The comments of respondents describe the experience, and its context, associated with the variable. A summary of this experience and context in all comments was used to formulate the variable definition.

#### 4.3.3.7 Identifying patient groups using dominant variables

Cluster analysis is used to group subjects on their similarities of reasons for food choice using the dominant variables frequencies. Clustering is a partitioning technique that groups objects or items into subsets based on their similarities across certain variables or attributes. This technique was developed by J.A. Hartigan and M.A. Wong (1975) of Yale University. The objective of this technique is to divide N observations with P dimensions (variables) into K clusters so that the within-cluster sum of squares is minimized (Hintze, 1995). Clusters are generated on the basis of the mean and each object is assigned to a cluster by the smallest distance to the mean which is the centroid of that cluster minimizing within cluster sum of squares (Lorr, 1983).

Cluster or groups of respondents are characterized by differences in the cluster means of each of the dominant variables. Some means are large and others are small. The variables with large means represent a relatively greater influence on respondent

behavior than those with small means. The three or four variables with the largest means were used to describe the most important characteristics of each cluster.

Each cluster was seen as representing a group of respondents with similar ways of thinking about food choice behavior, because they shared similar influences of the dominant variables on their behaviors. It was assumed that other patient groups, who have comparable characteristics and experience to the patients participating in this study, would exhibit the same ways of thinking.

## **4.4 Quality Control**

### **4.4.1 Demographic Data**

The respondents completed all demographic questionnaires. The researcher reviewed each respondent's questionnaire before starting the respective interview to ensure the clarity of information. The respondent had the right not to answer any of the questions on the demographic questionnaire.

### **4.4.2 FCM Interview Data**

The two researchers received training in conducting FCM interviews, data handling and content analysis. The training ensured that the two researchers were able to explore and obtain similar and adequate information from a respondent. Two types of training activities were conducted. First, training was done on the process of interviewing and creating the visual maps during the conversation. Second, training was done on the coding of transcripts, involving the use of pilot data and comparisons of the differences in codes selected by the two researchers.

Coding decision and crosschecking were repeated until the two researchers agreed (98% of the time) with each other's coding result.

To check for construct validity, all comments under a certain code were grouped into a table (Table 3 and 4). By checking the comments with defined construct definition, odd comments that did not belong to a particular code were identified. This process assures consistency within a particular code.

The same interview question guide was used for all interviews and all interviews were completed around 45 minutes.

#### **4.4.3 The interview data comparison between two researchers**

Each of the two researchers conducted 20 complete interviews. The writer coded all interview transcripts. Since the two researchers might have had different interview dynamics due to different interview environment or personality, which may have affected the data, the two data sets were compared for consistency.

The ten variables with the largest frequencies in both sets of data were compared. The ten largest frequency variables were used because these were expected to include the dominant variables in the data sets.

Table 3 Ten highest frequency ranks among variables for researcher #1

Rank	Variable (construct combination)	Variable frequency
1	Behbel, conint, knowgen	140
2	Behbel, attbeh	102
3	Behbel, phys	60
4	Behbel, infohs	53
5	Behbel, subnor	24
6	Behbel, conint	22
7	Behbel, conext	19
8	Behbel, resacc	14
9	Behbel, socint	10
9	Behbel, knowgen, phys	10
10	Conbar, phys	9



Tables 3 and 4 show the comparison of the ten variable frequencies in the data set of each researcher. Eight out of ten variables were identical in both data sets. This difference was assumed to be due to respondent differences. The variable frequency distributions were compared. There were no significant differences in frequencies between the two data sets (paired t-test,  $p = 0.8$ , power = 94.7%). Therefore, the two sets of data were regarded as coming from the same population and combined for further analysis.

Table 4 Ten highest frequency ranks among variables for researcher #2

Rank	Variable (construct combination)	Variable Frequency
1	Behbel, conint, knowgen	123
2	Behbel, attbeh	97
3	Behbel, conint	65
4	Behbel, phys	63
5	Behbel, infohs	61
6	Behbel, resacc	38
7	Behbel, subnor	25
8	Behbel, resacc, resfin	21
9	Resacc, resfin, attbeh	16
9	Resacc, socres, attbeh	16
10	Behbel, conext	13

## Results

### 5.0 Highlights

The demographic characteristics of the respondents were compared with characteristics reported for the population of Winnipeg. On average, the respondents were found to be older and fewer were employed than the Winnipeg population.

For research question 1 : “What are the major ways of thinking for people with type 2 diabetes? Eight major types of thinking towards food choice behavior were identified among 40 respondents.

For research question 2: “Does the perceived importance of information from health service associate with better dietary patterns?”, the results showed that respondents who perceived information from health services as important in making food choices were more likely to eat an appropriate diet compared to others ( $\chi^2 = 6.679$ ,  $df=1$ ,  $p<0.01$ ).

For research question 3: “Does the perceived importance of information from health service associate with better weight management?”, the results showed that respondents who perceived information from health services as important in making food choices were more likely to have success in managing weight compared to others ( $\chi^2 = 4$ ,  $df=1$ ,  $p<0.05$ ).

Seventy percent of all information used by respondents came from the DEC.

## **5.1 Sample Description**

One hundred contact letters were sent to potential participants. Eighty respondents met the inclusion criteria for the sample. Of these 80 people, 42 participated in the data collection. The remaining 38 people were not able to attend interviews because of problems related to the cost and time for travel and work commitments during the day. Anecdotal information about the people who did not participate suggests that they may have included more people with an aboriginal background.

Interviews were conducted with 42 respondents. Two respondents had interruptions during the interview that led to incomplete data collection. Therefore, these two respondents were excluded from the study. The analysis was completed for 40 respondents.

Thirty-five of the respondents lived in Winnipeg. Three lived in areas within 50 km from Winnipeg and two lived on the Cross Lake Reserve, 400 km from Winnipeg. All respondents completed the demographic questionnaires. Table 5 is a summary of demographic characteristics for the 40 respondents.

Respondents consisted of 16 males and 24 females. The age range was from 30 to 72 years. Sixty-five percent of the respondents were over 55 years of age, which is consistent with 66% of the diabetes population in Manitoba being over age 55 (Manitoba Health, 1998). Seventy-two percent of the respondents were retired or unemployed, which could be explained by the large proportion of seniors in the sample. The remaining (28%) were either employed or running a personal business.

Forty-five percent of the respondents had high school education, compared to 28% in the Winnipeg population that has high school education (Statistics Canada, 1996).

Eighty-seven percent of the respondents had an annual income < \$50,000. The average annual income of the Winnipeg population in 1994 was \$24,136 (Statistics, Canada, 1996).

Table 5 Demographic characteristics of the 40 respondents

	<b>Number (N)</b>	<b>Percentage (%)</b>
<b>Age (years)</b>		
Under 35	1	2.5
36 – 45	8	20
46 – 55	5	12.5
56 – 65	11	27.5
65 - 75	15	37.5
<b>Gender</b>		
Male	16	40
Female	24	60
<b>Marital Status</b>		
Married / Common law	27	67.5
Single	13	32.5
<b>Ethnicity</b>		
Aboriginal	5	12.5
Non – aboriginal	35	87.5
<b>Education Level</b>		
Secondary / Lower	22	55
Post secondary	18	45
<b>Employment Status</b>		
Employed	10	25
Personal Business	1	2.5
Retired	18	45
Unemployed	11	27.5
<b>Income (annual)</b>		
< \$50,000	35	87.5
\$50,000 +	5	12.5

Twelve percent of the respondents were aboriginal people, both from Winnipeg and from Cross Lake. This proportion is higher than the aboriginal population in Winnipeg, which is estimated at 7% (Statistics Canada, 1996).

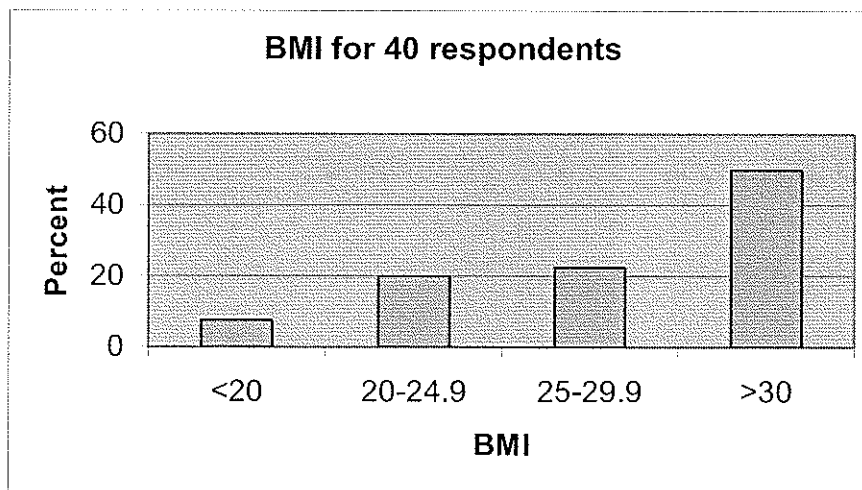
The education level, income status, and ethno-cultural characteristics of the study sample were similar to the structure of Winnipeg population. The age distribution was consistent with the Diabetes population in Manitoba.

The prevalence of diabetes is higher among Canadians with low income than the prevalence for other groups. For example, about 6% of 45 to 64 year-olds with household incomes of 10,000 to \$29,000 reported having diabetes. For individuals the same age but with household incomes of \$60,000 or more, the prevalence was only about 3% (James et al, 1997).

## **5.2 Body Mass Index (BMI)**

The BMI distribution (Figure 2) was shown according to the four body weight categories defined by WHO (1998). Twenty percent of the respondents had normal body weight ( $20 < \text{BMI} < 24.9$ ), 7.5% were underweight ( $\text{BMI} < 20$ ), 22.5% were overweight ( $25 < \text{BMI} < 29.9$ ) and 50% were obese ( $\text{BMI} > 30$ ).

Figure 2 BMI distributions of 40 respondents



In total, 72.5% of the respondents were overweight or obese, compared to 80% of people with type 2 diabetes (CDA, 2000).

During the interview, 22 respondents reported a weight loss or were maintaining normal body weight. This will be discussed later.

### **5.3 Major types of thinking towards food choice behavior**

**Research question 1:** What are the major ways of thinking that people with type 2 diabetes use in food choice behavior?

The major focus of analyzing the interviews was to identify the common reasons people with diabetes used to choose foods and structure their diets. The process of analysis is described under “Methods” and includes describing food choice behavior (see Methods, p 37), identifying the reasons and combinations of reasons for food choice, expressed as construct combinations (variables) (see Methods, p40). These steps were designed to answer Research Question 1 (see Design, p27).

#### **5.3.1 Identifying construct combinations (variables)**

Content analysis identified 26 constructs and 415 construct combinations or variables among all 40 respondents. All the constructs defined prior to the start of the coding of transcripts were used. The new constructs, food security and self-efficacy, were identified on the basis of respondent comments and were added to the construct list. The definitions for these constructs are shown in Appendix F.

The constructs were combined to generate construct combinations (see Methods, p 40). All 415 variables (combinations of constructs) were sorted in descending order by their frequencies of occurrence among all 40 respondent transcripts. Frequencies ranged from 275 to 1. Appendix G shows the frequencies of all construct combinations.

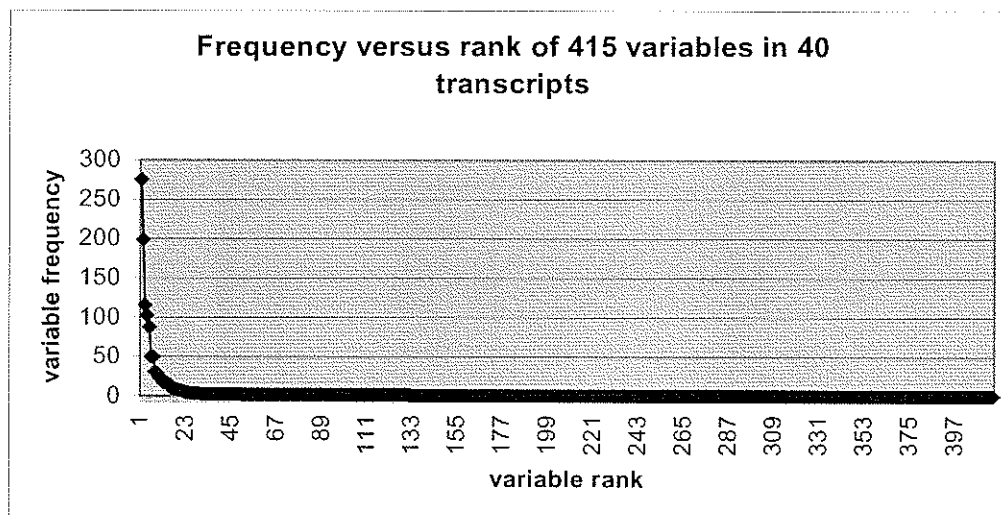
### 5.3.2 Identifying dominant variables

The total number of variables is large in relation to the number of respondents. The variables that occur very frequently across all 40 respondents are seen as characterizing common reasons and contexts for food choice. The variables that occur only once or twice, for only one or two respondents, are seen as characterizing differences between people.

The frequency of each variable was compared to its frequency rank in order to separate the variables characterizing common elements from those characterizing differences between the respondents. Figure 3 shows the frequency and frequency rank of each variable.

Seven of the highest frequency variables met the criterion of having the highest frequencies of occurrence among all variables in all transcripts, and the cumulative sum of differences in frequencies between consecutive variables, when they are ranked in descending order, they make up at least 80% of the sum of all differences between all variables.

Figure 3 Variable Frequency Ranking



These 7 variables, labeled as dominant variables, were used to characterize common reasons and contexts for food choice among the 40 respondents. Table 6 lists the dominant variables and their function for food behavior.

The construct Behavioral-Belief was part of all seven variables. Behavioral Belief, defined as the belief that underlies a person's attitude towards the behavior, describes the perceptions derived from individual experience. Hence, behavioral belief reflects an important foundation for decisions about food behavior.

Table 6 Functions of the dominant variables that characterize food choice

<i>Variable label (descending order by frequency)</i>	<i>Functions for food behaviour</i>
<b>Attitude</b> Constructs: Beh-bel, Att-beh	Manages part of the external environment with food choices
<b>Health Services Information</b> Constructs: Beh-bel, Info-hs	Perceives a need for information and accepts to use external sources of information: health services
<b>Knowledge</b> Constructs: Beh-bel, Con-int, Know-gen	Perceives a need for information and trusts own knowledge
<b>Physical Factor</b> Constructs: Beh-bel, Phys	Uses food to cope with physical problems
<b>Resource Access</b> Constructs: Bye- bye, Res-acc	Perceives that access to resources, including food, is inadequate to for making optimum choices.
<b>Obligation</b> Constructs: Beh- bel, Sub-nor	Perceives that greater quality of life results from complying with the opinions of others rather than own opinions about food choice
<b>Internal</b>	Uses food to cope with perceived internal needs



The Health Services variable is related to the ways that respondents used information from health services, and health professionals specifically in making choices. Comments related to following information from the Diabetes Education Centre were included under this variable. The relationship of this variable to meal patterns or weight control is shown under section 5.4, in order to determine the role of information from health professionals in respondent lifestyle choices.

### **5.3.3 Identifying patient groups**

The seven dominant variables were used to characterize the reasons and contexts for food choice among the 40 respondents. The number of comments related to a variable determined the frequency of that variable for the respondent. The unique set of standardized variable frequencies for each respondent was compared between respondents.

In order to interpret this comparison, variables with higher frequencies were seen as more important to a respondent. Higher frequencies indicated that the respondent used the construct more often in explaining choices and contexts. Hence, the meaning of these variables was more often important for a respondent than other variables related to fewer thoughts. The same concept is used in the semantic analysis of language (Landauer et al, 1998; Lowe, 2001).

Comparison of variable frequencies between respondents was designed to find patterns in the frequencies. The purpose was to identify groups of respondents that used similar constructs and combinations of constructs in explaining lifestyle choices. The comparison was carried out with the statistical K-means cluster calculation. This

calculation allocates each respondent to a cluster, such that the total within cluster sum of squares for all clusters was the lowest that could be achieved.

K-means cluster analysis was run with the frequencies of the seven dominant variables (see Methods, p43). The result grouped respondents according to their combinations of frequencies for the common variables. Eight clusters of respondents were generated. The clusters explained 68% of variation in variable frequencies. Table 7 summarizes the three highest variable means for the 8 clusters.

Table 7 Variable means characterizing groups on food choice behavior  
(units are standardized variable frequencies)

<b>Variables</b> (descending frequency order)		<b>Cluster numbers (respondent groups)</b>							
		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>
1	<b>Attitude</b> Constructs: Beh-bel, Att-beh	<u>0.170</u>	<u>0.269</u>	<u>0.054</u>	<u>0.104</u>	<u>0.151</u>	<u>0.081</u>	<u>0.085</u>	<u>0.092</u>
2	<b>Health Services Information</b> Constructs: Beh-bel, Info-hs	0	0.022	0.023	0.038	0.050	<u>0.075</u>	<u>0.085</u>	<u>0.196</u>
3	<b>Knowledge</b> Constructs: Beh-bel, Con-int, Know-gen	0.03	<u>0.141</u>	<u>0.189</u>	<u>0.151</u>	0.068	<u>0.120</u>	<u>0.299</u>	<u>0.148</u>
4	<b>Physical Factor</b> Constructs: Beh-bel, Phys	0.021	<u>0.093</u>	<u>0.131</u>	0.026	<u>0.101</u>	0.061	0.031	0.048
5	<b>Resources Access</b> Constructs: Beh-bel, Res-acc	0	0.021	0.017	<u>0.084</u>	0.017	0.008	0.026	0.018
6	<b>Obligation</b> Constructs: Beh-bel, Sub-nor	<u>0.137</u>	<u>0.060</u>	0.042	0.012	0.021	0.023	0.012	0.008
7	<b>Internal Control</b> Constructs: Beh-bel, Con-int	<u>0.047</u>	0.015	0.024	<u>0.083</u>	<u>0.095</u>	0.032	0.015	0.014

The bold and underlined variable means are the highest variable means in each cluster. These highest means were used to define each group because the smaller means represented variables that had little influence on food or lifestyle choice. Each group showed a unique set of influences based on the variable means of the seven variables. In addition, comments from respondents in different groups about the same variables were compared in order to find similarities between group characteristics.

The variables, and their frequencies, were derived from the comments of patients. The comments explained their reasons for individual actions, such as lifestyle choices. The reasons were related to the social, economic and cultural environment of each patient. Since these environments provide a context for individual perceptions and behavior, the explanations of actions that patients provided were seen as having been influenced by these environments. The variables therefore reflect the social, economic and cultural environment of each patient. The combinations of these variables represented patterns of reasons for action from a respondent. Hence patterns that are common among a number of respondents can be seen as describing the reasons for decision-making. Therefore each of the eight groups of respondents was seen as representing a distinct type of decision-making, characterized by the variables that explained most of the variability in variable frequencies.

#### **5.3.4 Defining Groups**

Groups were compared using on demographic data and dietary pattern data.

**Two groups (group 1 and 2) have a strong influence from the obligation variable and relatively low health services information variable, and fewer respondents were**

**eating appropriate diet. These two groups are different in education level, income, and vegetable intake.**

GROUP 1      2 respondents

Appropriate diet: no one eats appropriate diet in this group

Vegetable intake: low

Education level: some high school education

Income: under 12,000

Variables: Attitude, obligation, and internal control (variable 1,6,7) characterized the food choice of these people. The low education and low income created barriers for managing diet for this group of people. Their obligation and food choice attitude strongly influenced their food choice (see examples below) and are associated with low levels of following DEC advice as well. This group has low vegetable intake. In this group, 50% are aboriginal. Example comments from transcripts:

- *“That’s what we have been eating since we were kids.”*
- *“That’s what we usually eat. We eat bannock, bannock, and bannock*
- *“Like moose meat, chicken. They are good. Ever since I could remember, I eat this meat. They tasted quite good.”*
- *“Yeah that’s our Indians used to eat.”*
- *“See I am a Ukrainian, and potato is our meal, is our main dish.”*
- *“We use canned fruit for desert cause that all we can find. Sometimes you can’t find fresh fruit.”*
- *“There is not much non-sugar stuff in our area.”*

- *“He does the hunting. That’s how we get the moose meat. Even my sons they hunt. I guess a lot of things we eat are wild.”*

GROUP 2     3 respondents

Appropriate diet: 33% eats appropriate diet

Vegetable intake: high

Education level: above the level of college education

Income: 25,000 – 74,999

Variables: Attitude, knowledge, and physical factor (variable 1,3,4) characterized the food choice of these people. This group also has the second highest obligation variable among the eight groups. This group of people has high education and income level. They have control over their food choices based on knowledge. However, they also have access to high fat foods/restaurants. Strong food choice attitude, knowledge, and physical factor are associated with less use of DEC information. Example comments from transcripts:

- *“I’ve been brought up that way. I was brought up having perogies every weekend.”*
- *“I just brought up I guess a lot of food that was cooked in margarine.”*
- *“I am a creature of habit.”*
- *“That’s what they said but I have eaten them all my life. My mother when I was little, I pinch them up in the garden and eat them.”*

**Three groups (group 6,7 and 8) reflect a strong influence from the health service information variable. Compared to the rest of the groups, these three groups have**

**relatively more use of DEC information and more eat an appropriate diet. Within these three groups, there is a difference in education and income level.**

GROUP 6     7 respondents

Appropriate diet: 57% eats appropriate diet

Vegetable intake: high

Education level: 86% completed high school

Income: 12,000 – 49,000

Variables: Knowledge, attitude, and health service information (variable 3, 1, 2) characterized the food choice of these people. They had control over their diet based on knowledge. They applied information from health professionals in their daily food choices, but also used personal food preference as a reason for food choice. Example comments from transcripts:

- *“We have different things every time. We try it at different days to vary.”*
- *“I can’t make marshmallow cake because of the sugar. Marshmallow is loaded with sugar.”*
- *“I quit eating canned vegetable because they are loaded with salt and sugar for me.”*
- *“I like to eat the whole can but I know I’d better not cause you know, when your sugar is high, you don’t feel good anyway.”*

GROUP 7     4 respondents

Appropriate diet: 50% eats appropriate diet

Vegetable intake: high

Education level: college

Income: 25,000 – 74,999

Variables: Knowledge, health service information, and attitude (variable 3, 2, 1)

characterized the food choice of these people. They followed the advice from health professionals faithfully. Their knowledge plus advice from the DEC gave them the reasons for food choices. People in this group have more financial freedom and more knowledge background (high level of education) to make healthy decisions. Example comments from transcripts:

- *"I love grapes but I have to be very careful because they have lots of sugars."*
- *"I've tried very much to avoid those fat foods like McDonalds. It's so unhealthy to the body."*
- *"I make sure I have breakfast every morning instead of just grabbing the coffee."*
- *"Most days I'll have something with potassium you know, like a banana at noon."*
- *"I am allowed only to eat ten of them. That's what they told me in the training."*
- *"I got to know today at the Health Science Center that I shouldn't even touch apple juice. That has very much sugar in it, which I didn't know that. I just left it on my table and went to the kitchen and get myself a glass of water."*

GROUP 8      5 respondents

Appropriate diet: 60% eats appropriate diet

Vegetable intake: high

Education level: less than grade 8 – high school

Income: 0 – 74,999 (80% under 24,999)

Variables: Health service information, knowledge, attitude (variable 1,2,3) characterized the food choice of this group. This group has low level of education and they tended not to apply lees of their own ideas to health advice. They simply follow the instructions from health professionals. They had the most frequent responses categorized as value of use information from health professionals. They use the information from the DEC in their daily food behavior very often. Example comments from transcripts:

- *"Because it's suggested 1% milk on my diet sheet."*
- *"The dietitian said it's good for you and yeah, I get them, the whole wheat bread."*
- *"It's too salty the dietitian said so I don't have it anymore."*
- *"Most of these stuff has sugar in it. the dietitian told us to ask for dressing and gravy on the side."*
- *"He gave us a little sample package and I read the label and it got sugar, honey, glucose, fructose. I phoned him and said "Did you know what it says on that label?" He said yes but there is not too much of anything in there."*
- *"I'll just have a small glass of diet Pepsi or any diet drinks because it hasn't got sugar in it."*

**Two groups (group 3 and 5) have strong influence from the physical factor variable and relatively less use of DEC information and fewer respondents were eating an appropriate diet.**

GROUP 3      6 respondents

Appropriate diet: 0% eats appropriate diet

Vegetable intake: low

Education level: grade 8 - university



Income: under 12,000 – 49,000

Variables: Knowledge, physical factor, and attitude (variable 3, 4, 1) characterized the food choice of these people. They often give physical needs as their reasons for eating.

Example comments from transcripts:

- *“When I eat beef and chicken you know, it doesn’t keep you as long as the moose meat or fish. You get so hungry.”*
- *“I think it’s a very relaxing substance that relaxes that if you feel tense at all. You take a glass of wine and settle down.”*
- *“I don’t feel satisfied if I haven’t had something with meat.”*
- *“I don’t eat I don’t drink a lot of milk because of the facts sometimes it doesn’t agree with my stomach.”*
- *“The sweetener is so different. My taste buds now have transferred over to sweetener and different texture.”*
- *“Cause I can’t stand 1% milk. That’s water, I’d rather drink water.”*

GROUP 5      6 respondents

Appropriate diet: 33% eats appropriate diet

Vegetable intake: high

Education level: grade 8 - university

Income: under 12,000 – 49,000

Variables: Attitude, physical factor, and control internal (variable 1,4,7) characterized the food choice of these people. They have strong internal control over their physical needs.

Example comments from transcripts:

- *“Right now I am fighting food addiction. If you addicted to something you can’t touch that thing, cause you want done with it.”*
- *“I try not to eat too much.”*
- *“I very seldom ever cheat on what I eat.”*
- *“I am a real protein eater but I cut that back.”*
- *“So I sort of changing my eating habits completely.”*

**One group has showed a strong influence from the resource access variable.**

GROUP 4     7 respondents

Appropriate diet: 28% eats appropriate diet

Vegetable intake: high

Education level: grade 8 - university

Income: under 12,000 – 74,999 (71% between 25,000 – 74,999)

Variables: Knowledge, attitude, and resource access (variable 3,1,5,7) characterized the food choice of these people. This group thought that food accessibility was very important to them. Eating out, order deliveries, or food availability in household play important roles in their food pattern. They applied their knowledge on the diet and food access and meanwhile had strong control over the food choices. Example comments from transcripts:

- *“She buys all the good stuff and I buy all the junks.”*
- *“We buy what is the cheapest.”*
- *“I make my sandwich depending what’s in the fridge.”*
- *“I’ve looked at the price in Superstore. That’s more expensive than Safeway. Then I said no.”*

- *“And when you can't find things when you get there, just forget it.”*
- *“We order French fries for sure.”*
- *“We don't make that at home, we usually go out for that.”*

In summary for research question 1, the data showed eight groups of respondents who apparently had different ways of thinking towards food choice behavior. Although groups shared characteristics, the combination of characteristics of each group was unique.

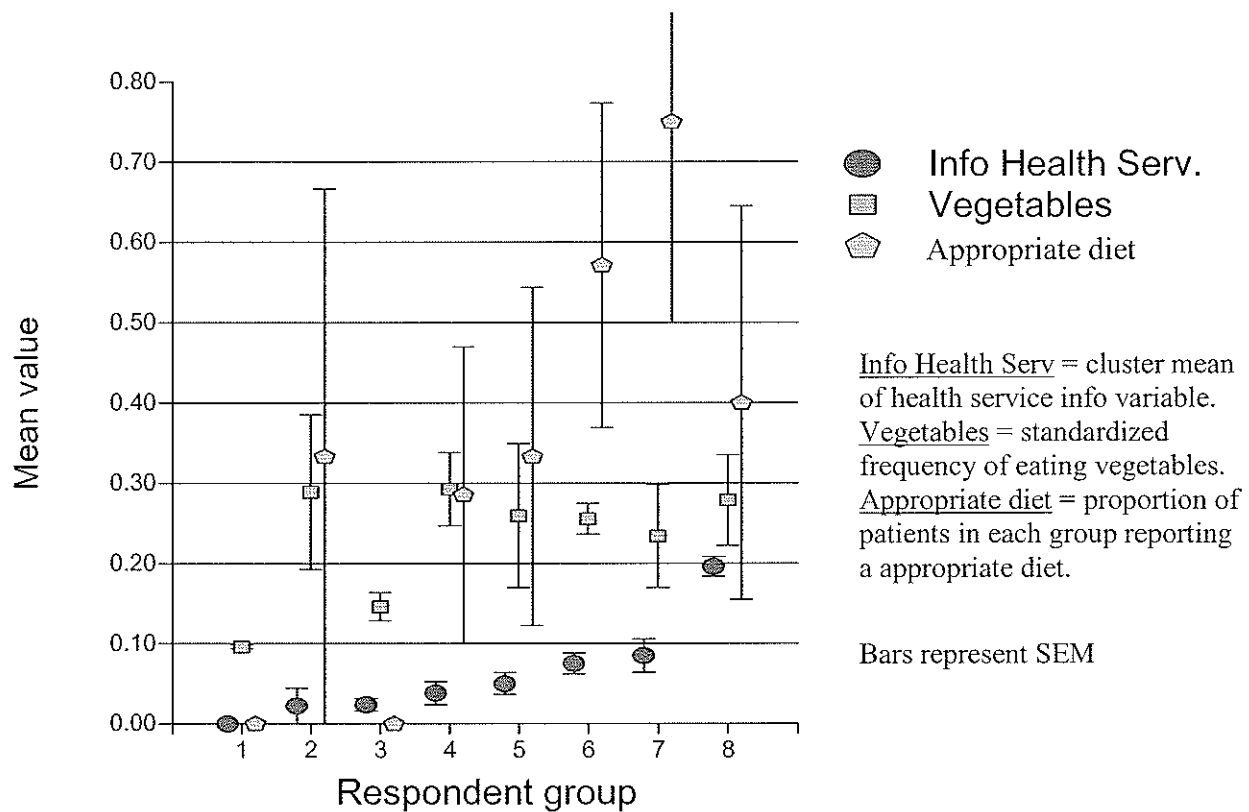
## **5.4 Health service information and dietary pattern**

**Research question 2:** Does the perceived importance of information from health service result in better dietary patterns?

The use of information by respondents in each of the groups representing a way of thinking about food choices was related to the dietary patterns they reported. Combinations of factors that are shared by people in making life style choices are associated with different dietary patterns.

Figure 4 shows the relationships between the use of information from health services and the frequency of consumption of vegetables, and the proportion of respondents in a group reporting an appropriate diet. People who use information from health services often tended to eat appropriate diet (Table 9). Groups 6, 7 and 8 used information from health services frequently, including information from the DEC, and frequently ate vegetables and appropriate diets. Conversely, groups 1, 2 and 3 did not use information from health services frequently. Groups 1 and 3 showed low frequencies of vegetable and appropriate diet consumption, while Group 2 showed average consumption.

Figure 4 Mean values of three variables by respondent group



Although group 1 and 3 show relatively low frequencies of vegetables in their diets, there is no significant difference when comparing the frequencies of vegetable consumption of group 1 and 3 combined with the frequencies of consumption all other respondents (t-Test,  $p > 0.05$ ). Similarly, the use of health service information and the frequencies of consumption of vegetables, fat or sugar did not show significant relationships.

This lack of association between the use of health services and frequency of consumption of specific food groups suggests that food consumption cannot be predicted from a single variable used to explain food choice, such as the use of information from health service in this case. These associations are influenced by a number of other

factors, in a variety of combinations, such as resource access, physical and social environment factors.

The researcher reviewed food choice maps and made comments according to the meal patterns (see Methods, p 39). Comments like: high fat diets, less vegetable intake, appropriate diet were recorded for each map. Among the 40 maps, it was observed that almost half of the people did not have enough vegetable intake (minimum 5 servings per day). This might be due to the interviews were taking place in the winter season, when the access to vegetables was more difficult compared to other seasons. Thirty percent of the people consumed fat more often than the rest, in terms of eating fast foods (burgers, hotdogs, and fries) and they liked gravy and potato chips. Eighty percent of the people did not add or used very limited (less than twice in a week) sugar in their diet in terms of using regular jam, honey, syrup and eating ice cream, fruit cocktails. Thirty-five percent of the people had well appropriate diets. They balanced the meals from different food groups and consumed enough vegetable and chose low-fat products.

Table 8 Mean frequencies of fat and sugar consumption by group

Group	Added sugar		Added fat	
	Mean	SEM	Mean	SEM
1	0.0	0.0	2.0	1.0
2	0.33	0.33	9.67	2.73
3	2.67	1.98	3.67	0.95
4	0.71	0.71	3.86	2.16
5	2.67	1.31	2.67	1.27
6	2.14	1.26	7.15	1.74
7	1.75	1.75	5.75	0.95
8	1.20	0.73	6.80	2.92

The consumption of fat and sugar was compared among groups, and there were no significant difference among groups (Table 8). For this comparison, frequencies, not standardized frequencies, were used because dietary advice for patients with diabetes is to restrict these foods in a recommended diet.

To test if there was an association between the two different information groups and the eating an appropriate diet behavior, a contingency table statistical analysis was performed. The result showed that there was a real association between these two groups and eating appropriate diet behavior ( $\chi^2 = 6.679$  df=1,  $p < 0.01$ ). Groups 6, 7, and 8, group 7 has the highest proportion of respondents eating appropriate diet (Table 9).

There were altogether 16 respondents from group 6, 7, and 8. These respondents had high health service information variable value towards food choice behavior. Among people in these three groups, 63% of them had a well appropriate diet. The rest either were on night work shifts so the meal pattern was interrupted or had fairly high fat intake because of personal eating habit, but were good on sugar intake control.

Table 9 Proportion of respondents with appropriate diets by health information

Group	Health service information variable	Proportion of respondents reporting an appropriate diet
6	High	63 %
7		
8		
1	Low	17%
2		
3		
4		
5		

In summary for research question 2, respondents who perceived a greater importance of information from health services, in food choice behavior, than others, tended to eat more appropriate diet. ( $p < 0.05$ ).

## **5.5 Health service information and weight management**

**Research question 3:** Does the perceived importance of information from health service result in better weight management?

To test if there was an association between the two different information groups and weight management, a contingency table statistical analysis was performed (Table 10). The result showed that there was a real association between these two groups and eating appropriate diet behavior ( $\chi^2 = 4$  df=1,  $p < 0.05$  )

Table 8 Proportion of respondents with control over weight by health information

Group	Health service information variable	Proportion of people lost weight or maintaining normal body weight
6	High	69%
7		
8		
1	Low	46%
2		
3		
4		
5		

In summary for research question 3, respondents who perceived a greater importance of information from health services, in food choice behavior, than others, tended to be successful in weight control ( $p < 0.05$ )

## 5.6 Source of dietary related health information

The respondents used a wide range of knowledge and information when they talked about their food choices. The different sources of knowledge and information were identified, such as from dietitians, doctors and nurses, friends or media. Categories of sources are shown in table 11.

Table 9 Percent of references to health information by source among 40 respondents

Source category	Percentage of all information referred by patient.
Diabetes Education Centre	70%
Other health professionals (doctor, nurse, etc.)	12%
Family members and friends, media	18%

The Diabetes Education Center (DEC) played a very important role in the passing of nutrition knowledge to the patients. Seventy percent of the total information was from the Diabetes Education Center. People who wanted to learn more about the disease usually would conduct their own research. They read medical journals and did internet research (Table 12). Many patients use a combination of knowledge from different sources and applied them in their daily life.



Table 10 Examples of health information

Source Category	Example
DEC	<ul style="list-style-type: none"> <li>- The dietitians told me that I was not supposed to take sugar.</li> <li>- This is what I got last time, it says that what I should and what I shouldn't touch.</li> </ul>
Other health professionals (doctors and nurses)	<ul style="list-style-type: none"> <li>- And again at the approval of the doctor. I have a drink of rye and water before dinner.</li> <li>- I mean I don't have to think about it. My doctor automatically decides thing for me and I consciously make these decisions.</li> </ul>
Family members and friends	<ul style="list-style-type: none"> <li>- Because you need it for potassium I learned this from my husband because he had heart conditions, so I started banana then I kept on having my banana.</li> <li>- My brother gave me a lot of information.</li> <li>- One of my friends who have diabetes suggested that.</li> <li>- We have one friend, whose brother is a diabetic for whole life so we got a lot of really good cooking tips and hints from her.</li> </ul>
Media and own studies	<ul style="list-style-type: none"> <li>- I read natural cookbooks and stuff like that. I listen to people talking about natural cooking.</li> <li>- I read something again in the book, which I thought is kind of neat. They call it fork method.</li> </ul>

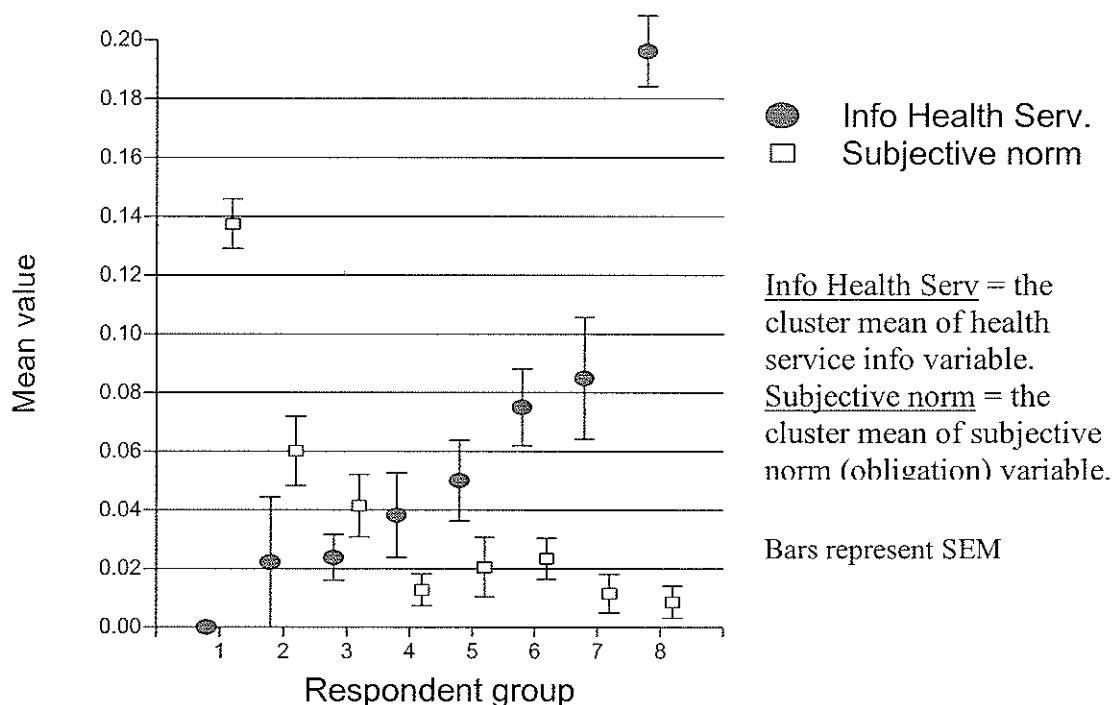
## 5.7 Health service information and subjective norm

It was observed during the analysis that high subjective norm variable means appeared to be associated with lower variable means for health service information.

The description of groups of respondents by types of thinking about food choice showed the influence of subjective norms for several of the groups. Subjective norms, as pointed out in the literature review, may influence the acceptance of new information or

behavior. For this reason, the relationship between use of information from health services and the relative importance of subjective norms was investigated more closely.

Figure 5 Information from Health Services and Subjective Norm by respondent group



An inverse relationship was found between the groups in the use of information from health services and the apparent importance of subjective norms in making choices (Figure 5). People in groups 1, 2 and 3 expressed subjective norms more strongly than people in other groups. A linear regression analysis was run with subjective norm as the dependent variable and use of information from health services as the independent variable. These two variables were shown to be inversely related, with a coefficient of -0.8 and a probability of 0.0046.

## **Discussion**

### **7.1 Major types of thinking towards food choice behavior**

The patients in this study, who reported using the same factors for making food choices, were seen as representing a way of thinking about food choice. Each of the groups of patients, characterized by their unique combinations of factors, were seen as representing separate ways of thinking about food choice. The cluster analysis procedure allowed for an objective grouping of respondents into the different ways of thinking. This observation answers research question I of this study. Eight major ways of thinking were identified. The literature does not report equivalent descriptions of behaviors of patients with diabetes.

The description of different ways of thinking towards food choice provides diabetes educators with additional understanding about food choice behavior of people with type 2 diabetes. Diabetes education is becoming more client-centered. This research provides a structure or frame for major types of thinking towards food choice. Therefore, the use of these results in education may make programs more suited to individual needs.

### **7.2 Influences on food choice behavior**

In this study, identified a number of influences on food choices, such as resource access, health service information, internal control, food preference attitude, subjective norms, and physical factors. This finding confirms the work of other researchers who identified similar determinants of behavior, as discussed in the Literature Review.

However, it was found that respondents used combinations of these variables to explain their food choice decisions. The dominant variables were labeled as: attitude,

health service, knowledge, physical, resources, obligation, and internal. The literature describes relationships between single constructs or variables, and not all of the ones used in this study, and food choice behavior (Savoca, 2001). There is little information on determinants that matched the combinations of constructs observed in this study.

The combinations of variables show that people respond to a number of influences at the same time when thinking about food choices. The choices appear to relate to several influences at the same time. This finding is important for attempts to change the food choice behavior of people, or their compliance with recommended diet plans.

For example, a future education program may focus on several aspects in a patient's life at the same time, such as helping a patient not only with information, but also with resource allocation and with physical problems that are uniquely relevant to this individual. In this context, a patient's subjective norms, represented by the obligation variable, appeared to be one of the key potential influences on the use of information.

### **7.3 Health service information and behavior change**

Information from the DEC constituted the greatest proportion of all health service information mentioned by respondents. Hence DEC education was regarded as having a strong and positive impact on diet management and weight control. This is consistent with the objective of diabetes education, which is: "to provide information, strategies and a context for making choices that improve quality of life" (Meltzer et al., 1998). Apart from the DEC, respondents also received health information and advice from doctors, nurses, family, friends, and media. Educators could help patients to make correct judgments about information from these sources as necessary.

The results showed that the perceived importance of health services information associated with eating appropriate diet and achieving better weight management. This answered research questions 2 and 3. It is suggested that the frequency of using health service information might predict dietary and weight management behavior. This is consistent with the finding that knowledge about food selection and food estimation tasks are better predictors for dietary management than demographic variables (Travis T, 1997), in spite of the fact that patients reported many other factors influencing dietary and lifestyle behavior.

However, eating vegetables more frequently, or eating fat and sugar less frequently, were not significantly associated with the relative importance of 'health service information' to the respondent groups. The lack of association with fat consumption may be due to the following reasons: respondents might not have understood the relationship between diabetes and heart disease so inadequate attention was paid to fat intake, or respondents might not receive the same information on fat intake due to differences in body weight. The lack of association with sugar consumption may be due to the fact that patients ate very little sugar, because eliminating sugar is the basic dietary management and was considered mandatory by most of the type 2 diabetes people (Savoca and Miller, 2001). Therefore, in this study group differences in sugar intake were not significant. The lack of association with vegetable consumption may be explained by findings from Savoca and Miller (2001), who reported that most of the patients did not incorporate a variety of vegetables in their diet because they ate minimal amounts of vegetables before the onset of diabetes. In addition, the fact that consumption

of single foods is affected by a large number of factors, such as personal preference, economic and social factors, may lessen the effect of 'health service information'.

#### **7.4 Self-efficacy and food choice behavior**

Self-efficacy was identified as a new construct during content analysis because patients expressed this construct in their explanations. Self-efficacy is equated by some researchers with will power. Previous studies showed that self-efficacy contributes to diabetes self-management (Aljasem, et al, 2001). Patients in this study also referred to self-efficacy and appeared in several variables. However, they expressed this construct less frequently than other constructs, and as a result, self-efficacy was not part of the dominant variables.

This result is consistent with previous studies that self-efficacy was a weak predictor for dietary management (Kingery et al, 1989). Similarly, another study on how type 2 diabetes patients adapt recommendations for self-care in their daily life suggests that self-efficacy does not have strong impact on patient's dietary behavior (Hunt, et al, 1998).

The explanation for these observations may be that food behavior is really a collection of behaviors and cannot be understood as simply a matter of will power or a global self-efficacy measure. Many patients must consistently make many small decisions to achieve appropriate self-care behavior. This process is difficult for dietary change because many emotional, cultural, economical, and social aspects influence food behavior. Achieving change in food behaviors requires the allocation of resources and negotiation to balance relationships.

## **7.5 Subjective norm and health service information use**

The influence of subjective norms was inversely associated with the reported use of health service information in this study. The relationship was strong, which may be explained by the different functions of the subjective norm and the role that health information in the thinking of patients. Subjective norm is one's perception that others desire the performance, or non-performance, of a specific behavior, even if it may or may not reflect what others actually think the person should do (Ajzen, 1991). By contrast, the use of health information implies personal judgment that may take the opinions of others into account, but is not dependent on those opinions.

In the case of this study, some respondents' food choice behaviors were more influenced by information from significant others than health services.

## Conclusion

The research findings show that combinations of factors influence the food choices of respondents. These combinations have provided complex descriptions of reasons for food choice behavior. There is little information from literature on determinants that matched the combinations of constructs observed in this study.

To answer research question 1, different factors were identified that affect ways of thinking towards food choice behavior among type 2 diabetes people. For example, resource access, physical factors, and using health service information influenced respondents' thinking. Different ways of thinking were explored by identifying different combinations of constructs. Eight thinking groups were identified in this study.

Health services information use was identified as an important factor that affects respondents' food choice behavior. In addition, when respondents use health services information in daily dietary management, it resulted in eating a more appropriate diet and better weight management. This showed the important role of DEC in nutritional management and the impact of implemented information. This answered research questions 2 and 3.

For people who did not use health service information towards food choice behavior, their dietary behaviors were more affected by resource access, physical factors, and internal control and obligations.

DEC information was the major source of respondents' health service information, which means although patients sought dietary advice from doctors, nurses, and other health professionals, the DEC was the major source of respondents'



information. This is consistent with the DEC's role in diabetes nutrition management. However, respondents did not solely rely on DEC and other health professionals for information. Eighteen percent of the information was from family, friends, and media.

The influence of subjective norm appeared to be inversely associated with the acceptance of health service information. If this relationship is confirmed by future research, education strategies may need to be modified specifically for this type of thinking.

## Future Implementation

The study provided an understanding of the complexity of type 2 diabetes food choice behavior. By using this understanding of different ways of thinking in the design of education strategies, the results of education may be enhanced.

Several combinations of reasons for food choice behavior were identified. Some of the combinations are easy to identify among future patients. For example, a patient with very strong internal control or strong obligation influence could be identified after only a brief conversation, especially by an experienced educator. Some thinking groups may not be easily identified within a short time period, but should become apparent as the educator explores personal aspects of diabetes management and life experience.

New research is needed in the application of this research findings to education program to test if education programs can be more effective by using the results of this study. Different education strategies could be designed for different groups. To educate people with a strong obligation influence, it is important to identify the relationship that causes the perception of obligation. For example, if family members influence the patient's food choice, educating the patient together with family members would likely be more effective. To educate people who have strong internal control, pointing out the right approach to behavior change for the patient, and provide external support, would be helpful. To educate people that are affected by physical factors, advice on how to cope with physical symptoms, adjust medications might be helpful to increase dietary adherence. Alternatives to problems in accessing resources could be provided to people who are affected by this factor.

Also, other behavior change research methods can be used in combination with this study. For example, studies could be designed to identify the learning style and the stage of behavior change for each group. The combined results may provide more information on using appropriate methods for education, and to achieve motivation, could promote behavior changes.

A future study that repeats the research, but with a larger sample size, could provide more reliable conclusions in the distribution of demographic characteristic among patient groups. This would help educators to identify the ways of thinking of patients more easily.

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## **APPENDIX**

### **A. Introductory Letter to Respondents**



THE UNIVERSITY OF MANITOBA

FACULTY OF HUMAN ECOLOGY

Department of Foods and Nutrition

Human Ecology Building  
Winnipeg, Manitoba  
Canada R3T 2N2  
(204) 228-5535  
(204) 269-7242

April 1999

Dear Participant,

The Department of Foods and Nutrition at the University of Manitoba and the Diabetes Education Centre are participating in a study to improve services. The purpose of the study is to help patients with diabetes make life style changes. This study can help in choosing food according to personal preferences and a variety of other aspects important to managing diabetes. The results are also intended to help in designing and promoting better diabetes education programs in your community.

Your participation in a 45-minute conversation about your views about health, food and diabetes, would be a very valuable contribution. In addition we ask you to complete a food frequency questionnaire in your own time and mail it back using a stamped envelope included with the questionnaire.

The time for the conversation will be scheduled at a time that is convenient for you. One of the researchers will talk to you in a room in the Centre. We ask you agree to have the conversation tape-recorded.

All of the information you provide, both documents and tapes will be kept entirely confidential. None of the information will have your name attached to it and no reports will identify individuals in any way. The research records will be destroyed when the final report is ready. If you wish you can get the analysis of your own information before the study finishes. Your participation is voluntary and choosing not to participate does not affect any services, or access to services, at the Diabetes Education Centre or any other health service.

If you decide to participate or have any questions, please contact us at the above telephone number. The staff from the Diabetes Education Centre will also telephone you in a few days to ask whether you can join the study.



THE UNIVERSITY OF MANITOBA

FACULTY OF HUMAN ECOLOGY

Department of Foods and Nutrition

Human Ecology Building

Winnipeg, Manitoba

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(204) 228-5535

(204) 269-7242

Thank you for your assistance.

Sincerely,

Amy Leung Hui, Researcher  
Department of Foods and Nutrition  
University of Manitoba

## B. Consent Form



THE UNIVERSITY OF MANITOBA

FACULTY OF HUMAN ECOLOGY

Department of Foods and Nutrition

Human Ecology Building

Winnipeg, Manitoba

Canada R3T 2N2

(204) 228-5535

(204) 269-7242

## CONSENT FORM – FOOD CHOICE STUDY

## REFERENCE NO.

I understand that the Department of Foods and Nutrition at the University of Manitoba is conducting a study on factors that determine food choices, and that the Diabetes Education Centre is assisting in that study. I understand that in participating in the study, I will be interviewed once at Health Sciences Centre and this interview will be audio taped.

I understand that I will complete demographic questionnaire and food frequency questionnaire after the interview and will hand the food frequency questionnaire to the interviewer within one week. I understand that I am free to withdraw from the study at any time and that I can choose not to respond to particular questions. My name, phone number and address will be deleted from the data records and audio tapes to ensure confidentiality.

I realize participation is voluntary and that there is no remuneration for my involvement.

I \_\_\_\_\_, the undersigned, agree to participate in the research study described above.

\_\_\_\_\_  
(Signature of Participant)

\_\_\_\_\_  
(Date)

Address: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Phone Nos. \_\_\_\_\_

## TO BE SIGNED BY THE INTERVIEWER:

To the best of my ability, I have fully explained to the participant the nature of this research study. I have invited questions and provided answers. I believe that the subject fully understands the implications and voluntary nature of the study.

\_\_\_\_\_  
(Signature of Interviewer)

\_\_\_\_\_  
(Date)

## C. Demographic Questionnaire

Ref. No. \_\_\_\_\_

**Please circle the best answer that describes your response and fill out the blanks**

Age: 18 – 25      26 – 35      36 – 45      46 – 55      56 – 65      66 +

Gender:      Male      Female

Weight: \_\_\_\_\_

Height: \_\_\_\_\_

Marital Status:      Single (Never been married)  
                                 Married or common law  
                                 Divorced / Separated  
                                 Widowed

Family Origin: \_\_\_\_\_

Location of immediately related family/relationship: \_\_\_\_\_

Type of transportation used on daily basis: \_\_\_\_\_

Date of last visit to physician: \_\_\_\_\_

Frequency of visits to any health service over last 6 months: \_\_\_\_\_

Number of people living with you (including yourself): \_\_\_\_\_

Number of children under age 18 living with you: \_\_\_\_\_

Level of education:

Grade 8 or less  
Completed high school  
College certificate or diploma  
Completed university  
Other \_\_\_\_\_

Some high school  
Some college training  
Some university  
Post-graduate

Language most frequently spoken at home:

English  
German  
Ukrainian

French  
Italian  
Other \_\_\_\_\_

Employment status:

Employed  
Student  
Home maker

Self-employed  
Retired  
Unemployed

Income category:

Under \$12,000  
\$25,000 – 49,999  
\$75,000 and over

\$12,000 – 24,999  
\$50,000 - \$74,999



## D. Food Choice Map Interview Question Guide

### Food Frequency

What food do you eat often?

When in the day do you usually eat that (mentioned) food?

Which meal(s) or snack(s) does that food usually belong to?

What other food do you usually eat at this meal or snack?

How often during a week do you eat these mentioned foods during this meal/snack? Do you eat these foods more or less often, or the same number of times as the first one?

What other meals or snacks do you eat during the day?

What food do you usually eat at this (newly mentioned) meal or snack?

How often during a week do you eat these mentioned foods during the meal or snack?

### Food Choice

You seemed to eat this food more often than that food, is it very important for you?

In regards to the first food you mentioned, are there other food that could take its place in that meal?

How often do you eat this alternative foods-more often, less often or as frequent as the food you first mentioned?

Are there alternative choices for each of the foods in their respective meals?

Why do you actually choose the first mentioned food more often than the alternative food(s)?

The foods you eat most often are very important for you, why?

Which meals or snacks do you eat alone or with others?

Who do you eat with?

What the relationship are the people to you?

How often do you eat this meal (snack) with these persons?

Do you share the money for the foods/meals? With whom - who contribute?

Who decides what foods will be purchased?

### Food Preparation

Where is the meal prepared (ask for every meal of the day)?

Do you prepare meals alone or do you have help?

How often do you prepare meals each day?

Where do you buy your food?

Who decides which foods will be purchased? What are the criteria?

Have you recently changed the amount or type of food(s) you eat? Why?

Did the amount increase or decrease, and by how much for the consumption of any of these foods/meals? Why?

Are you planning to change the amount of any foods you eat? – Which ones? – Why?

Where do you get the information on the best buys, what is in the food, how healthy it is?

Do you feel you have to wait for the decision of any person before buying or spending money? – Which person?

Diabetes Management / Education Use

What information do you hear from the Diabetic Education Center? (E.g. nutrition, medication, exercise, etc.)

Do you use the information in your daily life? If so, in what way, if not, what difficulties do you find?

Do you receive nutrition and health information from anyone else? If so, what did you hear?

Do you follow the nutrition and health information you hear from others? If so, why?

Do you believe in any “food traditions” that may affect your blood sugar level, If so, what are they?

Is some food more important to you?

Are you afraid of any food?

Who tells you about the “traditions”? What relationship are the people to you?

Is there any physical activity dos you usually do? Do you like it?

**E. Example of completed Food Choice Map**

# Food Choice Map

Respondent number .....

Interviewer .....

Date .....

Location .....

	0	1	2	3	4	5	6	7
6.30 am		egg	jam, jelly	bread	cold cereal	At home		milk
						plain cookies	In student room	Eaten with people at work
12.30 pm		apple	egg	banana	peanut butter	In cafeteria		bread
		kiwi	mayonnaise					
						regular pop	On the way home	
				Eaten with family				
7.30 pm		poultry	bean sprouts	squash	spinach	zucchini	chilli	rice
				beans	onions	fish fillet		
							At home	orange

## F. Construct Definition Table

Construct definition	Application	Examples
Behavioral beliefs (beh-bel) The beliefs that underlie a person's attitude towards the behavior (Ajzen & Fishbein, 1980)	Belief - an individual's intrinsic information about their behavior/environment possessing an attribute - person's subjective probability judgment concerning some aspect (behavior or action) of their world (Ajzen & Fishbein, 1975)	- I eat healthy - We're both pretty indecisive people - If I cut out my fat, that's when I lose my weight - I don't like to eat deli meats or anything like that
Attitude behavior (att-beh) Personal evaluation of performing the behavior or having a specific opinion (Ajzen & Fishbein, 1980)	- personal consequence of actions - may be positive or negative - affect toward the action or behavior	- What we eat is bad - I don't like to eat deli meats or anything like that
Subjective norm (sub-nor) Positive or negative perception of social pressure to situations considered socially significant (Ajzen & Fishbein, 1980)	- social influence of affect towards behavior - may be positive or negative - social consequence of actions - evaluation of normative belief	- Most people think what we eat is bad - My wife think it is best so I do it - My family thinks it is the appropriate way of eating so I eat like that
Normative belief (nor-bel) Normative nature, Beliefs that certain referents think the person should or should not perform the behavior in question (Ajzen & Fishbein, 1975)	- external stressors - beliefs that are referenced external to the individual	- My wife said that I shouldn't drink homo milk - Mother told me to eat more vegetables
Control Personal regulation of goal-directed behavior or performance OR person's belief as to how easy or difficult performance of the behavior is likely to be (Ajzen & Fishbein, 1986)	- Perception of personal control  Internal control (con-int): Attributes agency to oneself  External control (ext-cont): Attributes agency to others, environment, or fate	- I help out as much as I can      - When the weather is cold, I will do exercise at home. - Everything I eat has fat in it -

Control barriers (con-bar) Perceptions of barriers to perform a behavior (FCM working group definition)	Limitations and situations that the individual finds difficult to overcome or deal with	- I cannot afford those expensive new products - Everything has sugar in it, it hard for you to select
Coping (cop) Cognitive and behavioral effort made to master, tolerate, manage or reduce specific external or internal demands that tax or exceed a person's resources (Cohen & Lazarus, 1979 in Kessler et al, 1985)	- problem solving - stress management - strategies/tactics that are used by a person to deal with stimuli (Perry et al, 1990, p.166, Social Learning Theory)	- We would use frozen vegetables instead of fresh ones to save money in winter - I take vitamin pills because I don't eat enough vegetables
Family resource balance (frb) Household resource (money, time, information, health) and proportion of resources available for food acquisition	- income coming into household: family, land, social services, employment	- Money for food is from my husband - My wife works shift work
Resource access (res-acc) The availability of food and the ability to acquire available food (Campbell, 1991; Reutlinger et al, 1986)	- food security, accessibility, availability, as well as service availability	- I don't drive, like I have food delivered - I go to Safeway because you don't have to bring your own bags
Resource finance (res-fin) Availability of food markets, quantity and quality of food present in food markets related to financial ability to acquire food that is available (Campbell, 1991)	- limitations or restrictions to food and services due to finances - abilities to command resources	- I bought 2% milk because it was on sale - I always compare price and use coupons
Resource time (res-time)	- resource related to time (physical, emotional, social)	- I shop on my way home to save time
Social support (soc) Perceived support by the individual. The emotional, instrumental, and financial aid that is obtained from one's social network (Berkman, 1984)	- physical, emotional and spiritual support - categories of support /assistance: spouse, significant other, relatives, friends, siblings, co-workers, community, other	- Usually my wife does supper unless she is working
Emotion (em) Expressing a feeling towards an action, person, thought, or object (FCM working shop)		- I am happy when my children eat well - I feel sad about the situation

Physiology (phys) Physiological factors that affect intake (FCM working group)	- A person's subjective probability judgment concerning some aspect (i.e. any physiological responses) of their world (Ajzen & Fishbein, 1975)	- I feel hungry all the time so I keep eating - Tomato makes my stomach sick
Knowledge general (know-gen) Correct or incorrect facts that explain their world. A perception of beliefs outside of behaviors (FCM working group)	- definition of behaviors, attitudes and non-behaviors	- I know homo milk has a lot of fat in it - If you don't sweat, then the exercise is not effective
Health service information (info-hs) information received from health service (FCM working group)	- including message, advise and directions offered by medical or other health professional outside or within a health service premise	- My doctor told me to stay away from pop
Information outside the family (info-osf) Information received from outside health service and family (FCM working group)	- include media, friends	- I search for information online all the time - I read a lot of magazines on this topic
Information within family (info-wf) Information received from within immediate and extended family (FCM working group)	- from family members	- My daughter sent me this information
Social service curative (ss-cur) Treatment programs that are targeted at specific individuals delivering personal health services to control or cure disease episodes (Remington, 1990)	- care refer to health service curative	- I come here every month for tests and treatment
Social service preventive (ss-prev) Disease prevention and health promotion efforts/strategies that benefit the entire community (Remington, 1990)	- can be health service preventive - individual or entire community	- I went to weight watchers - I went to a health fair and they said that I need to lose weight

### **New constructs that emerged from the transcripts:**

#### **Self-efficacy (self-ef) (Bandura, 1977)**

One's ability and confidence to perform a behavior. Note: "this and related research thus provides further evidence that although personal control over outcomes (i.e. Self-efficacy) is important, it is not sufficient for intrinsic motivation, the feelings of competence must be accompanied by perceived autonomy for people to be intrinsically motivated (Deci & Ryan, 1991; Ryan 1993). Therefore, behavior must also be self-determined.

#### **Food Security (food-se)**

Access by all people at all times to enough food for an active healthy life, and at a minimum includes the following:

- 1) ready availability of nutritionally adequate and safe foods, and
- 2) the assured ability to acquire personally acceptable foods in a socially acceptable way (Campbell, 1991)

### **Additional definitions in formulating the definitions of constructs:**

#### **Attitude**

A general predisposition. The person is not required to perform any specific behavior, rather it leads to a set of intentions that indicate a certain amount of affect toward the objection in question (Ajzen & Fishbein, 1975).

#### **Normative nature**

Beliefs that certain referents think the person should or should not perform the behavior in question (Ajzen & Fishbein, 1975).

Note: the totality of normative pressure is subjective norm.

#### **Entitlements**

A semi-legal concept, focusing on the bundles of goods and services that a person can legitimately establish command over, using the laws, regulations, conventions, opportunities and rights ruling in the society in question. This also reflects ownership, on the one hand, and opportunities of production and exchange on the other (Sen, 1984)

This construct is further divided into family resource balance (frb), and food security, which encompasses resource access (res-acc), and resource finance (res-fin).



## G. All Identified Variables of Food Choice Behavior

Variable frequency	Variable (construct combination)	
275 behbel	conint	knowgen
199 behbel	attbeh	
116 behbel	infohs	
103 behbel	phys	
88 behbel	conint	
50 behbel	resacc	
50 behbel	subnor	
31 behbel	conext	
29 behbel	resacc	resfin
24 resacc	resfin	attbeh
22 resacc	socres	attbeh
19 behbel	resacc	attbeh
18 resacc	attbeh	
18 resacc	socsup	
16 behbel	conext	conint
15 behbel	norbel	attbeh
10 behbel	conint	phys
10 behbel	phys	attbeh
9 behbel	conbar	attbeh
8 behbel	conext	knowgen
8 behbel	socint	
8 resacc	socres	attbeh
7 behbel	conext	frb
6 behbel	cop	phys
6 behbel	knowgen	resacc
6 conbar	phys	
6 conint	attbeh	
6 cop	knowgen	
6 cop	resacc	
6 knowgen	attbeh	
5 behbel	conint	resacc
5 behbel	resacc	fs
5 behbel	socint	
5 conbar	conint	
5 frb	resacc	
5 knowgen	resacc	
4 behbel	conbar	
4 behbel	conbar	phys
4 behbel	conext	attbeh
4 behbel	conint	cop
4 behbel	conint	socint
4 behbel	cop	phys

4 behbel	cop	phys	
4 behbel	cop	resacc	
4 behbel	cop		
4 behbel	frb	resacc	
4 behbel	knowgen	phys	
4 behbel	knowgen	phys	
4 behbel	phys	resacc	
4 behbel	resacc	socres	
4 behbel	resacc	socint	
4 behbel	resfin		
4 behbel	resfin	attbeh	
4 behbel	resfin		
4 behbel	restime		
4 behbel	restime	attbeh	
4 behbel	restime		
4 behbel	socint		
4 behbel	socsup		
4 conbar	attbeh		
4 conbar	attbeh		
4 conbar	knowgen		
4 conbar	phys		
4 conbar	phys	attbeh	
4 conbar	resacc	resfin	
4 conbar	resacc		
4 conbar	socint		
4 conint	attbeh		
4 conint	knowgen	socint	
4 conint	resacc		
4 cop	knowgen	resacc	
4 frb	resacc	socsup	
4 infoosf	attbeh		
4 phys	attbeh		
4 resacc	frb	resfin	
4 resacc	resfin		
4 resacc	socint		
4 resacc	socres	attbeh	
3 behbel	conbar	phys	
3 behbel	conbar		
3 behbel	conext	resacc	
3 behbel	conint	cop	
3 behbel	conint	cop	socint
3 behbel	conint	resacc	
3 behbel	cop	attbeh	
3 behbel	cop	phys	
3 behbel	cop	knowgen	
3 behbel	cop	resfin	
3 behbel	resacc	socint	

3 behbel	resacc	socsup	
3 behbel	resfin		
3 behbel	socint		
3 behbel	socsup		
3 behbel	value		
3 conb	resacc		
3 conbar	attbeh		
3 conbar	conext		
3 conbar	conint	attbeh	
3 conbar	frb	resfin	
3 conbar	infohs		
3 conbar	resacc	resfin	
3 conext	phys		
3 conint	cop		
3 conint	knowgen	resacc	
3 cop	knowgen	attbeh	
3 cop	knowgen	phys	
3 cop	phys		
3 infoosf	resacc		
3 infoosf	socint		
3 phys	attbeh		
3 resacc	resfin	socsup	
3 resacc	socres	attbeh	
3 resfin	attbeh		
3 socres	attbeh		
3 socsup	attbeh		
3 subnor	attbeh		
2 behbel	conbar	conext	resacc
2 behbel	conbar	phys	attbeh
2 behbel	conbar	phys	
2 behbel	conbar	socint	
2 behbel	conbar	frb	
2 behbel	conbar	infohs	value
2 behbel	conbar	resacc	
2 behbel	conbar	subnor	
2 behbel	conext	attbeh	
2 behbel	conext	resacc	
2 behbel	conext	socsup	
2 behbel	conext	phys	
2 behbel	conext	socint	
2 behbel	conext	subnor	
2 behbel	conint	infohs	
2 behbel	conint	norbel	
2 behbel	conint	restime	
2 behbel	cop	resacc	
2 behbel	cop	attbeh	
2 behbel	cop	resacc	resfin

2 behbel	frb		
2 behbel	frb	attbeh	
2 behbel	frb	resacc	
2 behbel	fs	resacc	
2 behbel	fs	attbeh	
2 behbel	fs		
2 behbel	phys	socint	
2 behbel	resacc	socint	
2 behbel	resacc	socres	
2 behbel	resacc		
2 behbel	resfin	socres	
2 behbel	socint	subnor	
2 behbel	socint	attbeh	
2 conbar	conext	attbeh	
2 conbar	conext	socint	
2 conbar	conext	attbeh	
2 conbar	conint	cop	
2 conbar	conint	knowgen	attbeh
2 conbar	cop	resacc	
2 conbar	cop	resfin	
2 conbar	cop	resacc	socres
2 conbar	frb		
2 conbar	infohs	phys	
2 conbar	infoosf		
2 conbar	knowgen	phys	
2 conbar	knowgen	resacc	
2 conbar	norbel		
2 conbar	resacc	resfin	cop
2 conbar	resacc	socres	
2 conbar	restime		
2 conbar	socint		
2 conext	attbeh		
2 conext	frb		
2 conext	resacc	attbeh	
2 conext	resacc		
2 conext	socsup		
2 conext	sscur		
2 conext	subnor		
2 conint	cop	attbeh	
2 conint	cop	knowgen	
2 conint	infoosf	resacc	
2 conint	knowgen	phys	
2 conint	phys	attbeh	
2 conint	phys		
2 conint	resacc		
2 conint	socint		
2 cop	attbeh		

2 cop	fs	resacc	
2 cop	infoosf	attbeh	
2 cop	knowgen	phys	
2 em	attbeh		
2 frb	attbeh		
2 frb	resacc		
2 frb	resacc	attbeh	
2 frb	resfin		
2 infohs	ssprev		
2 infoosf	attbeh		
2 infoosf	norbel		
2 infoosf	resacc	resfin	
2 knowgen	phys		
2 knowgen	resacc	resfin	
2 knowgen	resacc		
2 resacc	conext	frb	
2 resacc	conext	socsup	
2 resacc	conint	knowgen	
2 resacc	resfin	socres	
2 resacc	resfin	socsup	att
2 resacc	resfin		
2 resacc	socint	attbeh	
2 resacc	socsup	attbeh	
2 resfin	attbeh		
2 resfin	frb	socsup	
2 socint	socres	attbeh	
2 socint	socsup		
2 socsup	ssprev		
1 behbel	conbar	conext	
1 behbel	conbar	conext	frb
1 behbel	conbar	conint	
1 behbel	conbar	conint	frb
1 behbel	conbar	conint	phys
1 behbel	conbar	cop	resacc
1 behbel	conbar	fs	
1 behbel	conbar	knowgen	attbeh
1 behbel	conbar	knowgen	resacc
1 behbel	conbar	phys	attbeh
1 behbel	conbar	resacc	resfin
1 behbel	conbar	resacc	subnor
1 behbel	conbar	resfin	
1 behbel	conbar	sscur	
1 behbel	conext	conint	sscur
1 behbel	conext	conint	frb
1 behbel	conext	conint	phys
1 behbel	conext	conint	infohs
1 behbel	conext	conint	knowgen

1 behbel	conext	phys	attbeh
1 behbel	conext	phys	
1 behbel	conext	resfin	
1 behbel	conext	socsup	
1 behbel	conext	sscur	
1 behbel	conint	cop	knowgen
1 behbel	conint	frb	knowgen
1 behbel	conint	frb	
1 behbel	conint	fs	
1 behbel	conint	infohs	norbel
1 behbel	conint	infoosf	
1 behbel	conint	knowgen	phys
1 behbel	conint	knowgen	infowf
1 behbel	conint	phys	attbeh
1 behbel	conint	socint	attbeh
1 behbel	conint	subnor	
1 behbel	cop	attbeh	
1 behbel	cop	knowgen	resacc
1 behbel	cop	phys	socres
1 behbel	cop	resacc	attbeh
1 behbel	cop	socint	
1 behbel	frb	fs	
1 behbel	frb	resacc	attbeh
1 behbel	frb	socint	attbeh
1 behbel	frb	subnor	
1 behbel	fs	phys	
1 behbel	fs	resacc	
1 behbel	fs	resacc	restime
1 behbel	fs	resacc	attbeh
1 behbel	fs	resacc	socres
1 behbel	infoosf	attbeh	
1 behbel	infoosf	knowgen	
1 behbel	infoosf	norbel	
1 behbel	infoosf		
1 behbel	knowgen	attbeh	
1 behbel	knowgen	fs	
1 behbel	knowgen	phys	attbeh
1 behbel	knowgen	socint	
1 behbel	knowgen		
1 behbel	knowgen	resfin	
1 behbel	knowhs	ssprev	sscur
1 behbel	phys	norbel	
1 behbel	phys	resacc	attbeh
1 behbel	phys	resfin	
1 behbel	phys	restime	
1 behbel	resacc	socres	attbeh
1 behbel	resacc	socres	

1 behbel	resacc	socsup	attbeh
1 behbel	resfin	attbeh	
1 behbel	resfin	socint	
1 behbel	socres		
1 conbar	conext	conint	cop
1 conbar	conext	cop	socres
1 conbar	conext	cop	knowgen
1 conbar	conext	frb	resfin
1 conbar	conext	resacc	attbeh
1 conbar	conint	attbeh	
1 conbar	conint	cop	infohs
1 conbar	conint	phys	
1 conbar	conint	resfin	
1 conbar	conint	subnor	
1 conbar	cop	attbeh	
1 conbar	cop	knowgen	infoosf
1 conbar	cop	knowgen	
1 conbar	cop	phys	
1 conbar	cop	resacc	socint
1 conbar	cop	socint	
1 conbar	cop	socsup	
1 conbar	cop		
1 conbar	cop	knowgen	
1 conbar	frb	infoosf	
1 conbar	infohs	attbeh	
1 conbar	infohs	norbel	
1 conbar	infoosf	resacc	
1 conbar	knowgen	attbeh	
1 conbar	knowhs		
1 conbar	norbel	attbeh	
1 conbar	norbel	ssprev	attbeh
1 conbar	phys	attbeh	
1 conbar	phys	conint	cop
1 conbar	phys	cop	sscur
1 conbar	resacc	attbeh	
1 conbar	resacc	socres	
1 conbar	resfin	attbeh	
1 conbar	resfin	socint	
1 conbar	resfin		
1 conbar	resfinn	resacc	attbeh
1 conbar	socint	attbeh	
1 conbar	socint	resacc	
1 conbar	socsup		
1 conbar	subnor	attbeh	
1 conext	conint	cop	
1 conext	conint	knowgen	
1 conext	conint	phys	

1 conext	conint		
1 conext	cop	attbeh	
1 conext	cop	frb	resacc
1 conext	cop	phys	
1 conext	cop	socint	socres
1 conext	frb	resacc	
1 conext	fs	resacc	
1 conext	knowgen		
1 conext	norbel	ssprev	
1 conext	phys	resacc	
1 conext	resacc	socsup	
1 conext	resfin		
1 conext	socint		
1 conext	socsup		
1 conint	cop	infohs	
1 conint	cop	knowgen	
1 conint	cop	knowgen	attbeh
1 conint	cop	resacc	
1 conint	frb	resacc	
1 conint	fs	resacc	
1 conint	infoosf		
1 conint	knowgen	resacc	
1 conint	knowgen	resacc	resfin
1 conint	knowgen	socint	
1 conint	norbel		
1 conint	phys	socint	
1 conint	resacc	socint	
1 conint	socsup		
1 cop	attbeh		
1 cop	conext	socint	socres
1 cop	conext	socint	
1 cop	frb	socsup	
1 cop	fs	infohs	
1 cop	fs	phys	
1 cop	infohs	subnor	
1 cop	infoosf		
1 cop	knowgen	fs	
1 cop	knowhs		
1 cop	resacc	resfin	
1 cop	resacc	resfin	subnor
1 cop	resacc	resfin	
1 cop	resacc	restime	
1 cop	resacc	socint	
1 cop	resacc	socres	
1 cop	resfin		
1 cop	restime		
1 frb	resacc	resfin	



1 frb	resacc	restime	
1 frb	socsup		
1 frb	subnor		
1 fs	resacc	attbeh	
1 fs	resacc	socsup	
1 fs	resacc		
1 fs	socsup		
1 infohs	norbel	sscur	
1 infohs	norbel		
1 infohs	resacc	ssprev	
1 infoosf	knowgen	resacc	
1 infoosf	norbel		
1 infoosf	resfin	attbeh	
1 infoosf	socres	attbeh	
1 infowf	socsup		
1 knowgen	norbel	attbeh	
1 knowgen	norbel		
1 knowgen	phys	attbeh	
1 knowgen	resacc		
1 knowgen	resfin		
1 knowgen	socsup		
1 knowgen	subnor		
1 knowhs	phys	socsup	ssprev
1 norbel	sscur		
1 phys	socsup		
1 reacc	socres	attbeh	
1 resacc	conext	resfin	
1 resacc	conext	subnor	
1 resacc	conext		
1 resacc	conint		
1 resacc	frb	fs	
1 resacc	infowf	socsup	
1 resacc	knowgen		
1 resacc	resfin	frb	
1 resacc	restime		
1 resacc	socint		
1 resacc	socres	socsup	
1 resacc	socres		
1 resfin	frb		
1 resfin	socres	attbeh	
1 socint	attbeh		
1 socres	attbeh		
1 socres	resfin	attbeh	
1 socsup	sscur	ssprev	