12-2004

The Relationship between Locus of Control and Nutrition Health Status among Adult WIC Participants

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THE RELATIONSHIP BETWEEN LOCUS OF CONTROL AND NUTRITION HEALTH STATUS AMONG ADULT WIC PARTICIPANTS

by

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A Dissertation
Submitted to the
Faculty of The Graduate College
in partial fulfillment of the
requirements for the
Degree of Doctor of Public Administration
School of Public Affairs and Administration
ADVISOR: DR. PETER KOBRAK

Western Michigan University
Kalamazoo, Michigan
December 2004

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ACKNOWLEDGMENTS

I would like to express my gratitude to Dr. Peter Kobrak whose guidance and understanding as my committee chair provided invaluable encouragement and never-ending belief in my capabilities; Dr. Ronald Parsons for his discussions, suggestions and support throughout this study; and Drs. Robert Peters and Brent Smith for providing guidance and insight as committee members; Dr. Kenneth Wallston for creating and making available the Multidimensional Health Locus of Control Scale, and his generosity in providing guidance to me in the use of the scale in the study.

In addition, I wish to thank the following individuals and organizations whose support helped to bring this study to completion: Alethia Carr, WIC Division Director; Janet Hunter, WIC TEC Unit Manager; Dr. Kobra Egthedary, WIC Data Consultant; Dave Sachau, Data Specialist, Michigan Department of Information and Technology; Chris Borysewicz, WIC Student Assistant, for his tireless data entry; Gina Betcher, for her expert editing skills; the WIC State Staff; the Michigan Department of Community Health; the Office of Great Workplace Development; participating WIC Agencies; local WIC Coordinators and their staff; and participating WIC mothers.

This study would not have been possible without the financial support of Blue Cross Blue Shield of Michigan Foundation (BCBSM), Little Crow Foods of Warsaw, Indiana, Michigan Integrated Food and Farming Systems (MIFFS), and the Michigan Food and Beverage Association.

A special thanks is extended to Julie A. Lane and Nadia J. Zweiback for their love, patience and support, and to many friends and family members whose encouragement and reinforcement inspired me to keep going.

Most importantly, this project is dedicated in memory of my mother and father, whose words and wisdom provided me the strength, the heart and the character that guides my life, and who, most importantly, taught me the power of prayer: Ruth Marie Williams (1937-2000) and Theodore R. Dorsette, Sr. (1923 – 2001)

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CHAPTER I

INTRODUCTION

Statement of the Problem

Over half the deaths in the U.S. are associated with eating habits. Coronary heart disease, cancer, stroke, and diabetes are among the highest causes of death. All of these are associated with dietary patterns. It is estimated that healthier diets might prevent over $200 billion per year in medical costs and lost productivity (DHHS: Objectives for Improving Health, 2000). The dietary patterns of pregnant women, infants and children, in particular, are of critical importance, both as a reflection of the current health status of a large segment of the U.S. population and as a predictor of the health of the next generation (DHHS: Maternal, Infant, and Child Health, 2000). Poor eating habits by women during pregnancy are the major factor contributing to low birth weight babies, infant mortality and even to death of the mother from complications. Malnutrition during the fetal stage or first few years of life can cause serious physical or mental impairment, which may last a lifetime. Children with poor diets fail to develop and grow adequately, have learning disabilities and have poor performance in school. These children are at high risk for long-term health problems such as obesity, which leads to diabetes and heart disease.

WIC is the federally funded food and nutrition program designed to improve the health of low-income women, infants and children. The program has an excellent

reputation for its customer service and value among participants and supporters. WIC has also had some success in reducing the prevalence of low birth weight infants and increasing the food-purchasing power of participants (U.S. Department of Agriculture, 2000). Despite these successes, some researchers state that the nutritional quality of participants' diets has not substantially changed. Counseling, nutrition education and referrals to community resources have been largely ineffective at bringing about reduced risks associated with participants' eating behavior (Besharov and Germanis, 2000, Abussabha et al., 1999, Schiller and Fox, 1999, Contento, 1995, Labotne, 1966). Research studies, such as this one, that examine the psychosocial and nutrition values of WIC participants may help increase the effectiveness of health assessments and outcomes.

The success of the WIC program is based on the knowledge-attitudes-practice paradigm (Schiller and Fox, 1999). To impact behavior, the WIC practitioner must ask: what are the knowledge, attitudes, constraints, and motivations that relate to healthy eating and increased physical activity among participants? Ammerman, et al. (2001) of the Research Triangle Institute, for example, provide an entire volume of annotated references to 92 studies addressing issues related to the efficacy and effectiveness of interventions to modify dietary behavior. Their literature review indicates that the evidence for effective interventions is often of uneven quality, focusing in detail on certain dietary impact than others. The lack of similarity in methods makes it difficult to draw broad conclusions about the most efficacious behavioral dietary interventions (Ammerman, et. al., 2001). Taken together, these reviews suggest several generalizations about the state of our knowledge concerning the impacts of dietary interventions on WIC participants.

First, the passive learning methods used for nutrition education, such as lectures, are simply not meaningful to participants and will not make a significant impact on behavior changes (Besharov and Germanis, 2000, Abusabha, 1999, Schiller and Fox, 1999, Contento, 1995, Labonte, 1996). Second, standards for evaluating the impact of WIC services on participants' nutrition behavior are not well developed. WIC lacks tools for evaluating the effectiveness of various types of dietary interventions (Ammerman, 2001). Third, the WIC program lacks important details about participant characteristics to help impact nutrition behavior. Identifying individual needs, perceptions, motivations and desires are essential for enhancing people's quality of life (Ahijevych and Bernhard, 1994: Erikson, 1993; Hollar, 2000). Yet, few studies have assessed the psychosocial values and perceptions about nutrition of WIC participants. Such knowledge may help guide WIC services for more meaningful outcomes of clients' behavior and well-being.

Purpose of the Study

The purpose of this study is to examine the relationship between locus of control orientation and the nutrition health status of adult participants in the Michigan WIC Program. The locus of control variable is defined as the degree to which an individual perceives reinforcement or outcomes as contingent upon his or her own behavior. It ranges from internal to external. Internal locus of control is the individual's belief that she is an actor and can determine one's fate within limits. External locus of control is the person's belief that she is controlled by forces outside of one's self (Lefcourt, 1976; Koger, 1999). The locus of control variable is measured by the participant's score on the Multidimensional Health Locus of Control (MHLC) Scales. MHLC is a self-report

questionnaire, which measures participant's beliefs regarding control outcomes. The examination of locus of control is important to this study because locus of control influences behavior. According to social learning theory, WIC clients who have an internal locus of control are more likely to change their nutrition behavior, have better health status and, therefore, have better quality of life.

Nutrition health status reflects the eating patterns, health history, anthropometric and biochemical measurements of WIC participants. Nutrition health status is generally assessed by examining one's eating patterns, biochemical level (usually blood iron), anthropometric measurements (body-mass index using height, weight, and age), and physical appearance. The assessment identifies a nutrition risk as a detrimental or abnormal nutritional condition such as anemia, underweight or overweight. The demographic variables to be statistically controlled for in this study are: age, race, income, education level, geographic region and family size.

Research Questions

The central research question in examining locus of control and nutrition health status is: Do WIC participants with an internal locus of control have better nutrition health statuses than those with an external locus of control? In order to answer this question it is necessary to ask the following descriptive and multivariate questions:

1) What percentage of adult WIC participants are internally oriented and externally oriented?
2) What percentage of adult WIC participants has internal orientations and what percentage has external orientations towards weight?
3) What are the demographic characteristics of internally and externally oriented

participants?

4) What are the characteristics of participants who show up for their nutrition education appointments?
5) What are the health statuses of internally and externally oriented participants?
6) Does health locus of control relate to nutrition health status among adult WIC participants?
7) Does weight locus of control relate to health locus of control?
8) Does weight locus of control relate to nutrition health status?

Hypotheses

The following two hypotheses are formulated for this research. Each of the hypotheses describes an expected outcome regarding the study's results.

H_1: Locus of control orientation is related to nutrition health status.

H_2: The majority of WIC participants who are at nutritional high risk will have a general external locus of control.

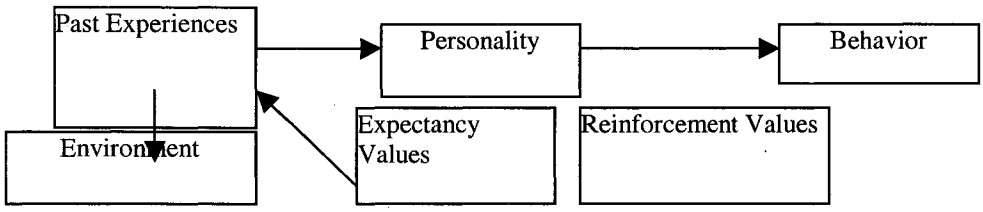
Theoretical Perspective

The overall framework for studying the relationship between locus of control orientation and nutrition health status is grounded in social learning theory (Rotter, 1954, 1966; Rotter, Chance, and Phares, 1972). Social learning theory was developed by Rotter in 1954 and has been used to study several aspects of human behavior in areas of criminology, mental and physical health, academia and general education, ethnic and environmental influences, etc.

Social learning theory indicates that human behavior is the result of continuous (reciprocal) interaction between an individual's thinking, past experiences, and

environment (Rotter, 1954; Bandura, 1977; Crutchfield, 1986; Koger, 1999). Individuals classified as internally oriented believe that the results of circumstances are due to their own behavior, while externals believe that results depend on luck, fate, or other individuals in power. Figure 1 illustrates Rotter's social learning theory (Koger, 1999).

Figure 1: Social Learning Theory



Source: Koger, D. "The influence of a home visitation, parent education program on locus of control and parenting behaviors of limited resource mothers." 1999.

Application to this Study

In this study, social learning theory serves as a means to better understand ways in which locus of control influence eating behavior. Within the context of nutrition, the social learning model offers a useful framework for determining how WIC adult participants make health-related behavioral decisions that shape their lives and the lives of their children. According to social learning theory, WIC clients who have an internal locus of control are more likely to change their nutrition behavior, have better health status and, therefore, have better quality of life.

Definition of Terms

Anthropometric Risk: is measured by the participants calculated BMI (body mass index) for age. Iron level is measured by a blood draw and Hematocrit reading. BMI and iron level calculations, which are out of normal range, will result in an assessment code of "high risk" for the participant's nutrition health status. Any untreated or

on-going nutrition related illness or condition might also result in an assessment code of "high risk" for the participant. Anthropometric risks are designated by the 100 series code.

Biochemical Risk: Participants with low iron levels will be measured as follows: Breastfeeding women with a hemoglobin < 12.0; Pregnant women with a hemoglobin < 10.5, designated by risk code 201.

Dietary Risk: When eating practices are determined to be inadequate a participant receives a risk code of 400, 401, or 425.

Family Size: The total number of people living in the participant's household.

Clinical/Health/Medical History: In WIC, clinic/medical/health history is determined by a brief questionnaire that adult participants complete regarding general health and nutrition-related health. The questionnaire is screened by a competent professional health authority (CPA).

Locus of Control Orientation: Locus of control, which ranges from internal to external, refers to the degree to which an individual perceives reinforcement as contingent upon his or her own behavior. Internal locus of control is the individual's belief that he or she is an actor and can determine his/her fate within limits. External locus of control is the person's belief that he or she is controlled by forces outside of him or herself (Koger, 1999; Lecourt, 1976). The health locus of control construct is measured by the participant's score on the Multidimensional Health Locus of Control Scale (MHLC), a self report questionnaire which measures participant's attitudes regarding the extent to which they are able to control their own fate within limits.

Nutrition (Eating) Behavior: Nutrition behaviors are the eating habits and practices utilized by WIC mothers for themselves and their children. It is an intervening variable that is implied based on the social learning theory and health locus of control construct that health status is a result of nutrition (eating) behavior.

Nutrition Health Status: WIC participants with one or more nutrition risk codes with have a plus (+) sign are classified as at "high risk" by the MDCH WIC Division.

Women, Infants and Children (WIC): A federally funded program for limited resource mothers who are pregnant or parenting young children that provides supplemental food packages and nutrition education at community-based clinics.

Delimitations and Limitations of the Study

Several limitations of this study exist. One limitation is that time constraints and costs do not allow for a non-WIC equivalent comparison group. A second limitation is that the study only focuses on adult WIC participants in Michigan and therefore may not be generalizable to WIC participants living outside the state of Michigan. A third limitation is that not all of the variables that may impact nutrition behavior will be tested. Such a task is beyond the feasibility of this study. Fourth, relatively little literature focusing on nutrition and locus of control exists. This problem hinders comparison analysis, and the use of proven or tested studies on nutrition and locus of control. Fifth, the study uses a "one-shot" data collection methodology that indicates the respondents' judgments and feelings at a single moment, rather than over time.

Significance of the Study

This research study will contribute to the literature by adding a dimension to the health locus of control research that focuses on nutrition-related health behaviors. A better understanding of the links among locus of control and nutritional health status will contribute to improved designs of nutrition education programs. Knowing about participants' locus of control orientation will provide insight into how, from their perspectives, WIC services can be empowering processes that improve their quality of life (Wallston and Wallston, 1978; Perkins and Zimmerman, 1995; Abusabha, 1999). This research will help strengthen WIC's policy on nutrition assessment. Practitioners will not only identify eating patterns that are associated with diet quality, but will and link these to the psychological, socioeconomic and lifestyle characteristics of WIC participants. This knowledge also shed light on the costs and benefits of food choices and how different demographic groups discount the long-term benefits of healthier diets.

The results of this study will help WIC staff provide the best method of nutrition education for the participant. Based on the participant's locus of control status, the practitioner may provide face-to face individual contact, face-to-face group contact, or independent nutrition education, via the Internet or community-based resources. In the broader context of public administration, findings from this study and changes in service delivery will contribute to policy planning, effective service delivery, effective outcomes, and efficient use of resources.

CHAPTER II

BACKGROUND

The Michigan WIC Program

WIC is a federally funded nutrition assistance program designed to improve the health of lower income pregnant, breastfeeding and postpartum women, infants, and children up to age 5, who are nutritionally at risk for health-related problems. WIC provides participants with nutritious supplemental foods, nutrition education, and referrals to health care services. It was established in 1972 by Public Law 92-433 as an amendment to the Child Nutrition Act of 1966 with an initial appropriation of $40 million. Detroit was one of the earliest sites. The USDA's Food and Nutrition Service (FNS) Division administers WIC through federal grants to state agencies. In 1976, Congress formally authorized the WIC Program and by 1980, it had an annual budget of over $700 million. Between 1980 and 1988, the WIC program doubled in size to nearly $2 billion nationally and more than $60 million in Michigan. In 1999, Congress appropriated $3.9 billion for the WIC program, which is expected to serve about 7.4 million participants in an average month (GAO Report, August 1999, p.14).

In Michigan, the WIC program is administered by the Department of Community Health, WIC Division. Its current annual budget exceeds $149 million. There are 49 contracted local agencies operating 242 local clinics (36 of which are local health

departments). The average annual participation rate statewide is 217,045. About 50 percent of the babies born in Michigan are serviced by WIC. The average monthly food cost in dollars paid to local retailers/vendors is $1,077,569 statewide.

Michigan WIC Services and Benefits

An individual wishing to apply to the WIC program schedules an appointment at the local county WIC clinic. During the appointment, the applicant is assessed on three factors: categorical eligibility, income eligibility, and nutritional risk.

Categorical eligibility includes infants up to one year-old, children aged one through four years, women who are pregnant or have delivered within six weeks; breastfeeding women within one year postpartum, or women within 6 months postpartum if not breastfeeding. WIC income eligibility is set at 185 percent of poverty. Each WIC applicant must be determined to be at nutritional risk based on a medical and nutritional assessment by a competent professional authority such as a physician, nutritionist, nurse, or other health professional or paraprofessional. Dietary and health history questionnaires are administered, and anthropometric characteristics (height and weight for children and adults, length and head circumference for infants and children under 24 months) are measured. A BMI (body, mass index) score is calculated based on the participant's height, weight and age. Finally, with the exception of infants under six months, a biochemical test (blood iron) is administered. Together all of these data are used by the nutrition counselor to assess nutrition status.

Food coupons are then distributed to participants (usually in 3-month intervals) to provide specific nutrients (protein, iron, calcium, and vitamins A and C) known to be lacking in the diets of target populations. Different food packages are designed for the

different categories of eligibility. Participants are offered at least two nutrition education sessions during each 6-month certification period. These sessions may be one-on-one, group sessions, or use a variety of other formats.

Nutrition education and counseling play crucial roles in the WIC Program and are viewed as essential benefits directed toward achieving positive changes in participant knowledge, attitude, and behavior about food consumption. Participants also receive assistance with obtaining and using preventive health care services either on-site or through referrals (U. S. Department of Agriculture, 1996).

WIC Goals

WIC tries to counteract the negative effects of poverty on prenatal and pediatric health, and provide direct nutritional supplementation, nutrition education and counseling, along with access to health care and social service providers for program participants (U.S. Department of Agriculture, 1996). It has three primary goals: to provide good health care during critical times of growth and development, to prevent health problems, and to improve the health status of women, infants and children.

The program is designed so that the provider provides the following: (1) nutritious food to the client to increase nutrient intake, (2) health examinations to catch deficiencies early on, (3) nutrition education to give the client the knowledge and skills to maintain a nutritious diet and (4) referrals to other health services to address additional well-being needs.

CHAPTER III

LITERATURE REVIEW

This chapter presents a review of the empirical literature pertaining to this research. It shares the results of studies that deal with themes related to this study and relates this study to the larger dialogue in the literature.

Support for the Research

"Scientific research increasingly confirms that what we eat may have a significant impact on our health, quality of life, and longevity (Frazao, 1998, p.5)." Research shows that in the U.S., 14% of all deaths are probably unnecessary since a significant proportion of these is attributed to poor diets and sedentary lifestyles (McGinnis and Foege, 1993). In her estimate of the medical costs and lost productivity associated with dietary patterns, Frazao calculated the estimated economic benefits that might derive from improved diets to be at least $70.9 billion (Frazao, 1998). However, Frazao writes, in spite of efforts by public and private agencies to educate consumers on how to achieve better, healthier diets, continued and improved efforts are needed to further inform, educate, and motivate consumers to change their eating habits.

Nutrition behavior is determined by a number of factors such as one's socioeconomic status, cultural practices, and geographic location. WIC (like other behavior-based health programs such as sexual abstinence, smoking cessation and

substance abuse treatment) relies on education as an intervention for preventing or reducing risky behaviors that can lead to detrimental health outcomes. Studies show that more education is directly related to better life circumstances and life expectancy; therefore, prevention education related to nutrition theoretically makes sense according to the knowledge-attitudes-behavior paradigm (Schiller and Fox, 1998). The KAB (Knowledge-Attitudes-Behavior) theory states that knowledge affects attitudes and attitudes affect behavior, or in terms of nutrition, increases in knowledge about the role of food on health affect positive attitude which leads to more frequently targeted eating behaviors (Baranowski, 1997).

To reach its goals, utilizing this model, two important exchanges must happen effectively in WIC: 1) the provider must meet the needs of the participant and 2) the participant must make decisions and take action toward change. The WIC nutrition educator must assess participants' understanding of the information being communicated, determine whether or not there are barriers that might affect the participant's ability to adopt a recommended behavior, and assess the participant's willingness to make the behavior change (Schiller and Fox, 1998). In addition, the clients must still perceive themselves to be susceptible to an illness related to poor diet, believe that poor diet has serious consequences and believe that taking preventive action (eating more fruits and vegetables) will improve either their current health status or increase their odds for better health outcomes in later years (AbuSabha and Achterberg, 1997).

Provided this happens effectively, the success of WIC still depends on the client's decision to change her health behavior. However, nutrition education in WIC has historically followed a "top-down" didactic approach (Brikett et al., 2004). Participants

said that this type of instruction, which uses very little open discussion, discouraged them from returning to WIC for nutrition education. They expressed an interest in a more interactive approach and new themes for WIC education. Preferred methods of nutrition education give emphasis to the need for individualized, culturally competent health services. However, Schiller and Fox (1998) found that staff in four of six WIC clinics assigned rather than negotiated goals for behavior change in either group or individual settings.

What participants believe about their health is important because effective "behavior change" programs are based on the needs, perceptions, motivations, environmental influences and desires of the target audience (Contento, 1995; Baranowski, 1997; Schiller and Fox, 1999). In 1995, Contento and others reviewed 217 nutrition education programs to determine if the nutrition education worked and if so, what were the success elements across interventions and what were the implications for program implementation, policy, research and demonstrations? The researchers found that nutrition education does improve dietary practices, when behavior change is the goal and the educational strategies are designed with that as the purpose. This approach differs from interventions that disseminate 'how-to' information with the expectation that such information will result in changes in attitudes and behavior, thus misapplying the KAB model. The application of the KAB model uses motivational knowledge, which is about the potential positive or negative consequences of behaviors.

Brikett et al. (2004) studied WIC clients to identify potential motivators and barriers to changing behaviors and found that most frequently discussed motivators were responsibility and health. Parents who identified these issues as their own health

concerns were especially aware of helping their children maintain good health. Barriers were identified as lack of knowledge or lack of support from partners and family members and lack of resources such as time and money. "Participants of the study said their children learn unhealthy behaviors habits from parents and other caregivers such as grandparents, fathers and child-care workers, as well as from television, advertising, and peer pressure.

Contento (1995) found that the more successful programs were those that: 1) set behavior change as a goal; 2) incorporated communications that were motivating, 3) taught strategies for behavior change, 4) included active involvement of both the individual and the community, and 5) attempted to build health-enhancing environments. While there is no single best approach to nutrition education (Kendall, A. et al., 2001), the most successful programs are client centered, incorporate formative research, and provide feedback mechanisms.

Still, the problem with programs based on prevention education (and the KAB model) is that successful outcomes are difficult to measure and those studies that do show a link between knowledge, attitude and behavior change account for very little of the variation in that behavior change (Baranowski, 1997); therefore the idea that knowledge leads to attitude change to behavior change may not correct the problem (Contento, 1995). Often what is missed in prevention education is the connection between values, attitudes and beliefs clients have about their own health.

Many studies have attempted to examine the psychosocial influences of participants' eating behaviors and whether or not WIC benefits have made a significant difference. Relatively few, though, have related perceived health value to other health-

related behavior models (AbuSabha and Achterberg, 1997), in order to empower WIC families to improve short-and-long term health through sustainable changes based on the needs and interests of each family.

Significant Prior Research

Research on Nutrition Education and Behavior Change in WIC

Several studies of the WIC program have resulted in findings of varying degrees of success (AbuSabha and Acheterberg, 1997, AbuSabha et al.,1999; Bonham and Hembroff, 2000; Brien and Swann, 1997; Burkhead et. al., 1995; Caan et. al., 1987; Devaney, 1990-1997; Fox et. al., 1999; Gordon and Nelson, 1995; Institute of Medicine, 1996; Ku, 1999; Oliveria and Gunderson, 2000; Puma et. al., 1992; Randall et. al., 1998; Rose et. al., 1988; Schiller and Fox, 1998, 1999; Schramm, 1986; Schwartz et. al., 1992; U.S. Department of Agriculture, 1997-1999; U.S. General Accounting Office, 1999). Some of these studies show that WIC has been a successful and cost-effective program in terms of dollars saved, reduced cases of low birth weight infants, increased nutrition education for children and overall satisfaction with WIC services. For example, recent evaluation research shows that for every $1 WIC spent on pregnant women, $3.13 is saved in Medicaid costs.

Pregnant women in WIC have benefited also from increased birth weight, less chance of a preterm birth, and a longer gestational period (Fraker, T., S.K. Long, and C.E. Post, 1990). Children in WIC experience increased nutrient intake of iron, vitamin B6, and foliate (Olivera and Gundersen, 2000). In exploring the factors that may affect mothers' continued participation in WIC, overall responses indicated a high satisfaction

with WIC services and a high value placed on these services (Bonham, 2000; Schiller and Fox, 1998).

Hamilton, C., Schiller, R. and Boyne, L. (1994) studied nutrition-related attitudes and practices of WIC mothers and found positive perceptions and favorable nutrition attitudes and practices among WIC participants. Most participants understood WIC to be more than "free food" and considered WIC to be a source of nutrition information and other health care services. Most participants stated that nutrition education is valuable because it helps improve health care use, health-related practices, and health knowledge. Many expressed a desire to learn more about nutrition. Data from the study suggests that over time, WIC recipients are making behavioral changes in line with sound nutrition attitudes and practices advocated by WIC dietitians. Facilitated group discussion (FGD) has been found to be more effective than conventional nutrition education lectures and accomplishes as much as other educational efforts. These participant-centered, interactive forms of education where learners share their problems, knowledge, and experience with other group members through discussion, may contribute more in the areas of rapport with clients, meeting the clients' perceived needs, and stimulation for educators. The basis for the FGD technique is a 'bottom-up' approach in which the educator becomes the facilitator, encouraging participants to discuss problems freely and answer each others' questions to the fullest extent possible. In FGD, nutrition educators move from a directive leadership style to a supportive leadership style, but correct misinformation as needed, and guide the discussion process and outcomes (Achterberg, et al., 1999).

Other studies, however, show that WIC is less successful in helping to prevent health problems through changed behaviors (Abusabha et. al., 1999; Schiller and Fox, 1999, Contento, 1995). A review of WIC's nutrition education programs suggests that these programs were not very effective in bringing about behavioral change. Even in the Hamilton, Schiller, Boyne study (1994), a majority of WIC participants reported that they did not attend WIC nutrition classes. Dietitians may wish to examine the value of revising their schedules, class content, and teaching methods to better accommodate the needs of this group. Doyle (1996) states that people need to participate and agree in finding the solutions to their problems; otherwise, implementation is usually halfhearted and likely to fail.

In her article on empowerment through nutrition education, Rusness (1993) stated that nutrition education is ineffective when it does not address the root problems of poverty and powerlessness. Besharov and Germanis (2000) also feel that the WIC program could be more effective by motivating behavior change and becoming more relevant to participants' needs. They state that behavior change largely does not occur because WIC mothers lack meaningful incentives and that perhaps behavior-change requirements tied to food benefit issuance would have a greater impact on positive behavior change. Contrary to other research findings and recommendations, Besharov and Germanis suggest more directive counseling which would require mothers and caregivers to attend life skills training and parenting classes as a condition of receiving their food benefits.

According to Abusabha et al, 1999, nutrition knowledge is only one part of the decision-making process. They too feel that alone, it will not institute sustained dietary

change. Clients who gain stronger commitments to taking control of their lives feel empowered and are more likely to make positive behavior changes. WIC clients who make informed decisions about their diet are empowered to take control of their eating habits (Abusabha, Peacock and Achterberg, 1999).

Additional research shows that all too often behavior change models do not factor in environmental influences. Such factors can have a significant impact on the effectiveness of interventions and must be explained and emphasized for effective interventions to occur. For example, LeCuyer-Maus studied factors related to stress and coping in high-risk mothers and their effect on parenting. Different sources of stress such as poverty and unemployment, negative life-events, marital discord, isolation, anxiety and depression, alcohol and drug abuse, daily hassles, and single parenthood all disrupt or alter parenting and account for 74% of the variance in mothers' responsiveness to their children (2003). Scheule et al. (2004) conducted a study to identify and assess opportunities and challenges for food safety education in WIC and similarly found that the educational level of WIC participants and the lack of basic necessities such as transportation, refrigeration, electricity, and cash for the costs of thermometers are barriers to good food safety practices.

The expectation that WIC participants will improve their diets relies heavily on the participant to take some action in assisting in her own health care, which requires a certain level of personal efficacy (Bandura, 1977). Although the concept of empowerment is not new to nutrition education and other public programs, what is new is the idea that the way to make it happen in practice may lay with interventions that affect locus of control.

Research on Health Locus of Control

Wallston concluded that "the positive and negative consequences of seeking and gaining control over life events have been systematically studied by psychologists since the late 1960s." Substantial literature exists supporting the importance of health-related control beliefs to both physical and psychological adjustment. Those who believe that there are ways of exercising control over their illness or related circumstances have more positive psychological and physical adaptation than those who do not. Bennett (1997) reported that a number of studies have examined the relationship between health locus of control and the performance of health-related behaviors and found a positive relationship between scores on the internal dimension and health-promoting behaviors (Weiss and Larsen, 1990) or a negative relationship between scores on the chance dimension and positive health behaviors (Steptoe et al., 1994). Studies reporting on the powerful others dimension, however, have failed to produce a clear pattern of results (Normam and Bennett, 1996).

As summarized by Koger (1999), a variety of positive behaviors and personal characteristics has been associated with internal locus of control. Internally-oriented individuals are able to find and utilize information more so than their externally oriented counterparts, even when given access to the same information (Lefcourt, 1991). Moreover, internally-oriented individuals tend to have better mental health, a more positive satisfaction with life and successful behavioral changes in weight loss, smoking cessation, athletic performance and medical and substance abuse treatment programs (Lefcourt, 1982; Kopp and Ruzicka, 1993; Landau, 1995; Haworth et al, 1997). Progressive ideology toward life, optimistic views towards the future, effective problem

solving, positive outlooks, and the perception of difficult situations as being challenging are all dimensions of internal locus of control (Schaefer, 1983). Additionally, many studies have found that individuals who are internally oriented seem to excel in academics (Lefcourt, 1991).

In contrast, individuals who exhibit external locus of control behavior tend to move in the exact opposite direction than those individuals exhibiting internality. These individuals tend to have more depression, psychopathology, poor self-concept and low academic achievement (Benassi et al, 1988; Lefcourt, 1996; Goodman et al, 1994; Lee and Dengerink, 1992). While Rotter (1966) and Smith (1985) hypothesized that externally-oriented individuals use these behaviors to protect themselves from feelings of failure, remorse or blame born out of a negative experience, other investigators link externality to feelings of helplessness and self-contempt (Koger, 1999).

With substantial evidence now suggesting that internal locus of control is linked to a variety of positive behaviors and that individuals change throughout their life span, researchers are interested in two primary focuses: 1) the relationship between health locus of control and behaviors, including the ability to change one's external orientation to an internal orientation (behavior change); and 2) the development of scales to measure locus of control and specific, goal-related behaviors. In behavior-change research Pevny, V., Stillman, M. J., and Wallston, K. (1985) examined the relationship between health beliefs and health locus of control for breast self-examination among registered nurses, using the Multidimensional Health Locus of Control Scale. Yamamoto, L. (1982) studied ethnic and environmental influences on the ANSIE (Adult Nowicki-Strickland Internal-External) Locus of Control Scale. Nowicki (1979) examined health locus of control and

perceptions of health following administration and interpretation of the social readjustment rating scale. Widmann, J. C. (1977) examined the effects of therapist personality characteristics on client locus of control using Rotter's Internal-External Locus of Control Scale.

Swinney conducted a study in 2002 to describe and examine the relationships among self-esteem, locus of control, and perceived health status in African Americans with cancer and to identify predictors of perceived health. Her hypothesis that a positive relationship exists between self-esteem and internal health locus of control (IHLC) was not supported; however a significant relationship was found between self-esteem and perceived health status. African Americans with higher levels of self-esteem tended not to express a strong belief in the influence of chance upon their lives, but instead expressed a strong belief in God as the Powerful Other. Other researchers have also found that African Americans voice their faith in God in relation to their health (scales related to God Locus of Control are discussed later in this chapter).

In the African American community, religion and health beliefs are often linked. In their study examining the relationship of health-promoting lifestyle practices between nursing and non-nursing students, Schank and Lawerence (1993) studied the lifestyles of 76 female students between the ages of 19 and 45. Half of the women were nurse majors and half were non-nursing majors. Findings revealed a significant difference between nursing and non-nursing respondents in that the nurse population had healthier lifestyles than the non-nurse population. Additionally, no relationship was found between health locus of control and lifestyle practices.

Successful changes in locus of control have been documented by a number of investigators utilizing various forms of intervention (Braton, 1981; Newsome and Foxworth, 1980; Roueche and Mink, 1976; Tait, 1976). For example, Koger (1999) examined the locus of control variable within the context of parent education and parenting behaviors using participants of a home visitation, parent education program (BSF) as the treatment group and WIC participants as the comparison group. Data was collected on a pretest-posttest basis using the Adult Nowicki-Strickland Internal-External Control Scale (ANSIE). Koger found that mothers who completed the BSF program experienced statistically significant differences toward more internal locus of control orientations following the program, while women in the comparison group, WIC, reported no changes. This difference may be due to the average hours of contact of a home visitation program and the setting in which the intervention takes place. A weekly home visitation program over a twelve-week period such as BSF allows the practitioner to observe the psychosocial factors influencing the client's behavior and allows more contact time with the client to influence their values and perceptions. In contrast, the WIC program, which takes place in a clinical setting, only averages about 1½ hours of contact with the client within a 6-month period, which leaves little time for influence. This study differs from the Koger study in that participants' current locus of control orientation is examined and compared to their nutrition health status as assessed by nutrition professionals within WIC. By assessing client's locus of control, the WIC nutrition consultant may be able to divide her time appropriately, spending more with nutritionally high risk clients and less time with low risk clients.

Kist-Kline and Lipnickey (1989) indicated that in general, health professionals prefer persons to be more internal in order to encourage more positive behaviors. However, in certain situations a combination of internal and external may allow persons to believe they can take action to control outcomes, and yet being amenable to suggestions of health care providers may be a desirable coping response (Deaton and Olbrisch, 1981; Forsyth, 1981; Balsmeyer, 1984). Green (2004) found similar results when she examined the impact of locus of control over matters of health and health care within the context of mothering a child with a disability. Findings support that belief in chance, in combination with internality, are positively associated with well-being, both in terms of increased social support and decreased subjective burden.

For some people, a realistic belief in the influence of external factors based on life experience (such as God) can enhance, rather than detract from, feelings of well being (Wong and Sproule, 1984). Green states that such belief may be particularly important to individuals with very high internality because they risk blaming themselves exclusively for a loss that is at least partially out of their control. Therefore, Green suggests, care should be taken in viewing lack of internality as a personal failing, which needs to be corrected by moving people from externality to internality in order to enhance well-being.

In Measures of Personality and Social Psychological Attitudes, Lefcourt (1991) reviewed 16 scales developed to measure locus of control. Five of the scales pertained to health-related behaviors, including the Multidimensional Health Locus of Control Scales (Wallston at al, 1978) and the goal-specific Weight Locus of Control Scale (Saltzer, 1981, 1982). Other goal-specific health locus of control scales measures include heart disease, labor and childbirth, children's recovery from illness, sexual functioning, mental

health, the study of health among the elderly, and children health locus of control, all developed between 1972 and 1982. More recently, Ozment and Lester (2001) developed a 12-item scale (with 6 externally-worded items and 6 internally-worded items) to measure feelings of helplessness from external forces and from one's own deficiencies. In 1996, an initial effort was made to expand the MHLC to include a construct termed "God control" (Welton, Adkins, Ingle and Dixon, 1996); findings predicted general health habits in one of the two undergraduate samples but were unrelated to the other.

In 1999, Wallston, et al. introduced the God Locus of Health Control (GLHC) scale to assess religiously-based health control beliefs, or the extent of belief that God has control over one's current disease state. These belief statements were met with slight or moderate disagreement and were not associated with internality. Holt, et al., in 2003, developed a scale to measure spiritual health locus of control beliefs and to examine the relationship between this construct, breast cancer beliefs and mammography screening among African American women. The results provided support for a two-dimensional model of spiritual health locus of control beliefs that God empowers individuals to take care of themselves (active spiritual health locus of control) and that a higher power is in control of health (passive spiritual health locus of control). Both active and passive spiritual health locus of control beliefs were positively associated with internality.

Research on Locus of Control and Nutrition Health Status

While there is considerable evidence in the literature that suggests there may be a significant relationship between locus of control orientations and specific health outcomes, conflicting results have emerged. Studies that focus on nutrition behaviors and locus of control have had similar results and have mainly been applied to weight loss and

obesity. Other studies have also examined dietary behavior with mixed results. Saturnio-Springer et al. (1994) for example, examined the relationship of nutrition locus of control to dietary behavior during pregnancy in 943 pregnant women and found a positive correlation between dietary behavior and internal locus of control. Pregnant women who scored high on the internal nutrition locus of control scale ate more fruits, vegetables, and breads and ate less meat, than women scoring lower. In addition, higher internality was associated with higher intakes of certain vitamins and minerals, such as vitamin A and calcium.

In her 1980 dissertation, Bonds examined the relationship between self-concept, locus of control and patterns of eating, exercise, and social participation in older adults. Other closely related research studies have focused on the relationship between locus of control and body weight (Saltzer, 1981; 1982; Casey, 1994; Kendel, N., 2001). For example, Kendell, A., et al (2001) evaluated psychosocial measures for understanding weight-related behaviors in pregnant women. Locus of control, self-efficacy, body image, feelings about motherhood, and career orientation were the constructs measured among 622 pregnant women in a rural health care system. Existing scales were used and an interview questionnaire was developed. The scale scores were strongly associated with lifestyle behaviors, body weight, and demographic characteristics of the participants. The analysis provides evidence of the validity of measures of psychosocial factors when they are related to health behaviors of pregnant women.

Not all nutrition-related studies, however, have found a relationship between dietary behavior and locus of control (AbuSabha and Acterberg, 1997). A few studies have examined locus of control in patients with hypertension, patients with diabetes,

patients undergoing long-term dialysis, and patients consuming cholesterol-lowering diets with mixed results. More often than not, past research involved locus of control alone (not in conjunction with other measures); and when used alone, its effect on behavior is small. Health value, for example, interacts with locus of control, particularly in persons who have a high internal health locus of control (AbuSabha and Acterberg, 1997). Several studies have found that persons with a high internal locus of control who also place a high value on their health are more likely to engage in health-protective behaviors. Studies that have examined this interaction have generally produced positive results (Lau and Ware, 1981; Bennett et al., 1990; Wallston and Smith; 1994).

Health Locus of Control, Stages of Change Theory and Nutrition Health

More recently WIC has begun to implement Prochaska's Stages of Change model for nutrition counseling (Story, Holt, Sofka, 2000). The model shows that change occurs gradually and that people move from an uninterested in change state (precontemplation) to considering a change (contemplation), to deciding and preparing to make a change (preparation), to actually engaging in changed behavior (action), to maintaining the behavior for at least six months (maintenance) and finally to a state when the problem behavior is eliminated (termination).

The Stages of Change model encompasses many concepts from the Health Belief model and Locus of Control. According to Zimmerman, et al. (2000) during the precontemplation stage, patients do not consider change. They may not believe that their behavior is a problem or that it will negatively affect them (Health Belief Model) or they may be resigned to their unhealthy behavior because of previous failed efforts and no longer believe that they have control (external Locus of Control). During this stage

researchers suggest practitioners engage in motivational interviewing to help patients begin thinking about change and moving to the next stage of Contemplation. With respect to nutrition, the most effective dietary behavior change program depends on helping clients build positive expectations about the results, defining the behavior to be changed, setting realistic goals, enhancing commitment from the client, prompting the desired behavior, providing positive feedback on progress and helping clients develop their own support (Andersen, J., 2002).

Summary

Social policy evaluation studies the impact of policy on how people act, think, feel and interact with one another; by definition, it is concerned with quality of life issues. When public managers effectively monitor quality of life outcomes, it provides them with tools for using their resources more efficiently and to better meet program participants' needs. This is the essence of continuous quality improvement at the organizational level (Amsden et al., 1994). From a public interest perspective, public administrators and policy makers are charged with understanding the magnitude and direction of the impact of public assistance policies and programs on participants (Hollar, 2000). Failure to study the needs, desires and wants of the groups decrease the chances of effective implementation of the policy or program and the possibility of achieving desired results. This suggests why it is important to change the paradigm used by WIC from providing information to motivating changed behaviors (Besharov and Germanis, 2000).

A person's description of what it means to have a good quality of life includes her values, perceptions and attitudes on a number of areas (education, financial security, career or job success, and personal success). These values, perceptions, and attitudes

result in behaviors that collectively comprise one's lifestyle. These elements are important in the study and practice of fields such as anthropology, economics, education, history, political science, psychology, sociology and health care administration. To develop, implement and evaluate culturally competent nutrition intervention, it is critical to assess the lifestyle behaviors of the population served (Ahijevych and Bernhard, 1994). True assessment of well-being requires more than the evaluation of economic outcomes (such as the number enrolling or leaving programs). It requires knowing about the resources of participants and their conditions of life from psychosocial perspectives (Erikson, 1993; Hollar, 2000).

CHAPTER IV

METHODS

Importance of the Research

According to the U.S. Department of Agriculture's Food Assistance and Nutrition Program (2000), effective messages and strategies for changing dietary behavior, require an understanding of the food assistance clientele's knowledge, attitudes, constraints, and motivations relating to barriers to healthy eating and increased physical activity. Therefore, priority research in the topic of food and nutrition include the need to identify factors and typologies that directly impact on health, longevity, and quality of life. Such factors include obesity, eating patterns, resources, nutrition education, and socioeconomic, demographic and psychosocial influences on behavior. Research that develops a link between diet quality and lifestyle characteristics would provide insights into the types of changes that may be more effective in improving diet quality for specific subgroups. Such research might include innovative methodologies that shed light on influences of eating behavior, the barriers to improving diet quality, effective strategies for overcoming barriers and acquisition and use of nutrition information by groups with common characteristics.

The examination of locus of control orientation is an important research study because one's overall pattern of choices of specific foods may be related to their locus of control orientation. Locus of control may explain barriers to certain behaviors, help

nutrition education to be more appropriate for the individual, and may provide a model approach to determining optimal strategies for diet improvement.

This study examines the relationship between locus of control orientation and the nutrition health status of adult WIC participants in Michigan by administering a self-report questionnaire (the Multidimensional Health Locus of Control Scales and Weight Locus of Control Scale), to WIC participants. The scales measure the participants' beliefs regarding control outcomes based on the participants' scores.

Social Learning Theory

Locus of control assessment was derived from Rotter's 1954 social learning theory. According to this theory, eating behavior should be related to nutrition locus of control orientation, which influences behavior. Rotter's 1954 social learning theory provides a foundation for understanding this relationship between personality and behavior (Rotter, 1954, 1966; Rotter, Chance, and Phares, 1972). According to social learning theory, WIC clients who have an internal locus of control are more likely to change their nutrition behavior, have better health status and, therefore, have better quality of life.

The basic assumption of social learning theory is that human behavior is the result of continuous (reciprocal) interaction between an individual's thinking, past experiences, and environment (Rotter, 1954; Bandura, 1977; Crutchfield, 1986; Koger, 1999). The role of reinforcements conveys information about the optimal response and provides incentive motivation for a given act because of the anticipated result. The theory describes how a social group or person evolves out of social conditions within which learning occurs and provides techniques of personality assessment (Mischel, 1968) and

behavior modification in clinical and education settings (Rotter, 1954; Bandura, 1977; Bower & Hilgard, 1981; Crutchfield, 1986).

Variables in Social Learning Theory

According to Rotter (1954), four variables must be considered in social learning theory: behavior potential, expectancies, reinforcement, and psychological situations. Behavior potential is the likelihood that a given behavior will occur in a given situation with regard to a single reinforcement. Expectancy is the degree of belief that a particular reinforcement will occur because of a specific behavior. Reinforcement describes the worth or importance of a particular reinforcement when the possibilities of all occur equally. The psychological situation is the situation to which the individual is responding. Rotter proposed a general formula for behavior that states the potential for a behavior to occur in any specific psychological situation is the function of the expectancy that the behavior will lead to a particular reinforcement (or reward) in that situation and there is value of that reinforcement (Rotter, 1954; Staats, 1975; Wallston et al, 1978). In other words, how one behaves in a given situation is a result of what one expects to occur as a consequence of the specific behavior and the value placed on that result (this is reinforcement), all within the context of one's environment and past experiences (Koger, 1999).

Locus of Control

In 1966, Rotter described expectancy as either internal locus of control or external locus of control. When an individual believes that reinforcements are a function of his or her own specific behavior, s/he is said to have an internal locus of control. Conversely, when the effects are attributed to luck, fate, or powerful others, s/he is said to have an

external locus of control. He suggested that people will behave differently if they feel that what happens to them is a result of their own behavior and is not controlled by chance, luck, fate, or powerful others. Perceptions of causal relationships need not be absolute positions. Rather, it may vary in degree along a continuum depending upon previous experiences and situational complexities (Rotter, 1966, Lefcourt, 1991; Koger, 1999).

Based on social learning theory, this researcher postulates that locus of control orientation is related to nutrition health status; the majority of WIC participants who are at nutritional high risk will have an external locus of control (a higher score on the MHLC scales).

Relevance to this Study

In this study, social learning theory serves as a means to better understand ways in which locus of control influence behavior. The principles of social learning theory have been applied to a wide range of social and health-related behavior such as birth control, overeating, smoking, alcohol abuse, preventive care, and mental health (MacDonald, 1970; Levenson, 1973, 1974; Strickland, 1973; Saltzer, 1981, 1982; DeVito, et al, 1982; Wallston and Wallston, 1976; Weiss, 1975).

Within the context of nutrition, the social learning theory model offers a useful framework in determining how WIC adult participants make nutrition-related behavioral decisions that shape their lives and the lives of their children. The four classes of variables identified by Rotter (1954) will be defined in this study in the following manner:

1. Healthy (low-risk) nutrition status is the desired "health" behavior.
2. Locus of control orientation is the expectancy that rewards are or are not

dependent upon specific behaviors.

3. Reinforcements are the perceived rewards for a healthy nutrition status and the value attached to these rewards.
4. Individuals' personal support networks (including WIC services) are the psychological situations that furnish many of the rewards for a healthy nutrition status.

Theoretical Hypothesis

With these specific variables, the formula for behavior which was developed by Rotter (1975) would be adapted to read: The potential for a healthy nutrition status to occur within one's personal support network is a function of his or her locus of control (internal or external) and the value placed on nutrition health (or the rewards for a healthier nutrition status). In other words, WIC adult participants with internal locus of control will show more involvement and control over their health behaviors and therefore will have healthy nutrition statuses. Certain demographic characteristics, such as age, educational level, and income may be associated with healthy nutrition behavior among WIC participants in a manner similar to that seen within other disciplines.

The following two hypotheses are formulated for this research. Each of the hypotheses describes an expected outcome regarding the study's results.

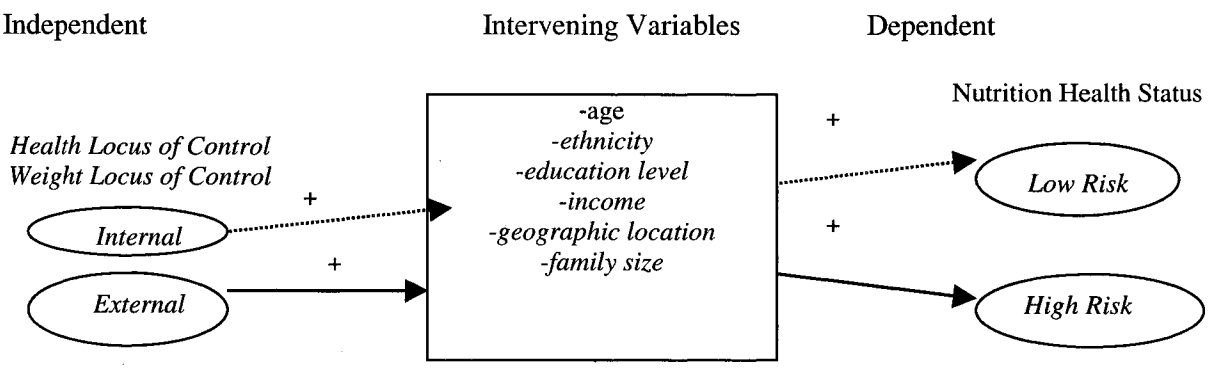
H_1: Locus of control orientation is related to nutrition health status.

H_2: The majority of WIC participants who are at nutritional high risk will have an external locus of control (a higher score on the MHLC Scales).

Variables in the Study

Figure 2 is an operational map for this study and describes the key variables within the model. The arrows among the variables of the operational map indicate influence and directionality. The first variable within the model, locus of control, serves as the independent variable of the study. The "control variables" include the following demographic variables: age, race, educational level, income, geographic location and family size. The dependent variable in this study is nutrition health status.

Figure 2: Operational Map



Following is a description of the ten variables in their entirety, indicating which specific variables are found within each type, and how they fit together in the study. The primary sources for these definitions were the Michigan MIC Policy and Procedure Manual, 2002 and Herbert Lefcourt's *"Locus of Control"* as found in the Measures of Personality and Social Psychological Attitudes, 1991.

Health Locus of Control Orientation: The degree to which an individual perceives her health status as contingent upon his or her own behavior, ranging from internal to external. Internal locus of control is the individual's belief that she is an actor in her own health outcomes. External locus of control is the person's belief that she is controlled by forces outside of herself (Lefcourt, 1976; Koger, 1999). The

locus of control variable is measured by the participant's score on the Multidimensional Health Locus of Control (MHLC) Scales. MHLC is a 27 item self-report questionnaire.

Weight Locus of Control: The degree to which an individual perceives their bodily weight status as contingent upon his or her own behavior, ranging from internal to external. Internal locus of control is the individual's belief that she is an actor in her own weight gain or loss. External locus of control is the person's belief that her weight gain or loss is controlled by forces outside of herself. The weight locus of control variable is measured by the participant's score on the Weight Locus of Control (WLOC) Scale. WLOC is a four-item self-report questionnaire composed of two internally and two externally worded items.

Nutrition or Medical Risk: The adult woman participant's individual need for WIC nutrition service benefits as assessed by a screening of anthropometric and laboratory (blood iron level) data and by review of the dietary questionnaire and health history indicating a medical and/or nutritional risk. Criteria which indicate an individual's medical and/or nutritional risk are defined by a designated code, termed a RISK CODE by the Michigan WIC Program. These risk codes are categorized in to four separate series: The 100 series indicate health risks associated with inadequate growth based on height, weight and BMI measurements. The 200 series indicate health risks that are associated with biochemical imbalance, such as low iron levels. The 300 series indicate health risks that are largely medical in nature, such as hypertension, high blood pressure, or thyroid disease. The 400 series of risk codes identify risks associate with diet patterns. All risk codes identified with a plus (+) sign indicate a HIGH

NUTRITIONAL RISK CODE, which requires the participant to be referred to a registered dietician (R.D.).

Nutrition Health Status: Nutrition health status is generally assessed by examining one's eating patterns, biochemical level (usually blood iron), anthropometric measurements (body-mass index using height, weight, and age), and physical appearance. Nutrition risk is a classification that identifies a detrimental or abnormal nutritional condition detectable by biochemical or anthropometric measurements, such as anemia, underweight, overweight, abnormal patterns of weight gain in a pregnant woman, low birth weight in an infant, or stunting in an infant or child. Nutrition health status is classified as either at risk or at high risk. A WIC participant's nutrition behavior and nutrition health status is assessed during routine certification procedures at WIC clinics using 24 hour diet recall questionnaires and anthropometric and biochemical procedures to determine BMI and iron levels. The demographic variables to be statistically controlled for in this study are: age, race, income, education level, geographic region and family size. An individuals WIC assessment report of high risk or low risk. Individuals receiving a risk code of 400, 401, or 425 are diagnosed as having poor diets, individuals receiving a risk code with a "+" sign are diagnosed as being at high risk for nutritional deficiencies. These risk codes are recorded in the WIC M-TRACX database. Table 1 provides a summary of M-TRACX data.

Age: The period of time in which an adult woman participant has been alive. The date of birth reported on the WIC Health History Form and entered in the WIC M-

TRACX database. This date will be subtracted from the date of completion on the MHLC survey to obtain the participant's age.

Ethnicity: The ethnic group with which an adult woman participant identifies. The ethnic group that the participant selects on the WIC Health History Form and entered in the WIC M-TRACX database. Racial/Ethnicity codes are:

- Asian (3)
- American Indian/Alaska Native (4)
- Black/African American (2)
- White (1)
- Native Hawaiian/ or other Pacific Islander (5)

Educational Level: The number of years that an adult woman participant has participated in formal education through a licensed institution. The number reported on the MHLC Survey as the number of grades of school completed.

Income: The dollar figure of gross annual monetary resources, which an adult participant's family acquires before deductions for income taxes, employee's social security taxes, insurance premiums, retirement plans, and wage garnishment. The total annual income for the family as reported on the WIC Income Calculation Form and entered in the WIC M-TRACX database.

Geographic Region: The city or town in which the adult woman participant resides as reported to the local WIC clinic and recorded in the WIC M-TRACX database.

Family Size: The total economic unit composed of a person or groups of persons, related or non-related, who usually (although not necessarily) live together and whose income and livening expenses are shared. The total economic unit as reported by the adult woman participant to the local WIC clinic and recorded in the WIC M-TRACX database.

Table 1. Summary of M-TRACX Data (See Appendix C for Screen Prints)

#	**Variable**	**Source in M-Tracx**	**Item on Screen**
1	Nutrition Health Status (High Risk)	Participant Inquiry Screen	Risk Categories
2	Age	Participant Inquiry Screen	Date of Birth
3	Ethnicity	Participant Inquiry Screen	Racial/Ethnicity
4	Income	Family Inquiry Screen	Income
5	Geographic Location	Family Inquiry Screen	City or Town
6	Family Size	Family Inquiry Screen	Size of Economic Unit
7	Nutrition Education Attendance	Nutrition Education History Screen	List of Nutrition Education Contacts Evaluation Code

Research Design

In this study, a point in time (cross-sectional), direct survey design is used to explore the locus of control construct and its relationship to the health statuses of Michigan WIC participants. The purpose of the survey is to generalize from a sample to the population so that inferences can be made about the characteristics, attitudes, or behaviors of the WIC participant population (Babbie, 1990; Creswell, 1994). A survey design is the preferred type of data collection procedure for this study because of the time and costs limitations. Advantages of the survey design are its cost effectiveness and rapid turn-around in data collection. It also provides the ability to identify attributes of the population from a small group of individuals (Creswell, 1994).

Research Population and Sample

The unit of analysis for this study is adult women participants in the Michigan WIC program. Currently, Michigan WIC has 256 clinics servicing approximately 48,500 low-income pregnant, breastfeeding, and non-breastfeeding women per month statewide.

The sample size 2,401 was calculated with a 95% confidence interval using z score 1.96, a maximum standard deviation of .5, and a 2% chance of error rate (see Figure 3 below). In order to reach this 2,401 target, a minimum of 20 local WIC clinics serving at least 191 participants per month will be asked to voluntarily participate in this study. This researcher will work with all clinics necessary to ensure that a representative sample participates in the study. The actual population to target will be 3,438 participants. A return rate of 70% would result in a sample size of 2407 MHLC questionnaires. This figure represents 5% of the women participants in Michigan WIC.

Figure 3. Sample Size Calculation

$$n = \frac{(1.96 \times .5)^2}{.02} = 2401$$

Data Collection Procedures

The primary data to be collected, that directly involves participants, will be obtained from the 1-page Multidimensional Health Locus of Control Scales (MHLC) questionnaire in Appendix B. Participants will be randomly selected during the data collection period in 2003. All adult women who enter WIC clinics for services during this period (i.e. certification, coupons or nutrition education) will be asked by the WIC clerk to participate in the study. The clerk will read the consent form to clients. Those women who agree to participate in the study will be asked to sign a consent for (Appendix A) and to complete the Multidimensional Health Locus of Control Scales. The participants' WIC ID# will be entered on the survey. No other identifying information will appear on the survey. The identification numbers will be kept confidential. The survey will be administered during routine client certification

procedures; nutrition education and coupon pick-up visits. Participants will complete the MHLC questionnaire themselves and hand them in to clinic staff. The clinic staff may review the questionnaire for completion with the participant's consent. The survey will then be placed in secure storage until the end of the data collection period. At the end of this period, the WIC Coordinator will mail all surveys to the researcher in care of the MDCH WIC Division. The researcher will pick up all surveys that are not returned by mail.

Of those individuals completing the survey, nutrition health status will be reviewed using existing data that WIC routinely collects to determine one's nutritional health risk. This data is currently housed in the WIC Division database system called "M-TRACX," (see the "Variables in the Study section of this chapter and Appendix C for sample data). This researcher will work with the Michigan WIC Program to obtain health status information using the participants' WIC identification numbers entered on the survey form. The scores from the MHLC questionnaires and the M-TRACX data will then be entered into a spreadsheet for data analysis. Existing demographic characteristics will also be obtained from the WIC M-TRACX system. These variables include income level, age, race, number of family members and geographic location. Education level will be obtained from the MHLC. Table 1 in the Summary section of this chapter shows the data to be collected, the type and the source.

Location

The WIC program is operated in 256 community-clinics throughout Michigan. Twenty (20) of these clinics serving at least 191 adult participants will be asked to voluntarily participate in this study. Surveys will be distributed to the Competent Professional Authority (CPA) staff person of each clinic. Participants of the study will

complete the questionnaire in the waiting areas of the WIC clinic. The CPA may review the questionnaire for completion in private with the client and with the client's consent.

Duration

The length of time for the WIC clerk to read the consent form, have the participant sign it, and provide the questionnaire is approximately 3 minutes. The length of time required of the participant to complete the questionnaire is approximately 5-10 minutes. Clinic staff will review the questionnaire for completion, only if the participant requests the review. The total time required of the participant is about 8 to 13 minutes.

Research Instruments

The dependent variable for this study is nutrition health status. Nutritional health status will be obtained from the WIC M-TRACX database as explained in the "Variables in this Study" section of this chapter. The independent variables are health locus of control orientation and weight locus of control orientation. To assess these variables, the following instruments will be used in this research: The Multidimensional Health Locus of Control Scale (MHLC), the Weight Locus of Control Scale (WLOC), two items from Wallston, Wallston, and DeVellis (1978), that tap health status, ("At the moment I am in excellent health" and "In general, I am an extremely healthy person"), and three general statements that assess desire and amount of effort to improve eating habits and health (Parsons, R., 1971). All items, except the values survey, utilize a 6-point, Likert-type format, ranging from "Strongly Disagree" (scored as one) to "Strongly Agree" (scored as six). One demographic question regarding educational level was also added to the questionnaire. For simplification, all survey items are merged into a single form in Appendix B.

The Multidimensional Health Locus of Control (MHLC) Scales

The Multidimensional Health Locus of Control Scales (MHLC) is a self-administered, self-report, pencil and paper questionnaire developed by Wallston, Wallston, and DeVellis in 1978. It assesses locus of control beliefs relevant to health on three dimensions of personal control or internality, the effectiveness of powerful others, and the role of chance in determining one's health status (Lefcourt, 1991).

The MHLC Scales has been a highly used device for the study of causal beliefs relevant to health. It represents a middle ground between highly generalized and highly specific levels of measurement (Lefcourt, 1991). The development of the MHLC Scales was based on earlier work with a general Heath Locus of Control scale, which, in turn, was based on Levenson's work, which in turn was developed from Rotter's social learning theory. Levenson (1974) demonstrated the utility of measuring three distinct dimensions of locus of control, internality, a matter of chance, or control by powerful others. This gave reason to explore this approach in predicting health behaviors utilizing health specific locus of control scales (Wallston, et al., 1978). The MHLC scales are conceptualized along multidimensional lines parrelling Levenson's work and consist of only personally worded items. Scores can be obtained on three separate theoretically and empirically differentiated dimensions (internality, chance, and powerful others). Equivalent forms of the scales are available for research designs that require repeated administrations and condition specific assessment (Wallston et. al., 1978).

Scales Description

There are 18 items requiring a rating from one (strongly disagree) to six (strongly agree). Scores for each subscale range from 6 to 36. The MHLC scales are intended for

use with adults; most persons with an eight grade reading level and no functional impairments should be capable of understanding and responding to the items. The instrument was developed through an adaptation of the Health Locus of Control Scale and Levenson's Internality, Powerful Others, and Chance Scales (Wallston, et. al., 1976, 1978) and was selected for this study due to its focus on health, suitability for noncollege adults, and construct validity and reliability.

Reliability and Validity

The scales (forms A and B) have been used extensively with different groups with specified and unspecified health problems. The norms deriving from these studies generally are as follows: for IHLC, M = 26, (SD = 5); for CHLC, M = 15, (SD = 6); and for PHLC, M = 20 (SD = 5.5). The two forms seem to produce similar normative data. As summarized by Lefcourt (1991), reliability and validity values support the use of this instrument in research studies. Several factor analyses reveal a replicable structure of three independent subscales. The subscales have Cronbach alpha values ranging between .61 and .80. When forms A and B are added to each other, alpha values increase to .83 and .87. Reported test-retest stability, with a time interval of 4-6 months, has ranged between .66 and .73. Convergent validity values compare the MHLC with Levenson's I, P, C scales and found that IHLC is positively related to Levenson's Internality Scale (r = .57) while not significantly related to the Powerful Others (r = 1.12) or Chance scales (r = -.14). CHLC was negatively related to Levenson's Internality (r = -.30) and positively related the P Scale (r - .28) next with C Scale (r = .23), and least with one (r = -.07). The PHLC, then, seems least strongly related to Levenson's scale. With respect to discriminant validity, the MHLC showed little or no relationship with social desirability, sex differences, and age.

The Weight Locus of Control Scale (Saltzer, 1982)

The Weight Locus of Control scale was developed by Eleanor Saltzer (1978) and was designed to be a more specific measure than other scales in focusing on weight-related behavior. This scale assesses the participant's perceived control over her own body weight. It too is a self-administered, paper and pencil questionnaire, with four-items composed of two internally and two externally worded item, scoring from one (strongly disagree) to six (strongly agree). The WLOC is scored in the external direction and the Likert format is reverse-scored for the internally worded items. The possible range of scores is from 4 to 24 with 4 indicating extreme internality and 24 indicating extreme externality. The scale was normed on 231 college students, primarily middle class and white, and 115 women who chose to begin a weight reduction program with an M range from of 7.0 to 7.8 (SD of between 2.8 and 3.5) (Saltzer, 1981, 1982; Lefcourt, 1991).

Cronbach alpha values were between .56 and 58 for reliability, and the test-retest reliability with a 24-day interval was .67 ($p < .001$, $n = 110$). For convergent validity, the WLOC scale is found to be correlated with the internality ($r = -.30$, $p < .001$, $n = 112$) and the chance ($r = .35$, $p < .001$, $n = 113$) scales of the MHLC scales (K. A. Wallston & Wallston, 1978). The powerful others scale from the MHLC was unrelated to the WLOC scale ($r = .11$, ns). In other words, personal attitudes influenced intentions of internals while social pressures affected the intentions of externals. The WLOC and social desirability (short form of Crowne & Marlowe social desirability scale – Crowne & Marlowe, 1964) were unrelated ($r = -.03$, $n = 111$) (Saltzer, 1981, 1982; Lefcourt, 1991).

HSIRB and Agency Permission Status

An application to conduct research was submitted to the Western Michigan University (WMU) Human Subjects Institutional Review Board (HSIRB) and to the Michigan Department of Community Health's (MDCH) Institutional Review Board prior to data collection. In addition, an approval letter from the MDCH WIC Division was obtained and is attached in Appendix D. This chapter provides an overview of the WMU HSIRB application protocol required for submission.

Project Description

The aim of this research study was to understand how one's locus of control influences her behavior and learning styles. It hopes to offer an explanation as to why some WIC participants are influenced by the program and others are not. The emphasis is on the participants' characteristics and how program delivery might change to better fit the needs of the participants.

Benefits of Research

The general benefits of this research are described on pages 11 and 16-23 of this proposal. Benefits specific to participants are as follows:

According to social learning theory, WIC adult participants with internal locus of control show more involvement and control over their health behaviors and therefore have healthy nutrition statuses. Certain demographic characteristics, such as age, educational level, and income may be associated with healthy nutrition behavior among WIC participants in a manner similar to that seen within other disciplines. By participating in this study, participants will be helping to improve Michigan WIC services

in meeting participants' needs. The results of this study will be shared with the dissertation committee for this project and other appropriate members of the Western Michigan University, the Michigan WIC Division and sponsors upon request.

Subject Selection

The unit of analysis for this study was adult women participants in the Michigan WIC program in 2003. Currently, Michigan WIC serves approximately 48,500 low-income pregnant, breastfeeding, and non-breastfeeding women per month statewide. The total population of women participants was targeted with a 5% return goal for an approximate sample size of 2,424 MHLC questionnaires. Participants were randomly selected during the data collection period in 2003. All adult women who entered WIC clinics for services during the data collection period (i.e., for certification, coupons or nutrition education) were asked by WIC clerical staff to participate in the study. The WIC clerk read the consent form to clients. WIC clients who agreed to participate in the study were asked to sign the consent form and to complete the Multidimensional Health Locus of Control Scales.

Risks to Subjects

There were no foreseen physical risks to the participants of this study. However, if an accidental injury had occurred while in the course of completing the survey, appropriate emergency measures would have been taken in accordance with the clinics' routine policy and procedures. No compensation or additional treatment was made available to the subject in relationship to this research project. Some psychological risks included: (1) the risk of someone determining the identity of the participant and that person's responses to the questionnaire, (2) the questionnaires asked questions pertaining

to the participants' values and beliefs about health; therefore, there may have been mild discomfort as the participant completed the questions and recalled experiences with varying emotions. A third psychological risk and social risk was the inconvenience of taking time to complete the survey. As stated earlier, the total time required of the participant was about 14 to 17 minutes in addition to their normal clinic appointment time.

Protection for Subjects

To ensure that the rights and welfare of the participants were protected throughout this study, several ethical considerations were taken into account. First, participants in the WIC program were assured that they would receive WIC program benefits regardless of their participation in the research study. Furthermore, participants had the opportunity to elect to discontinue participation in the study at any time and for any reason. A consent form (see Appendix A) was distributed to each participant, to ensure that she completely understood her rights regarding participation in the WIC program and the intent of this research.

Confidentiality of Data

Privacy of the subjects was protected through confidentiality. Each participant in the WIC program was assigned a WIC identification number by the WIC clinic. Participants used this same number when completing the MHLC questionnaire. No other identifying information, such as name and address, was on the survey. In addition, no such identifying information was recorded from the WIC M-TRACX system. In addition, federal regulations require that all WIC staff keep the names, addresses and pertinent clinic information confidential. All of the WIC clinics were bound by their local agency

confidentiality agreements. Privacy was protected further in that results were only reported for the aggregate, with no reference to individual subjects or responses.

Instrumentation

The instrumentation for this study is described on pages 26-28 of this dissertation.

Informed Consent Process

WIC clerical staff read the consent form to clients and had the clients sign the form if they agree to participate in the study. The consent form was attached to the questionnaire. All consent forms and questionnaires were mailed to this researcher following the data collection period, except those from Wayne County. The researcher collected these in person.

Project Summary

This study examined the relationship between locus of control and the nutrition health status of adult WIC participants in Michigan. Locus of control is the degree to which an individual perceives reinforcement or outcomes as contingent upon his or her own behavior. Existing nutrition health data of WIC mothers and the Multidimensional Health Locus of Control questionnaire (MHLC) was used to measure the locus of control variable relevant to one's beliefs about health, weight and eating habits. Results from this study may help to better understand locus of control and its relationship to nutrition health, improve nutrition education, improve program outcomes, and cost savings.

Activities (March, 2003 – December, 2003)

On March 20, 2003, the Western Michigan University, Human Subjects Institutional Review Board, granted approval of the dissertation proposal. The Michigan Department of Community Health, Human Subjects Institutional Review Board also

granted approval on April 1, 2003. The same month, the researcher made personal phone calls to 40 local WIC agency Coordinators. The purpose of the calls was to explain the nature of the research study and to obtain a verbal agreement to participate. In total, there are 50 local WIC Agencies in Michigan. Thirty-six (or 90%) of the agencies contacted agreed to participate in the study. The ten remaining agencies were not contacted based on recommendation from the WIC Consultant and/or the following reasons: agency's size varies; the agency only specialized in a smaller more at-risk population; the agency had a new Coordinator and/or was experiencing administrative difficulties.

In April 2003, the researcher conducted a grant search. The funding was required to cover the costs of copying and mailing the surveys and to provide an incentive to WIC participants who completed the survey. Over 100 granting organizations were reviewed using the Internet and telephone inquiries. On May 21, 2003, sixty-four (64) letters of request for funding (RFF) were mailed (see attached). Specifically, the letter requested support for the research in the form of in-kind contributions up to $5,000.

Three organizations responded with support. Little Crow Foods, wholesale manufacturer of food products, provided 3,000 discount coupons for food items. Each coupon had a savings value of $2.55 each and could be redeemed at any authorized WIC vendor in Michigan. The total in-kind contribution was $7,650. Michigan Integrated Food & Farming Systems (MIFFS), an organization that provides collaborative community action around agricultural issues, donated 50 tote bags (value unknown) baring the MIFFS logo. The tote bags were distributed to WIC mothers completing the survey in Kent County, where there was a MIFFS program existing. The Michigan Food and Beverage Association donated 25 T-Shirts celebrating Metro-Detroit Youth Day.

The City of Detroit Health Department received the T-Shirts to distribute to WIC mothers who completed the survey.

In June, five thousand copies of the consent form and questionnaire were printed, stapled together, and shrink-wrapped in groups of 100. Participants completed these forms and returned them at the clinic. To provide the participant with a copy of the consent form to keep, an additional five thousand copies were printed. Materials were then prepared for distribution.

In July, the researcher mailed materials to the 36 participating WIC agencies. Each agency received the following information: An (1) Executive Summary, (2) an Agency Agreement template, (3) a copy of the WIC Division Agreement Letter, (4) the Timeline for the Project, (5) Instructions for each Clinic, (6) a Script for Clerks, (7) Participant Consent Forms and Questionnaires and (8) discount coupons provided by Little Crow Foods (see sample enclosed). In addition, Kent County received 50 tote bags from MIFFS and the City of Detroit Health Department received 25 T-Shirts provided by the Michigan Food and Beverage Association. Each Agency also received a 12x15 manila return envelope for the surveys with prepaid postage. The researcher personally delivered one packet of materials to an agency that agreed to participate later in project. Overall, a total of 3700 consent forms and questionnaires were distributed to local agencies for data collection. The deadline to return the completed consent forms and questionnaires was set form August 15, 2003.

In August, notice of this grant award was received from BSBSM Foundation. Funding from this award was covered some copying expenses and all of the mailing expenses. By the August 15 deadline, only four agencies had returned 282 completed consent forms and surveys. The remaining agencies received follow-up phone calls.

In September, a database was created for entering the survey results. The database contains 44 fields (each variable is represents a field). The researcher entered the first 400 surveys returned to ensure the database was working properly and to make any necessary adjustments. In October, A WIC student assistant was assigned to help with data entry. The majority of the surveys were returned in late August, September and October. Four Agencies returned surveys in November. By the end of November, 27 out of 37 participating agencies (73%) returned 1833 surveys out of 3700 surveys (50%).

In December, the researcher cleaned and randomly checked the data for accuracy. Several of the returned questionnaires were missing the participant's WIC identification number on the survey. To find the matching identification numbers, a statewide listing of all the participants in Michigan (approximately 219,000 individuals) was printed and manually searched. The numbers were then verified using the M-TRACX system. Ninety-eight (or 5 %) of the surveys had missing or wrong participant identification numbers and could not be used. Next, a WIC Data Specialist used the identification numbers of the remaining 1,735 records to extract existing information on the WIC mother's current health status and health history from the M-TRACX system.

Unforeseen Problems/Difficulties

Some difficulties during the data collection phase were as follows: (1) Eight agencies initially agreed to participate in the study, but then declined after receiving the packet of materials. Reasons stated for declining were: not enough time to do it, too much work for staff, many staff on vacation or sick leave. (2) At one agency, which agreed to participate, the WIC Coordinator resigned the week that the surveys were to be administered. The Acting Coordinator's position was split among three individuals.

Neither distributed the surveys to participants. (3) Two agencies required prior approval through their local Human Subjects Institutional Review Board, which delayed distribution of the surveys. (4) Another agency agreed to participate, only if the researcher would distribute the surveys directly to WIC participants. This Agency felt that the work would be too taxing on the clerical staff.

In addition, many agencies did not follow the directions to have only WIC mothers who are participants on the program complete the survey. Instead, mothers who were not actually receiving benefits, but whose children were on the WIC program completed many of the surveys. This is very critical, in that the survey results are compared with the mothers' current health status and health history. Since only WIC mothers who are participants would have her information in the M-TRACX system, it posed a serious problem when matching the data. Approximately, 835 mothers, who were not on the WIC program, completed the survey. Therefore, there is no current health information for these mothers in the system.

Changes from Original Proposal

Since there was a large number of the proposals from mothers whose children were actually WIC participants and not the mothers, the children's health data may provide an interesting comparisons when we look at the mother's locus of control (as measured from the survey) and her child's health status as determined from the data in M-TRACX. Therefore, approximately 835 children's health status information will be extracted from the data in M-TRACX. This is an unobtrusive process using already existing data. It does not require additional contact with the participants.

January 2004 – October 2004

During the months of January, February and March, the data was cleaned, coded and analyzed. In May, June and August, the final chapters of the dissertation were completed. In September and October revisions were made to the final draft and copies were submitted to the dissertation committee members.

CHAPTER V

FINDINGS

This research surveyed adult women participants of the Michigan WIC program to determine their health locus of control orientation (external or internal) in relation to their weight locus of control orientation and their nutrition-related health status. Demographic variables such as age, educational level, ethnicity, family size, geographic region, marital status and income level are controlled for and presented in the descriptive statistics section. Statistical analysis for this research consists of both descriptive and inferential statistics. The rationale for the choice of statistics is based on the unit of measurement of scales in the study, the intent of the research to relate associated variables, and the statistical assumptions of the data.

In this chapter, results of the data analysis are presented in three sections. The first section provides an outline of the process used for data analysis. The second section utilizes descriptive statistics to report aggregate characteristics of the sample. The third section presents inferences about the population based on probability and statistical significance. A summary of the findings is presented at the end of the chapter.

Data Analysis

Data Entry, Verification and Cleaning

The Multidimensional Health Locus of Control Survey was administered to WIC participants throughout the months of July - November 2003. Surveys completed in

October and November did not differ substantially from those respondents who completed the survey in July, August and September. This procedure constitutes a response/no response check for response bias.

In September 2003 a database was created for entering the survey data using Microsoft ACCESS, Version 2000. The database contained 27 numerical fields (each field contained a variable). The first 400 surveys returned from the study were entered into the database to ensure the database was working properly and to make any necessary adjustments. In October, A WIC student assisted with entering the remaining surveys. The majority of the surveys were returned in late August, September and October. Four WIC Agencies returned surveys in November. By the end of November, 27 of 37 participating agencies (73%) returned 1,833 surveys (50%) of 3,700 distributed.

In December, the data was cleaned and randomly checked for accuracy. Several returned questionnaires were missing the participant's WIC identification number. To find the matching identification numbers, a statewide alphabetic list of all the participants in Michigan (approximately 219,000 individuals) was printed and manually searched, matching signature to name. The numbers were then verified using the WIC M-TRACX database. Ninety-eight (or 5 %) of the surveys were not matched and could not be used. The WIC Data Specialist then used the participants' identification numbers of the remaining 1,735 cases to extract existing information about the WIC mother's current health status and demographics from the M-TRACX database.

Unfortunately, many agencies did not follow the directions to have only WIC mothers who are participants in the program complete the survey. Instead, mothers who were not actually receiving benefits, but whose children were in the WIC program completed many of the surveys. As a result, there were 835 invalid responses from

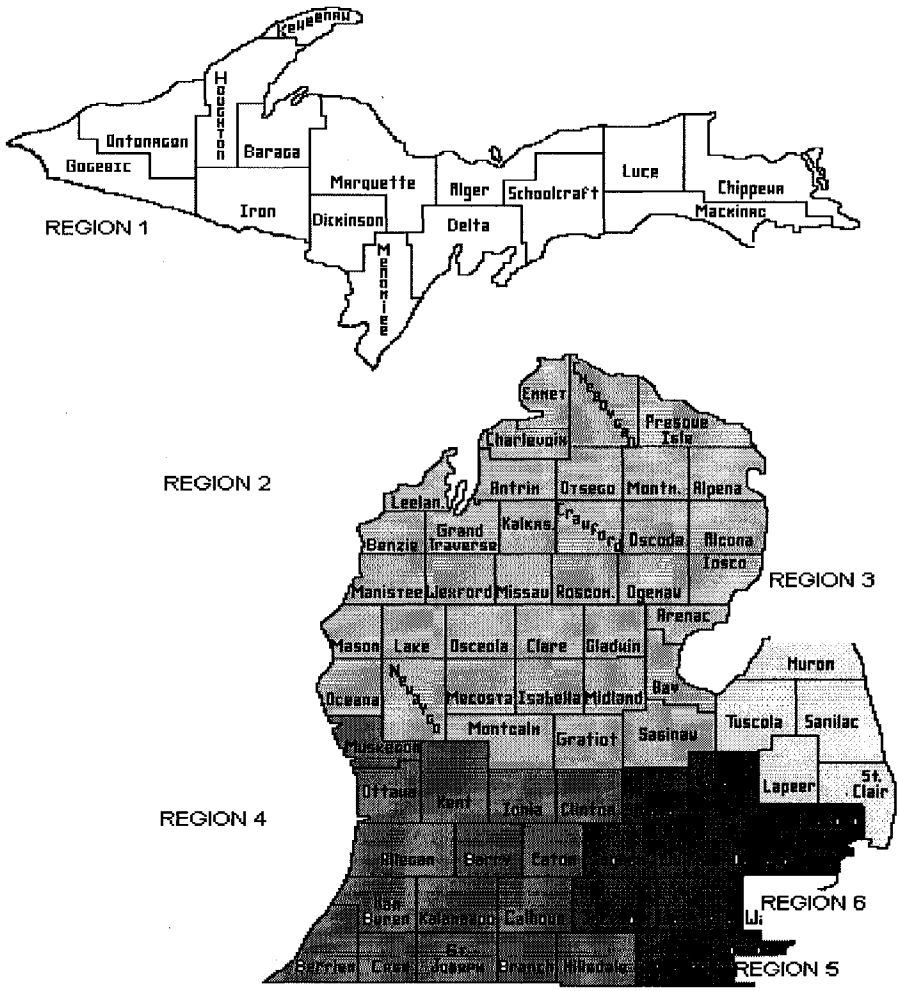
mothers who were not receiving WIC benefits and whose current health information was not in the M-TRACX database. Seventy-two surveys were completed by mothers under the age of 18 and therefore could not be included in the survey analysis, since the focus of this study was adult participants in WIC. The remaining 1,287 valid records were then entered, scored, and analyzed using the Statistical Package for the Social Sciences (SPSS) Version 11.5.

Data Coding

Each case (N=1,287) is identified by a WIC LA number, Clinic number and participant ID number. Region was coded using the LA identification number to divide the State into 6 geographic regions: Region 1 = the UP (Upper Peninsula), Region 2 = NM (Northern Michigan), Region 3 = Thumb (Sanilac, Tuscola, St. Clair, Huron and Lapeer Counties), Region 4 = WM (Western Michigan), Region 5 = SEM (Southeastern Michigan) and Region 6 = (Wayne County, including the City of Detroit). See Figure 4 below.

The Multidimensional Health Locus of Control Scales are measured theoretically and empirically on three separate dimensions (internality, chance and powerful others). Each dimension (or subscale) consists of six items requiring a rating from one (strongly disagree) to six (strongly agree). The score on each subscale is the sum of the values circled for each item on the subscale (scores ranged from 6 to 36). No items needed to be reverse scored before summing (Wallston, 1986). Higher scores on all three subscales indicate greater beliefs in Internality, Chance, or Powerful Others with respect to health status. Survey items 1, 6, 8, 12, 13 and 17 were summed to equal each respondent's ILOC score, coded as "Internal Scores." See Table 2 for remaining scale items.

Figure 4. WIC Regions



Source: MDCH, WIC Division, 2003

A fourth scale was also used to measure one's locus of control with respect to weight. The Weight Locus of Control Scale consists of 4-items requiring a rating of 1 – 6 and is coded as "Weight Scores." The two internally worded items (20 and 23) were reverse scored (i.e. where "strongly disagree"= 6 and "strongly agree" = 1). Scores range from 4 to 24, 4 = "extreme internality" and 24 = "extreme externality."

Each of the four scales (ILOC, CLOC, PLOC, and WLOC) was recoded into new categorical variables measuring participants as "Internal" or "External." Participants scoring below the median on the ILOC are classified as having an external locus of control, while those scoring above the median are classified as having a high internal locus of control. For the CLOC, PLOC and WLOC scales, participants scoring low are classified as having an internal locus of control, while participants, scoring high are classified as having an external locus of control. According to social learning theory, WIC participants with an internal locus of control will show a low-risk (or non-high risk) nutrition health status, while participants with an external locus of control will show higher risk nutrition health status.

In addition to the locus of control scales, the survey included two statements that measure WIC mothers' general beliefs about health, one statement that assesses desire and two statements that assess effort to improve eating habits and health (Parsons, R., 1971). These statements also utilize a 6-point Likert format, ranging from "strong disagree" (scored as one) and "strongly agree" (scored as six).

Nutrition health status is measured according to four primary risk types: Anthropometric, Biochemical, Clinical/Health/Medical, or Dietary Risk. Each risk type is designated by a risk code series: 100, 200, 300, and 400. These series denote anthropometric risks (risks associated with abnormal weights, heights and BMI), biochemical risks (risks associated with abnormal blood-iron levels), medical risks (risks related to existing medical condition such as high blood pressure and, thyroid disease), and nutrition risks (risks directly related to poor eating habits) respectively. A risk code containing a plus sign (+) indicates a high-nutritional risk.

Risk codes (RC) were recoded into several new variables based on risk code type: Seven risk specific variables were recoded as dichotomous variables indicating whether or not a WIC mother has the risk factor. These are: not overweight, not low iron, not hypertensive, no depression, not smoking, no alcohol or illegal drugs (AOD), and no unusual diet. The variables are stated in the favorable or healthy condition and are coded as a 1 if the mother does not have the risk and as a 0 if she does have the risk (i.e. Not Overweight, 1=Does Not Have RC; 0=Has RC). These specific risk variables were selected based on their frequency of assignment to a WIC mother. The variables received the highest percentage of assignment with the exception of the variable "unusual diet." This variable was selected due to its lack of frequency assigned. Since all WIC participants must have some nutrition-related risk factor to be eligible to participate in the program, often the healthiest of eligible individuals receive one risk factor of 400 or 401 (inadequate intake of recommended daily food groups). Therefore, to distinguish from all other individuals, the least assigned risk factors were chosen as the variables of interest. "Unusual diet (RCs 402, 403, 420, 421, 423 or 424) describes the following eating patterns for pregnant, breastfeeding, or nonlactating mothers: vegetarian diets, highly restrictive diets such as very low calories or severely limited intake of nutrients, excessive intake of caffeine, pica (craving or consumption of non-food substances such as coffee grounds, dirt or starch), inappropriate or excessive intake of dietary supplements, or inadequate vitamin/mineral supplementation.

In addition, "has RC 100 (rc100_yn)" is a newly created, dichotomous variable which indicates if the participant has a 100 series RC type or not ("Has RC" = 1, and "Does Not Have RC" = 0). "How many 100 series RC does the participant have

(rc_100_series)" counts the number of 100 series codes recoded for each participant. The other RC Series (200, 300 and 400) were recoded using the same format.

Nutritional health variables extracted from the WIC M-TRACX database included all risk codes recorded in the system for each participant (no more than 4 per participant), height and weight measurements and blood-iron level. BMI (body mass index) is an interval level variable that was calculated according to the following CDC formula: BMI = (Weight in pounds/(Height in inches)^2) x 703. Measures were then recoded into a new variable "BMI Category" according to the following:

1 = Underweight, BMI < 18.5

2 = Normal Weight, BMI 18.5 – 24.9

3 = Overweight, BMI 25.0 – 29.9

4 = Obese, BMI 30.0 and above

The remaining demographic variables were recorded as follows: Age was calculated from the participant's date of birth (extracted from M-TRACX) and "today's date." "Today's date" was recoded as the day the respondent completed the survey. Age was also recoded into 4 categorical groups. Education Level was extracted as interval data from M-TRACX as years of school completed and recoded into "Education Category" as 4 categorical groups. Annual Income was recorded as interval data from M-TRACX and was recoded into eight groups based on "Family Size" of 1 to 8 or more household members. FIA Status is nominal data that indicates the respondent's participation in a Family Independence Agency program. PBN Status is nominal data indicating a mother's categorical eligibility in WIC: P=pregnant, B=breastfeeding and N=nonlactating. Ethnicity is recorded separately from Race in M-TRACX as a

dichotomous variable ("White" =0 and "Hispanic" = 1). For descriptive and inferential analysis percentages from both variables are reported as Race with the Hispanic category added. Table 2 provides a summary of the variables in the study.

Descriptive Statistics

Statistical Methods for Descriptive Analysis

Descriptive statistics are used to describe population parameters in terms of central tendency and variability. Measures of central tendency and dispersion were calculated for each variable, and cross tabulations were computed to compare categorical variables. Measures of central tendency are values that represent the most typical or average value of the sample or population. The three primary types are the mean, median, and mode. The mean is the sum of a series of observations, divided by the number of observations in the series, and is typically used with interval and ratio data. The median is the middle value in a series of values arranged from high to low and is used when a few very large or very small values affect the mean, and requires at least ordinal level data. The mode is the most frequent value of a variable.

Measures of dispersion tell the variability of data values. The two primary types are the range and standard deviation (or variance). The range is the difference between the highest and lowest value. The standard deviation measures the dispersion from the mean and is calculated as the square root of the variance. Both the range and standard deviation are used with interval data. Together, a measure of central tendency and a measure of dispersion provide information about where the data set lies on the graph and if it is normally distributed. Each measure of central tendency and measure of dispersion has different assumptions associated with it.

Table 2: Summary of Variables in the Study

The following table cross-references the variables, the questions, hypothesis and the specific survey items:

	Variable Name	Type	Research Question	Source or Survey Item#
1	Internal Locus of Control (ILOC)	Interval	1) What percentage of WIC mothers are internally oriented and what percentage externally oriented?	1, 6, 8, 12, 13, 17
2	Chance Locus of Control (CLOC)	Interval	2) What percentage of WIC mothers are internally oriented and what percentage externally oriented toward beliefs in chance?	2, 4, 9, 11, 15, 16
3	Powerful Others Locus of Control (PLOC)	Interval	3) What percentage of WIC mothers are internally oriented and what percentage externally oriented toward beliefs in powerful others?	3, 5, 7, 10, 14, 18
4	Weight Locus of Control orientation	Interval	4) What percentage of WIC mothers has internal orientation or external orientation towards weight?	20, 21, 22, 23
5	General Health Belief	Interval	5) What do WIC mothers believe about their health status? 6) Does belief about health status relate to ILOC, CLOC, PLOC, or WLOC?	26, 27
6	Desire to Improve Health	Interval	7) What percentage of WIC mothers desire to improve their eating habits? 8) Does desire to improve relate to ILOC. CLOC, PLOC or WLOC?	24
7	Effort to Improve Health	Interval	9) What percentage of WIC mothers have made an effort to improve eating habits? 10) Does effort to improve relate to ILOC, CLOC, PLOC or WLOC?	19, 25
8	High-risk nutrition health status	Dichotomous	11) What are the health statuses of internally and externally oriented participants? 12) Does health locus of control related to nutrition health status among adult WIC participants? 13) Does weight locus of control relate to nutrition health status?	Routine WIC Data/MTRACX
9	BMI	Interval Categorical	BMI = [(Weight in lbs.)/(Height in In.)^2] X 703	Calculated from Height & Weight
10	Weight	Interval	Weight in pounds	Routine WIC Data/MTRACX
11	Height	Interval	Height in inches	Routine WIC Data/MTRACX
12	Blood Iron Level	Interval	Hemoglobin levels in blood stream	Routine WIC Data/MTRACX
13	Not Overweight	Dichotomous	Does the participant have an overweight risk code/factor? RC 111, 112 or 133	Recoded Routine WIC Data from MTRACX
14	Not Low Iron	Dichotomous	Does the participant have a low iron risk code? RC 201	"
15	Not Hypertensive	Dichotomous	Does the participant have a hypertension? RC 345+	"

	Variable Name	Type	Research Question	Source or Survey Item#
16	No Depression	Dichotomous	Does the participant suffer from depression? RC 361+	"
17	Not Smoking	Dichotomous	Does the participant smoke? RC 371	"
18	No Alcohol and Drugs (AOD	Dichotomous	Does the participant drink alcohol or take illegal drugs? 372	"
19	No Unusual Diet	Dichotomous	Does the participant have an unusual or unhealthy diet? RCs 402+,403+, 420, 421+, 423 or 424	"
20	Has RC Type 100?	Dichotomous	Does the participant have any 100 Series risk codes?	Recoded Routine WIC Data from MTRACX
21	Has RC Type 200?	Dichotomous	Does the participant have any 200 Series risk codes?	Routine WIC Data/MTRACX
22	Has RC Type 300?	Dichotomous	Does the participant have any 300 Series risk codes?	Routine WIC Data/MTRACX
23	Has RC Type 400?	Dichotomous	Does the participant have any 400 Series risk codes?	Routine WIC Data/MTRACX
24	How many 100 RCs?	Interval	How many 100 Series risk codes does the participant have?	Routine WIC Data/MTRACX
25	How many 200 RCs?	Interval	How many 200 Series risk codes does the participant have?	Routine WIC Data/MTRACX
26	How many 300 RCs?	Interval	How many 300 Series risk codes does the participant have?	Routine WIC Data/MTRACX
27	How many 400 RCs?	Interval	How many 400 Series risk codes does the participant have? Or How many nutrition related risk codes does the participant have?	Routine WIC Data/MTRACX
28	# of Health Related RCs	Interval	What's the total number of 100 series, 200 series and 300 series received by each mother?	Recoded MTRACX Data
29	Age	Interval	14) What are the demographic characteristics of internally and externally oriented participants? 15) What is the relationship between nutrition health status and locus of control, controlling for demographic characteristics?	Routine WIC Data/MTRACX
30	Education Level	Interval	"	Routine WIC Data/MTRACX
31	Ethnicity	Nominal	"	Routine WIC Data/MTRACX
32	Family Size	Interval	"	Routine WIC Data/MTRACX
33	FIA Status	Nominal	"	"
34	Income (Annual)	Interval	"	"
35	Martial Status	Dichotomous	"	"
36	PBN Status	Nominal	"	"
37	Race	Nominal	"	"
38	Region	Nominal	"	"

*For simplification, the Weight Locus of Control Scale was combined with the Multidimensional Health Locus of Control Scale in Appendix B.

To describe and summarize the data box plots, frequency distributions, percentile ranks, central tendency and measures of dispersion were calculated for each single variable. Tables 3, 4, and 5 summarize the frequency, percents, mean, and standard deviations of the data. Means and standard deviations are reported for internal level variables, and cell counts and percentages for ordinal and nominal variables.

To compare categorical variables, the cross tabulation command in SPSS was used to produce contingency tables. The output includes the number of occurrences of each combination of levels of each variable in a contingency table. Each level of the first variable is given a column and each level of the second variable is given a row. In addition, a row is added for total, and a column is added for total. Each cell contains the number of subjects and the percentages for each. Row percentages add up to 100% horizontally. Column percentages add up to 100% vertically.

The Means command in SPSS was used to provide descriptive statistics for subsets of the data using at least two variables. One variable represents the dependent variable and is the variable for which the descriptive statistics is received. The other is the independent variable and is used to create the subsets. The Means report lists the name of the dependent variable at the top and every level of the independent variable is shown in a row in the table. The last row is the "Total" row and contains the combined data. Results of the contingency table analysis and Means analysis are presented in the Descriptive Statistics section.

Tests for Normal Distribution and Outliers

Normal Distribution: Central tendency, dispersion, and regression analysis all require the normal distribution of data. To test for normal distribution skewness, kurtosis, Kolmogorov-Smirnov, the log, the square root and X^2 were all computed for

each scale scores and compared. All had values less than 1 according to SPSS calculations; therefore, the null hypothesis of normality (the variable is normally distributed) was accepted for each variable. The original raw scores had the best normal distribution of all and were used in all statistical calculations. Box plots were graphed to detect outliers. Education, BMI, Iron, and Marital Status each contained outliers that were recoded as missing data. Annual Income at first appeared to obtain outliers (range = $1.00 - $85,028.00), but on closer examination, each data point was indeed plausible. WIC allows a value of $1.00 to be entered into the database if the family has no income at all. At the same time, a family of 12 or more members, with a household income of $85,000, would still qualify to receive WIC benefits according the USDA income guidelines (Michigan WIC Program, 2003).

Demographic Findings

A total of 1,833 women completed the study by providing data during the data collection period. Of the total, 70.2% (1,287) of the records were valid. Participants were recruited during their routine visit to the WIC clinic in their areas. Demographic data was obtained from the WIC M-TRACX database, which contains information about the participant's annual income, date of birth, ethnicity, family size, and geographic location. Nutrition education attendance data was not available in the aggregate from the WIC M-TRACX database. Table 3 presents a summary of the demographic characteristics, including cell counts and percentages for all of the variables, and means, range and standard deviations of the interval level variables.

The total number of participants in this study was 1,287 (N). The ages of the participants ranged from 18-50 years, with a median age of 24 years. Fifty-nine percent

(762) were between the ages of 18 and 25. In this sample, 80% (1,031) were White, 14.8% (191) were African American, 4.4% (56) were Hispanic and 8% (9) were Asian, American Indian/Native Hawaiian, or Native American/Pacific Islander collectively. Twenty-eight percent (343) of the participants were not high school graduates and 24.7% (317) had participated in educational programs beyond their high school diplomas. Recorded incomes ranged from $1.00 to $85,028.00. The median income was $12,696.00, and the median family size was three (3).

Table 3: Demographic Findings: Cell Count, Percentages & Standard Deviations

Interval Variables	**Total N**	**Percent (%)**	**Median/Mean**	**Min - Max**	**Std. Dev.**
Age	**N = 1,287**		**24/25.3**	**18 – 50**	**5.43**
18-20	253	19.7			
21-25	509	39.5			
26-30	312	24.2			
31-35	130	10.1			
36+	83	6.4			
Annual Income	**N = 1,287**		**$12,696/$14,497**	**$1 - $85,029**	**$10,962.14**
16,613 or less	811	63.0			
16,613.01 – 22,422	207	16.1			
22,422.01 – 28,231	130	10.1			
28,231.01 – 34,040	78	6.1			
34,041.01 – 39,849	33	2.6			
39,849.01 – 45,658	13	1.0			
45,658.01 – 51,467	7	.5			
51,467.01 – 57,276+	4	.3			
Education	**N = 1,269**		**12.0/12.04**	**1-22**	**1.69**
Non-High School Graduate	359	27.9			
High School Graduate	611	47.5			
Post High School Education	298	23.2			
Graduate Education	19	1.5			

Nominal Variables	Total N	Percent (%)			
Family Size	**N = 1,287**		**3/3.55**	**1-12**	**1.44**
1	59	4.6			
2	240	18.6			
3	400	31.1			
4	301	23.4			
5	170	13.2			
6	69	5.4			
7	35	2.7			
8+	13	1			
Geographic Location	**N = 1,287**				
Upper Peninsula – UP	75	5.8			
Northern Michigan – NM	91	7.1			
Thumb Region	374	29.1			
Western Michigan – NM	398	30.9			
South East Michigan – SE	205	15.9			
Wayne County and Detroit	144	11.2			
Marital Status	**N = 1,270***				
Married	486	37.8			
Not Married	784	60.9			
PBN Status	**N = 1,287**				
Pregnant	371	28.8			
Breastfeeding	196	15.2			
Nonlactating	720	55.9			
Racial/Ethnicity	**N = 1,287**				
White	1031	80.1			
African American	191	14.8			
Hispanic	56	4.4			
Asian/Am. Indian/Alaska Native/ Native Hawaiian/Pacific Islander	9	.8			

Health Status Variables

Table 4 presents a summary of the health status variables in the study. There were 33.2% (427) more non-high-risk participants than high-risks. The average weight of participants was 175.1 pounds, with a standard deviation of 44 pounds. The average participant classified as overweight according to the BMI table (average BMI=29.7, overweight range = 25.0 – 29.9). This is consistent with the risk specific factor of overweight, with 50% (643) of participants having overweight risk codes of 111, 112, or 133.

Of the four specific clinical/medical related risk factors (hypertension, depression, smoking and alcohol or illegal drug consumption), 27.1% (349) had these risk factors, while 35.8% (461) had some other clinical/medical risk factors and 37.1% (477) had none. Of the four types of risk factors, the majority related to diet with 78.3% (1,008) of the participants having a 400 series risk code. Among these, 12% (150) had unusual dietary risks such as highly restrictive nutrients or craving or consumption of non-food items such as coffee grounds, starch or dirt. The second highest risk type was clinical/medical with 62.9% (810) of participants having a risk, followed by anthropometric risks, 58.4% (749), and biochemical risks, with only 21.7% (279) having risk code 201 (low iron). All of the remaining participants had normal iron levels.

Health Locus of Control Scales & Other Health Beliefs

Table 5 presents the means, standard deviations and range of the MHLOC subscale scores and other health belief scores. The mean score on the internal locus of control (ILOC) score was 25.8, with a standard deviation of 5.16. The chance locus of control (CLOC) mean score was 17.12, with a standard deviation of 5.3, and the

Table 4: Health Status Variables: Median, Means, and Standard Deviation

Health Status Variable	Cell Count	Percent	Median/Mean	Min –Max	Std. Dev.
Health Status	1287				
High Risk	430	33.4			
Non-Risk	857	66.6			
Weight	1287		167.4/175.1	84.2-359.4	44.4
BMI	1287		28.6/29.7	16.68-59.80	7.20

RC Series	Risk Specific Detail		Cell Count	Percentage
100	Does not have Anthropometric Risk	No Code in Series	538	41.8
	Has RC 111, 112, or 133	Overweight = 0	643	50.0
	Has Other Types of Anthropometric Risks	Not Overweight = 1	106	8.2
		Total	1287	
200	Does not have Biochemical Risk	No Code in Series	1008	78.3
	Has RC 201	Low Iron = 0	279	21.7
	Has Other Types of Biochemical Risks	Not Low Iron = 1	0	
		Total	1287	
300	Does not have Clinical/Medical Risks	No Code in Series	477	37.1
	Has RC 345+ (high risk)	Hypertension = 0	62	4.8
	Has Other Types of Clinical/Medical Risks	No Hypertension = 1	748	58.1
		Total	1287	
	Does not have Clinical/Medical Risks	No Code in Series	477	37.1
	Has RC 361+ (high risk)	Depression = 0	65	5.1
	Has Other Types of Clinical/Medical Risks	No Depression = 1	745	57.8
		Total	1287	
	Does not have Clinical/Medical Risks	No Code in Series	477	37.1
	Has RC 371	Smoking = 0	147	11.4
	Has Other Types of Clinical/Medical Risks	Not Smoking = 1	663	51.5
		Total	1287	
	Does not have Clinical/Medical Risks	No Code in Series	477	37.1
	Has RC 372	Alcohol & Drugs = 0	75	5.8
	Has Other Types of Clinical/Medical Risks	No Alcohol & Drugs = 1	735	57.1
		Total	1287	
	Does not have Clinical/Medical Risk	*No Code in Series*	*477*	*37.1*
	Has RC 345+, 361+ ,371 or 372 total	*Has any of the above Risks*	*349*	*27.1*
	Has Other Types of Clinic/Medical Risks	*Excluding the above Risks*	*461*	*35.8*
		Total	*1287*	
400	Does not have Dietary Risk	No Code in Series	279	21.7
	Has RCs 402+ (high risk), 403+ (high risk), 420, 421+ (high risk), 423, or 424	Unusual Diet = 0	150	11.7
	Has Other Types of Dietary Risks	No Unusual Diet = 1		66.6
		Total	1287	
Summary Variables	# of Health Related Risks	100, 200, or 300 series	1134	88.1
	# of Nutrition Related Risks	400 series only	1008	78.3

powerful others locus of control (PLOC) mean score was 19.08, with a standard deviation of 5.21. The mean score of the weight locus of control (WLOC) scale was 10.37 with a standard deviation of 3.67.

Table 5: Median, Mean, Standard Deviation and Range of Scale Data

Health Locus of Control Variables	**N**	**Median**	**Mean**	**SD**	**Min – Max**
Internal (ILOC)	1203	26.0	25.08	5.16	6 – 36
Chance (CLOC)	1200	17.0	17.12	5.3	6 – 36
Powerful Others (PLOC)	1193	19.0	19.08	5.21	6 – 36
Weight (WLOC)	1245	11.0	10.37	3.67	4 – 24
Other Health Beliefs Variables					
Desire to Improve	1262	5.0	4.45	1.40	1 - 6
Effort to Improve	1242	8.0	8.08	2.14	2 – 12
General Health Status	1264	8.0	8.47	2.42	2 – 12

Cross Tabulations

Table 6 shows a cross-tabulation of participants' ILOC score results (internal or external), health status (high risk and non-high risk) and their risk code types as assessed by WIC practitioners. Scores were divided into quartiles to reflect more sensitive score ranges; only the first and fourth quartile values are compared. A Pearson chi-square test of independence was calculated, and significant values were found for both the lowest quartile ($X^2(3) = 100.032$, $p < .001$) and the highest quartile ($X^2(3) = 107.870$, $p < .001$ for the highest quartile).

Table 6: Cross-Tabulation of Nutrition Health Status and Risk Codes

		100 Anthropometric	200 Biochemical	300 Medical	400 Nutrition	Row Totals
Internal	High Risk (row %)	13 (13.3)	2 (2.0)	80 (81.6)	3 (3.1)	98 (100%)
	(column %)	(12.1)	(7.4)	(68.3)	(7.0)	
	Non-High Risk (row %)	94 (48.0)	25 (12.8)	37 (18.9)	40 (20.4)	196 (100%)
	(column %)	(87.8)	92.6)	31.6)	(93.0)	
	Column Totals	107 (100%)	27 (100%)	117 (100%)	43 (100%)	**294***
Low Internality (External)	High Risk (row %)	23 (20.2)	2 (1.8)	88 (77.2)	1 (.9)	114 (100%)
	(column %)	(17.2)	(6.4)	(61.5)	(2.0)	
	Non-High Risk (row %)	110 (45.5)	29 (12.0)	55 (22.7)	48 (19.8)	242 (100%)
	(column %)	(82.7)	(93.5)	(38.5)	(98.0)	
	Column Total	133 (100%)	31 (100%)	143 (100%)	49 (100%)	**356***

***Values shown only reflect the first and fourth ILOC quartiles**

Approximately 10% more mothers had externality beliefs than internality beliefs ((356-294)/650=9.5%). Among mothers with anthropometric risks, high risk mothers were more likely to be external than internal (17.2%-12.1%=5.2%). Among mothers with medical and dietary risks, more high risk mothers had an internal orientation than their counterparts (6.8%, and 5.0% respectively). There was relatively no difference among high risk mothers with biochemical risks. The same observations were made among non-high risk mothers by risk type.

Findings from descriptive analysis show internal locus of control scores were substantially higher than powerful others or chance orientation scores on average. Consistent with the risk code findings, 50% of WIC mothers exhibit overweight risk factors and 50% have scores in the internality range. Among other health beliefs the desire to improve mean score was 4.45, with a standard deviation of 1.40, effort to

improve mean was 8.08, with a standard deviation of 2.14, and the general health status mean score was 8.47, with a standard deviation of 2.42.

Overall, WIC mothers tend to believe they are generally healthy. However, when compared to specific health risk factors, they tend to believe they have less control. These results are consist with the literature in that locus of control scores are sensitive to context, even within types of health risks or behaviors (Wallston, 1981; Steptoe, 2001). Desire and effort scores reflect that mothers desire to improve their eating habits and have made efforts to do so.

Inferential Statistics

The primary purpose of this study was to determine the extent to which locus of control orientation relates to the nutrition health status of Michigan WIC mothers. Therefore, the following hypothesis was formulated for this research:

H_1: High-risk WIC mothers will have external scores (lower scores on the Internality subscale and higher scores on the Chance and Powerful Others Scales) than their non-high risk counterparts.

Statistical Methods for Inferential Analysis

To test the above hypothesis, data were analyzed using four methods. Table 7 provides a summary of these methods and the variables used in the analyses. First, correlations between health status variables, other health beliefs and each health locus of control scale were computed using Pearson Correlation Coefficient (also called Pearson r). Pearson r is a statistic, symbolized as r, showing the degree of linear relationship

between two variables that have been measured on interval or ratio scales. Coefficients range from -1 to +1 to describe either a positive or negative association.

Second, the Chi-Square Test of Independence was computed for the health status variables and locus of control scores. The chi-square test is the procedure for evaluating the level of statistical significance attained by a bivariate relationship in a cross-tabulation. The chi-square test procedure assumes that there is no relationship between the two variables and determines whether any apparent relationship obtained in a cross-tabulation is attributable to chance. In analyzing the results, it appeared that the greater the deviation between expected and actual frequencies, the greater the departure from the null hypothesis. Hence the greater the confidence in inferring that a relationship exists between the two variables.

Third, multiple regression analysis was calculated to examine the relationship between continuous health status variables, participants' locus of control scores and other beliefs about health, while controlling for demographic characteristics. Multiple Regression is one of the most widely used multivariate statistical techniques for analyzing models with three or more variables. Multiple Regression easily incorporates multiple independent variables. Each independent variable is viewed as a control variable for all of the other independent variables in the model. The sequence of practicing multiple regression is (1) model specification (that is, identification of dependent and independent variables); (2) testing of regression assumptions; (3) correcting assumption violations, if any, and (4) reporting the results of the final regression model.

Finally, each health risk status was analyzed using Logistic Regression. Logistic regression deals with dependent variables that are dichotomous rather than continuous. A

dichotomous dependent variable violates the linear regression assumption that it should be continuous. To resolve this problem, an S-shaped curve is fitted to the observations such that the values of this curve always lie between zero and one. In this study, logistics regression modeling is the appropriate statistic for examining locus of control and health risks that are measured as dichotomous variables. Data associations were evaluated using partial correlations and logistic modeling (assessing the odds of engaging in healthy behavior with changes in locus of control scores) and compared to the Steptoe and Wardle study results (2001).

While multiple regression uses a straight line to best approximate data, logistic regression uses maximum likelihood (ML) and the logistic curve to best approximate data. In OLS, the regression line minimizes the sum of error terms, while ML chooses the regression coefficients so that wrong predictions of the dependent variable are minimized (Berman, 2002).

Pearson Correlations

A Pearson Correlation Coefficient was calculated for the relationship between each locus of control subscale, other health belief variables, health risk status (risk codes) and demographic variables. Internal health locus of control scores were positively correlated with powerful others scores ($r = .193$, $p < .001$), desire to improve ($r = .242$, $p < .001$), effort to improve ($r = 365$, $p < .001$) and positive belief about one's general health ($r = .305$, $p < .001$). Internal scores were negatively correlated with weight locus of control ($r = -.366$, $p < .001$). Chance scale scores were positively correlated with powerful others ($r = .391$, $p < .001$), weight locus of control ($r = .416$, $p < .001$) and effort ($r = .102$, $p < .001$). Powerful others scores were also positively correlated with weight

locus of control ($r = .196$, $p < .001$), effort (.281, $p < .001$), desire ($r = .061$, $p < .001$) and general health beliefs ($r = .090$, $p < .001$). Effort scores were also positively correlated with desire ($r = .351$, $p < .001$) and general health beliefs ($r = .285$, $p < .001$). There was no significant correlation between internal scores and chance scores.

Partial correlations were computed for health locus of control scores, other health beliefs and health risks, while controlling for education, marital status, age, WIC status (pregnant, breastfeeding, or non-lactating), racial/ethnicity, income and family size. Table 8 shows that internal, chance and powerful others scores were not significantly correlated with any of the health risks. However, desire was negatively correlated with "non-overweight" ($r = -.103$, $p < .05$), and positively correlated with "not smoking" ($r = .072$, $p < .05$). Effort was positively correlated with "not being depressed" ($r = .080$, $p < .05$) and general health beliefs were positively correlated with "not being depressed" ($r = .106$, $p < .001$). These results indicate that WIC mothers who want to improve their eating habits were more likely to be overweight or non-smoking. WIC mothers who believe they are generally healthy tend not to be depressed or make efforts to improve eating habits.

Specifically, values for the "not smoking" risk and the "non-overweight" risk were compared to the Steptoe (2001) study results (see Table 9 below). In both studies, "not smoking" was not significantly correlated with internal, powerful others or chance locus of control scores. However, Steptoe found significant correlations between powerful others and "limiting alcohol"($r = .086$, $p < .001$) and chance and "limiting alcohol," ($r = -.050$, $p < .001$), while this study did not. In the Steptoe study correlations for "not smoking" did not exceed .034, while in this study correlations were between .02

and .07 (slightly higher). The highest correlations with "limiting alcohol" in the Steptoe study was .086, while in this study the highest correlation was .044. In both studies, "not smoking" and "limiting/no alcohol" were negatively correlated with chance scores and "limiting/no alcohol" was positively correlated with internal scores. However, the Steptoe study showed a negative correlation with internal scores and a positive correlation with powerful others scores for "not smoking," and a positive correlation with powerful others for "limiting alcohol."

Chi-Square Analysis

A Pearson chi-square test of independence was calculated comparing each MHLOC subscale score for high-risk and non-high risk mothers. No significant relationship was found (ILOC: $X^2(3) = 1.685$, $p > .05$; CLOC: $X^2(3) = 3.022$, $p > .05$; PLOC: $X^2(3) = 2.945$, $p > .05$; WLOC: $X^2(3) = 2{,}161$, $p > .05$). In addition, an independent samples t-test was calculated comparing the mean score of WIC mothers who identified as high risk to the mean score of mothers who identified as non-high risk. No significant difference was found (ILOC: $t(1201) = -1.365$, $p > .05$; CLOC: $t(1198) = .868$, $p > .05$; PLOC: $t(1191) = -.447$, $p > .05$; WLOC: $t(1243) = 1.189$, $p > .05$). These results are consistent with earlier tabulations (see Cross tabulations in the Descriptive Statistics Section) that high risk or non-high-risk health status has no significant relationship with locus of control scores, thus accepting the null hypothesis. However, locus of control scores show some correlation with other beliefs and attitudes about health and show greater significance with respect to specific health risk factors or behaviors.

Table 7: Summary of Inferential Statistics for Analysis

Statistic	Pearson r	Chi-Square	Multiple Regression		Multiple Logistic Regression	
# of Variables	28	2	16		9	
Dependent Variable(s) *	NA	Health Status (High Risk)	Overweight	Interval	Not Overweight	Dichot-omous
		Ordinal	Iron	"	Not Low Iron	"
			# of Health Risks	"	Not Hypertensive	"
			# of Nutrition Risks		Not Depressed	"
					Not Smoking	"
					No Alcohol/Drugs	"
					No Unusual Diet	
Independent Variables		ILOC Scale	ILOC	Interval	ILOC	Interval
		Ordinal	CLOC	Interval	CLOC	Interval
			PLOC	Interval	PLOC	Interval
			WLOC	Interval	WLOC	Interval
			Desire	Interval	Desire	Interval
			Effort	Interval	Effort	Interval
			General Health	Interval	General Health	Interval
			High-Status	Dichotomous	High-Status	Dichot-omous
			BMI	Interval	BMI	Interval
			Iron Level	Interval	Iron Level	Interval
			Has RC Type	Dichotomous	Has RC Type	Dichot-omous
			# of RC Types	Interval	# of RC Types	Interval
Control Variables			Age		Age	
			Education Level		Education Level	
			Ethnicity		Ethnicity	
			Family Size		Family Size	
			FIA Status		FIA Status	
			Income (Annual)		Income (Annual)	

Table 7: Summary of Inferential Statistics for Analysis cont.

					Martial Status		Martial Status	
					PBN Status		PBN Status	
					Race		Race	
					Region		Region	

*A separate analysis is computed for each dependent variable

Table 8: Correlations between Health Locus of Control Scales, Other Health Beliefs & Health Status Variables

	Internal	Chance	Powerful Others	Weight	Desire	Effort	General Health Belief
Not Overweight	.0033	-.0059	-.0131	.0399	-.1025*	-.0513	.0395
Not Low Iron	-.0022	-.0545	.0231	-.0345	-.0053	-.0096	.0405
Not Hypertension	-.0192	.0323	.0380	.0556	-.0282	-.0107	.0598
No Depression	.0357	.0221	.0272	.0114	-.0466	.0795*	.1064*
Does Not Smoke	.0435	-.0566	-.0347	-.0523	.0721*	-.0265	.0246
No Alcohol & Drugs	.0099	-.0438	-.0263	-.0270	.0252	-.0295	.0159
No Unusual Diet	-.0306	-.0195	.0047	.0073	-.0176	-.0005	-.0188

*. Correlation is significant at the 0.05 level (2-tailed).

Table 9: Partial Correlation Comparisons of "Not Smoking" & "No Alcohol" with Steptoe and Wardle (2001) study

		Internal	Chance	Powerful Others	Weight	Desire	Effort	General Health Belief
Does Not Smoke	This Study	.0435	-.0566	-.0347	-.0523	.0721*	-.0265	.0246
	Steptoe	-.008	-.034	.004	na	na	Na	Na
No Alcohol & Drugs	This Study	.0099	-.0438	-.0263	-.0270	.0252	-.0295	.0159
	Steptoe	.018	-.050**	.086**	na	na	Na	Na

**. Correlation is significant at the 0.01 level (2 tailed)

Multiple Regression Analysis

A multiple regression analysis was calculated to test the hypothesis that WIC mothers' locus of control scores and other health beliefs are related to their nutrition health status, while controlling for demographic variables. Four dependent variables, weight, iron level, number of health-related risks factors, and number of nutrition-related risk factors, which have interval level measures, were selected for this analysis. The first regression was calculated to predict WIC mothers' weight based on locus of control scores (weight, it was hypothesized, increases with mothers' externality beliefs) and other health beliefs. A significant regression equation was found ($F(8,1147) = 33.113$ $p < .001$), with an R^2 of .188. The equation is presented in Table 10 below, where "smoking" and "unusual diet" are coded as 1=has risk and 0=does not have risk, and height is measured in inches. All were significant predictors.

The second regression was calculated to predict WIC mothers' iron level based on locus of control scores (iron level decreases with mothers' externality beliefs) and other health beliefs. A significant regression equation was found ($F(6,1123) = 15.754$ $p < .001$), with an R^2 of .078. "Alcohol & drugs" are coded as 1=has risk and 0=does not have risk. All were significant predictors except the chance and number of nutrition-related risk codes.

The third regression was calculated to predict the number of health-related risk factors a WIC mother may have based on locus of control scores (number of risk factors decrease with mothers' internality beliefs) and other health beliefs. A significant regression equation was found ($F(3, 1178) = 55.859$ $p < .001$), with an R^2 of .125. All independent variables were significant predictors.

The fourth regression was calculated to predict the number of nutrition-related risk factors a WIC mother may have based on locus of control scores (number of risk factors decrease with mothers' internality beliefs). A significant regression equation was found ($F(3,1034) = 13.021$ $p < .001$), with an R^2 of .036. Only effort and general health belief were significant predictors.

In each analysis, none of the scale scores (Internal, Powerful Others, or Weight locus of control) were significant independent variables in the model. The results indicate that WIC mothers who are more likely to have less health risk factors have the desire to improve their eating habits, have made some effort to improve, and have a generally positive belief about their own health status. Another influence is other existing health conditions. Mothers who have multiple risk factors tend to have more health risks (i.e., overweight and low iron) than those who have fewer risk factors. The percent of variance explained by each model increased as additional risk factors were added as independent variables to the model. However, this created violations of multi-collinearity.

Table 10: Multiple Linear Regression Equations

Regression Equations	
Weight=	-167.900+2.203(Effort)+3.601(Desire)+4.627(Height)+1.364(Age)-9.966(Smoking)-11.243(Unusual Diet)-3.415(General Health Belief)+.473(Chance).
Iron=	12.445+.557(Smoking)+.022(Age)+.579(Alcohol & Drugs)-.252(# of Health Risk Factors)-.011(Chance)+.125(# of Nutrition Risk Factors)
# of Health Related Risk Factors=	2.997-.048(General Health Belief)+.007(Weight)-.138(Iron Level)
# of Nutrition Related Risk Factors=	1.201-.053(Effort)+.069(General Health Belief)-.003(Desire)

Logistics Regression Analysis

The purpose of this analysis was to estimate a model to determine the factors which influence health risk status among WIC mothers. Specific health risk factors, coded as healthy (i.e., does not have risk code = 1), and unhealthy (i.e., has risk code = 0) are the dependent variables. The MHLOC subscales and other health belief scores are the predictor variables. Healthy risk factors are expected to be positively related to internality scores and inversely related to externality scores. The results presented in Table 11 show the coefficient estimates, the Wald statistics (in parentheses), the model chi-square statistic for overall model fit, the percent of correct predictions, the pseudo R^2 (or Nagelkerke R^2) for model performance, and the Hosmer and Lemeshow test of goodness of fit. The results of the models indicate that desire to improve eating habits, efforts made to improve, and WIC mothers' general belief about their own health status are more sensitive predictors of certain risk factors than the locus of control subscales. Desire was a significant factor in three of the seven health risks (not overweight, not depressed and not smoking). General health belief was a significant factor in no depression and no hypertension, while effort was a significant factor in no depression. Among the health locus of control scales, chance was the only significant factor and in only one of the health risk models: no low iron.

The data suggests that WIC mothers who are overweight or depressed have stronger desires to improve their eating habits than those who are not. Further, WIC mothers who do not smoke have a stronger desire to improve eating habits than those who do smoke. Among WIC mothers who do not suffer from depression, more effort was made to improve eating habits with positive beliefs about overall health status.

Mothers who do not suffer from hypertension also had more positive beliefs about their overall health status. Among mothers who tended to have normal or higher iron levels, the results showed less belief in chance locus of control. This is consistent with the research hypothesis that healthier mothers will show more internality in terms of health beliefs.

Overall, the strongest model for predicting health risk factors based on locus of control scores was in determining no depression status. This model showed a chi-square value of 21.104[7df] and was significant at the .05 level. In addition, 95.6% of the predictions, that is the match between the observed frequencies and the expected frequencies, were correct. However, only 4% of the variance in the health risk status for depression was explained by the health locus of control scores and other health beliefs. The model for determining the "not overweight" risk factor was also significant at the .05 level (X2=15.123[7]), with 54% of the predictions correct.

Table 11: Logistic Regression Results (MHLOC Scales and Other Health Beliefs)

Dependent Variable = Does Not Have Risk Code/Factor = 1 (Has Risk Code = 0)							
Variable	**Not Over-weight**	**Not Low Iron**	**No AOD**	**No Depression**	**No Hyper-tension**	**Not Smoking**	**No Unusual Diet**
Constant	-.032(.004)	2.025(10.48)	2.729(6.713)	1.043(.737)	1.475(1.418)	1.638(4.654)	2.85(12.191)
Desire	**-.130(6.834)***	.017(.079)	.102(1.062)	**-.264(3.867)***	-.062(.263)	**.182(6.604)***	-.42(.288)
Internal Scale	.019(1.722)	-.015(.705)	.014(.213)	.008(.052)	-.014(.163)	.017(.621)	-.018(.583)
Chance Scale	-.006(.175)	**-.037(4.650)***	-.020(.474)	.000(.000)	.010(.085)	-.018(.727)	-.018(.641)

Table 11: Logistic Regression Results (MHLOC Scales and Other Health Beliefs) continued

Powerful Others	-.004(.091)	.015(.726)	.006(.044)	-.008(.051)	.040(.032)	.005(.048)	.006(.071)
Weight Scale	.025(1.442)	-.030(1.333)	.001(.001)	.032(.382)	.067(.050)	-.010(.100)	-.002(.005)
Effort	-.036(1.054)	-.017(.163)	-.115(2.456	**.203(5.836)***	-.062(.079)	-.119(4.999)	.026(.233)
General Health Belief	.037(1.680)	.052(2.218)	.044(.574)	**.165(6.497)***	.135(.063)*	.047(.270)	-.018(.167)
Model Chi-Square[df]	15.123[7]*	11.488[7]	3.880[7]	21.104[7]*	12.218[7]	12.394[7]	1.981[7]
% Correct Predictions	53.8	78.9	94.0	95.6	95.2	87.9	88.4
Nagelkerke R^2	.020	.017	.010	.067	.037	.023	.004
Hosmer & Lemeshow	.233	.100	.085	.239	.165	.919	.440
Notes:	**Statistically significant at the .001 level; *Statistically significant at the .05 level						

Table 12 shows the increases in chi-square values when demographic control variables are introduced in the model. All of the models increased in chi-square values (with 16 df). Four of the seven models were significant at the .001 level and one, "no hypertension," was significant at the .05 level.

The percent of variance explained in Table 12 also increased. But it remained at weak to modest levels (.024-.223), while the percent of correct predictions remained relatively high (.884 – 95.6) for five of the seven models. Desire, effort and general health variables remained significant at the .05 level for not overweight, no depression, no hypertension, and not smoking. In addition, effort was also inversely related significantly to not smoking. However, chance, although still inversely related to not low iron, was no longer significant at the .05 level.

Table 12: Logistic Regression Results (Controlling for Demographic Variables)

Dependent Variable = Does Not Have Risk Code/Factor = 1 (Has Risk Code = 0)							
Variable	**Not Overweight**	**Not Low Iron**	**No AOD**	**No Depression**	**No Hyper-tension**	**Not Smoking**	**No Unusual Diet**
Constant	.570(.316)	3.363(7.409)	-3.006(1.880)	10.253(28.262)	17.733(.388)	-5.562(10.890)	.689(.224)
Desire	**-.133(7.036)***	.013(.045)	.116(1.146)	**-.331(5.395)***	-.029(.053)	**.204(6.636)***	-.036(.212)
Internal Scale	.020(1.714)	-.016(.736)	.007(.056)	.011(.090)	-.024(.426)	.020(.702)	-.021(.826)
Chance Scale	-.008(.286)	-.034(3.684)	-.021(.482)	.016(.200)	.006(.025)	-.019(.672)	-.020(.826)
Powerful Others	-.002(.26)	.032(3.146)	-.009(.080)	-.025(.441)	.036(1.171)	-.012(.284)	.012(.325)
Weight Scale	.028(1.658)	-.016(.382)	-.010(.043)	.027(.247)	.054(1.088)	-.016(.208)	.003(.007)
Effort	-.035(.998)	-.030(.470)	-.118(2.201)	**.198(5.309)***	-.068(.673)	**-.133(5.017)***	.033(.375)
Gen. Health Belief	.038(1.702)	.055(2.442)	.049(.587)	**.145(4.951)***	**.158(5.699)***	.052(1.196)	-.020(.204)
Sig. Demographic Variables.‡	None	pbn category** race* family size*	pbn category** family size** regio*	education* region*	age*	education* pbn category** family size* marital status* region**	None
Model ChiSquare[df]	25.244[16]	77.444[16]**	59.483[16]**	43.339[16]**	34.954[16]*	126.646[16]**	12.432[16]
% Correct Predictions	54.5	78.7	94.1	95.6	95.2	87.8	88.4
Nagelkerke R^2	.033	.114	.155	.137	.105	.223	.024
Hosmer & Lemeshow	.046*	.244	.611	.785	.103	.021*	.945
Notes:	**Statistically significant at the .001 level; *Statistically significant at the .05 level; ‡Coefficients not presented for demographic variables: education, pbn category, age, race, ethnic, income, family size, marital status, region						

Table 13: Odds Ratios for Health Risks by MHLOC Scales and Other Health Beliefs*

Health Risks	Interval	Chance	Powerful Others	Weight	Desire	Effort	General Health
Not Over-weight	1.02 [.990-1.050]	.994 [.967-1.022]	.996 [.969-1.023]	1.026 [.984-1.069]	.878 [.797-.968]	.965 [.901-1.033]	1.038 [.981-1.097]
Not Low Iron	.985 [.950-1.021]	.963 [.931-.997]	1.015 [.981-1.049]	.971 [.923-1.021]	1.017 [.903-1.145]	.983 [.904-1.069]	1.053 [.984-1.127]
No Alcohol & Drugs	1.014 [.955-1.077]	.980 [.926-1.038]	1.006 [.951-1.065]	1.001 [.919-1.091]	1.107 [.912-1.344]	.891 [.772-1.029]	1.045 [.932-1.173]
No Depression	1.008 [.940-1.081]	1.000 [.933-1.071]	.992 [.925-1.064]	1.032 [.933-1.143]	.768 [.590-.999]	1.225 [1.039-1.444]	1.180 [1.039-1.340]
No Hypertension	.986 [.921-1.056]	1.010 [.921-1.056]	1.041 [.978-1.108]	1.070 [.970-1.179]	.940 [.743-1.190]	.940 [.806-1.097]	1.145 [1.012-1.295]
Not Smoking	1.018 [.974-1.063]	.982 [.942-1.024]	1.005 [.964-1.047]	.990 [.930-1.054]	1.200 [1.044-1.378]	.887 [.799-.985]	1.049 [.964-1.141]
No Unusual Diet	.982 [.939-1.028]	.983 [.941-1.026]	1.006 [.941-1.026]	.998 [.936-1.064]	.959 [.823-1.117]	1.026 [.923-1.141]	.982 [.900-1.072]

*Results are consistent with earlier results in other analyses and are stated in more detail below.

Table 13 presents the odds ratios for each dependent variable, with a 95% confidence interval. Odds ratios greater than 1 indicate that as values increase in the independent variable, the more likely the event of the dependent variable will occur. In other words, respondents exhibiting a more internal locus of control or positive health belief should more likely have healthier risk status than those scoring in the external direction or those with less positive health beliefs.

Summary of Findings

The primary purpose of this study was to determine the extent to which locus of control orientation relates to the nutrition health status of Michigan WIC mothers. The hypothesis was that high-risk WIC mothers will have external scores (lower scores on the internality subscale, and higher scores on the chance and powerful others scales). Data were analyzed using Pearson Correlation Coefficient, Chi-Square Test for Independence, Multiple Regression, and Multiple Logistic Regression. A total of 1,287 (N) WIC mothers participated in the study. The median participant age was 24 years, mostly white, high school graduates, with a median income of $12,696, and a median family size of three (3).

Results indicate that overall, more WIC mothers have externality beliefs than internality beliefs (9.5%). However, analyses based on the mothers' "high risk" status showed inconsistent results. Although the average internal scale score was higher than powerful others or chance average scores, and WIC mothers believe they are generally healthy, analysis of specific risk factors revealed that most WIC mothers exhibit externality beliefs (indicating less control) when it came to specific health conditions.

Analyses of desire and effort scores reflect that most WIC mothers desire to improve their eating habits and have made efforts to do so. Further analysis of desire, effort and general health beliefs found these to have stronger relationships to health status than the MHLOC and Weight Locus of Control scales. In addition, the number and types of existing health conditions and some demographic characteristics showed more significant relationships.

These results are consistent with the literature in that locus of control scores are context specific, even within types of health risks and health behaviors (Wallston, 1981; Steptoe, 2001).

CHAPTER VI

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This study was undertaken to determine if a relationship exists between locus of control and nutrition health status and to determine if locus of control orientations were significantly different depending on one's nutrition health status. The unit of analysis was adult participants of the Michigan Women, Infants, and Children (WIC) program in 2003.

WIC is a federally funded program, established as part of the Child Nutrition Act of 1966, to counteract the negative effects of poverty on prenatal and pediatric health such as low birth weight babies, infant mortality, maternal death and slow development. The program assesses the nutrition health status of participants and provides a prescription of foods containing essential nutrients to improve health. A large component of the program is its nutrition education and counseling series about the importance of nutritious eating habits. These sessions are viewed as essential benefits directed toward achieving positive changes in participant knowledge, attitudes, and behavior about food consumption.

While studies have shown that WIC has helped to reduce the prevalence of low birth weight infants, some researchers believe that the eating habits of participants have largely been unchanged because current interventions simply are not meaningful enough

to participants to have a significant impact (Besharov and Germanis, 2000, Abussabha, 1999, Schiller and Fox, 1999, Contento, 1995, Labotne, 1966). To improve nutrition health outcomes, researchers agree that identifying individual needs, perceptions, motivations and desires are essential for enhancing quality of life (Ahijevych and Bernard, 1994, Erison, 1993, Hollar, 2000).

Locus of control (the independent variable in the study) is a belief variable that refers to the degree that health is or is not influenced by one's behavior. The degree ranges from internal to external with internals believing that one stays or becomes healthy as a result of personal behaviors, whereas externals believe that health status is mostly a result of fate, luck, chance, or powerful others (Wallston, Wallston, Kaplan and Maides, 1976). Nutrition health status, which served as the dependent variable in this study, reflects the eating patterns, health history, anthropometric (heights and weight), and biochemical (blood iron) measurements of the participants.

The remainder of this chapter is divided into the following four sections: (1) summary, (2) conclusions, (3) policy implications and recommendations, and (4) suggestions for further study.

Summary

A cross-sectional (point in time) research design was used to administer the Multidimensional Health Locus of Control (MHLOC) and the Weight Locus of Control (WLOC) questionnaires to adult mothers enrolled in the Michigan WIC program in 2003. Local agency WIC staff invited mothers to participate and administered the questionnaire. Participants who volunteered completed the one-page questionnaire in the WIC clinic

during their regularly scheduled appointment time. Mothers were advised that their participation in the study was voluntary, completely confidential, would not affect their participation in the WIC Program, and could be terminated any time they desired. They were also informed of the nature of the study and where they could contact the researcher if they had any questions or concerns.

The locus of control variable was measured by the participant's score on the Multidimensional Health Locus of Control (MHLC) Scales, a self-report questionnaire developed by Wallston et al. (1978) and the Weight Locus of Control Scale developed by Saltzer in 1982. The MHLC identified three separate health locus of control beliefs, each serving as an independent variable. Consequently, each subject obtained a score which reflected her degree of internal, powerful others, and chance health locus of control. Each subscale contained six questions with a six-point Likert-type format. The response selections and their assigned values included: 6 = strongly agree, 5 = agree, 4 = slightly agree, 3 = slightly disagree, 2 = disagree, and 1 = strongly disagree. The possible range of scores was 6 to 36. A high score demonstrated an internal health locus-of-control orientation on the internal subscale, and a high score demonstrated a powerful others or chance health locus of control orientation on their respective subscales. No items were reverse scored

The WLOC Scale was used to assess the participant's perceived control over her own body weight. This scale consists of four items, two externally worded and two internally worded using a Likert scale ranging from 1=strongly disagree to 6=strongly agree. The possible range of scores was from 4 to 24, with 4 indicating extreme

internality and 24 indicating extreme externality. The two internally worded items were reversed scored.

In addition, the questionnaire contained two items pertaining to general health beliefs, one item pertaining to desire to improve eating habits and two items pertaining to efforts to improve eating habits (Parsons, R., 1971). All were measured on the same Likert scale as the MHLC and WLOC questions. No reverse scoring was necessary.

Twenty-seven of the 37 participating WIC agencies (73%) returned 1,287 valid questionnaires (out of 3,700 distributed to WIC agencies) representing a 35% overall rate of return. The sample consisted of WIC mothers who were pregnant women, breastfeeding women, and non-breastfeeding, mostly white, unmarried, between the ages of 18 and 50, with mostly a high school education. The median family size was 3 and the median annual income was $12,696.

Nutrition health status was determined from existing data that is routinely collected by WIC. The data was extracted from the WIC State database "M-TRACX" using the WIC identification number of the respondents completing a questionnaire. This data included information pertaining to the participants' height and weight measures, blood iron levels, medical or clinical conditions and eating habits. In addition, demographic information was obtained including the participants' age, education level, annual income, ethnicity, and marital status.

Data were analyzed using the Statistical Program for the Social Sciences (SPSS), version 12. Four different procedures within this package were used to assist in testing the study hypotheses. Pearson Product Moment Correlations were utilized to compute bivariate coefficients for various pairs of input variables. Frequency analysis with chi-

square was used to determine whether there were differences in the dependent variables for individuals who scored in the top and bottom 25% on the three health locus of control scales and the weight locus of control scale. Multiple Linear Regression procedure was utilized to determine which independent variables (ILOC, PLOC, CLOC, WLOC, Desire, Effort and General Health Belief) contributed most powerfully in explaining the variance in health status (for each health status indicator when calculated as a continuous dependent variable. See Table 4 in the Findings Chapter). Finally, Logistic Regression procedure was used to estimate a model to determine the independent (predictor) variables, which most influence health status (calculated as a dichotomous dependent variable). These procedures were thought to be well suited for the objective of this investigation.

Results

Mothers' internal health belief scores (ILOC) were most positively correlated with effort to improve ($r = 365$, $p < .001$), positive beliefs about one's general health ($r = .305$, $p < .001$) and desire to improve ($r = .242$, $p < .001$). Internal scores were negatively correlated with weight locus of control ($r = -.366$, $p < .001$). Chance scores correlated less with effort to improve ($r = .102$, $p < .001$) than powerful other scores ($r = .281$, $p < .001$) or internal scores. Chance scores shared a weak and insignificant relationship with desire to improve eating habits and general belief about health (desire: $r = .061$, $p < .001$; general beliefs: $r = .090$, $p < .001$). Mothers with external weight locus of control had the highest correlation with chance locus of control ($r = .416$, $p < .001$), followed by powerful others scale scores ($r = .196$, $p < .001$). Desire was negatively correlated with

"non-overweight" ($r = -.103$, $p < .05$), and positively correlated with "not smoking" ($r = .072$, $p < .05$).

While regression analyses produced significant regression equations, internal, powerful others, and weight locus of control scores were not significant independent variables in the models. Overall, the strongest model for predicting health risk factors based on locus of control scores was in determining no depression status, with a chi-square value of 21.104[7df], significant at the .05 level. In addition, 95.6% of the predictions, that is, the match between the observed frequencies and the expected frequencies, were correct. However, only 4% of the variance in the health risk status for depression was explained by the health locus of control scores and other health beliefs. The model for determining the "not Overweight" risk factor was also significant at the .05 level (X2=15.123[7]), with 54% of the predictions correct.

All of the logistic regression models (see Table 12 in the Findings Chapter) increased in chi-square values (with 16 df). Four of the seven models were significant at the .001 level and one, "no hypertension," was significant at the .05 level. The proportion of variance explained also increased yet remained at weak to modest levels (.024-.223), while the percent of correct predictions remained relatively high (.884 – 95.6) for five of the seven models. Desire, effort and general health variables remained significant at the .05 level for not overweight, no depression, no hypertension, and not smoking. In addition, effort was also significantly inversely related to not smoking. However, chance, although still inversely related to not low iron, was no longer significant at the .05 level.

The odds ratios indicate that as values increase in the independent variable, the more likely the event of the dependent variable will occur. In other words, respondents

exhibiting a more internal locus of control, or positive health belief, should more likely have healthier risk status than those scoring in the external direction or those with less positive health beliefs. These results are consistent with earlier results in other analyses and are stated in more detail below.

Conclusions

The objective of the study was to determine the extent to which a relationship exists between health locus of control and nutrition health status with the purpose of gaining a better understanding of the role of locus of control as it relates to nutrition health. Based on the study findings and within the limitations stated in Chapter I of this study, the following three primary conclusions are offered: (A) MHLOC and WLOC scores have no significant relationship with nutrition high risk or non-high risk status of participants; (B) There are significant correlations between desire and effort to improve eating habits, general health belief and LOC scores; and (C) Significant models can be estimated for specific health behaviors when desire, effort, general health belief, MHLOC and WLOC scores are factored into the equation. These conclusions are explained in further detail in the paragraphs below.

A. MHLOC and WLOC scores have no significant relationship with nutrition high risk or non-high risk status.

It was hypothesized that more high-risk WIC mothers would have external scores (lower scores on the internality subscale) than non-high risk mothers. Cross-tabulations among the high risk group of mothers revealed that 4 percent had more external LOC beliefs than internal beliefs. However, the Chi-Square test statistics revealed that there

was no significant relationship between health locus of control scores and high-risk health status. In addition, T-test results showed no difference between high-risk and non-risk mothers. Therefore, the null hypothesis is accepted. It cannot be concluded that participants with an external locus of control will most likely be high-risk or that those with an internal locus of control will not be high-risk for WIC.

(B) There is a significant correlation between desire and effort to improve eating habits, general health belief and MHLOC and WLOC scores.

Although ten percent more WIC mothers scored as having externality beliefs than internality beliefs, the average score on the internality scale was higher than powerful others and chance scale scores. In addition, the average score for general health belief was 8.47 (out of a 2 to12 range), indicating that in general WIC mothers have positive beliefs about their health status and believe they have some level of control over their health status.

More specifically, correlation analysis of each independent variable revealed that desire and effort scores reflect that most WIC mothers desire to improve their eating habits and have made efforts to do so. Correlations between desire, effort and general health beliefs proved these to have stronger relationships to health status than the MHLOC and Weight Locus of Control scale scores.

Internality: WIC mothers who scored high in internality were more likely to desire to improve and make efforts than their counterparts. Internality mothers were also more likely to believe they have control over their weight gain or loss.

Powerful Others: Mothers with locus of control beliefs in powerful others were less likely to make an effort to improve than those with an internal orientation, but were

more likely to make an effort than mothers who believe health status is a matter of chance. Desire to improve eating habits and belief about their health played a weak, but significant role among these mothers.

Chance: There was no significant relationship between chance locus of control and desire or general health beliefs indicating consistency with findings in the literature (Wallston, et. al., 1978), that mothers who belief health status is a matter of chance may exhibit more or less of a desire to improve and vary in thoughts about their own general health.

Weight Locus of Control: The findings indicate that WIC mothers who believe they have less control over their weight may also believe that their weight gain or loss is a matter of chance and therefore are less likely to desire change and make efforts to improve eating habits. Some mothers may cope with these beliefs by developing more positive attitudes or beliefs about their overall health status, while others may not. Those with external beliefs in powerful others may attempt dieting upon the recommendation of doctors or health practitioners or when they are part of a social support group.

(C) Significant models can be estimated for specific health behaviors when desire, effort and general health beliefs are factors.

Health locus of control and other health beliefs and their relationship to nutrition health status were explored using multiple regression analysis. Health status was categorized into four continuous dependent variables: weight, iron level, the number of medical-related risk factors and the number of nutrition-related risk factors. A significant, but weak regression equation was found for each dependent variable with general health belief and desire as factors in all but the iron status equation. Neither

internal, powerful others nor weight locus of control scores were significant independent variables in the equations. Chance locus of control was a significant factor in the weight equation only. The equations also reveal that the number of medically-related and nutrition-related risk factors tend to decrease incrementally as effort, desire and positive beliefs about one's health increases. The results indicate that WIC mothers who have the desire to improve their eating habits, have made some effort to improve, and who have generally positive beliefs about their own health status, are more likely to have normal weight, healthy iron levels and less health risk factors.

Analysis of specific risk factors using logistics regression produced similar results. In this case seven health risk factors were analyzed as healthy or unhealthy. The results indicate that desire to improve eating habits, efforts and general belief about one's health were more sensitive predictors of certain risk factors than the health locus of control subscales. The data suggests that intent to change dietary behavior is a significant factor in determining mothers' overall health status. Healthier mothers showed less desire to improve their eating habits than those who were overweight or depressed. This may have been due to an internal perception that their diets were already nutritionally sound, and therefore they did not intend to change them, whereas externally-oriented mothers or those with less positive beliefs about their general health, may have felt their diets needed to be changed. There also appears to be a distinction between desire to improve and making efforts to do so in terms of specific health risks. Those who did not suffer from depression made greater efforts to improve compared to their counterparts.

The overarching conclusion of this study is that MHLOC scores and WLOC scores account for only a small amount of significant variance in nutrition health. Desire,

effort and general belief about one's health appear to be more significant predictor variables in explaining the variance in nutrition health status. Other variables identified as contributing to some of the explained variance in specific health status were: the number of health risk factors an individual has and the specific type(s) of health risk factor(s), i.e., anthropometric, blood-iron level, medical health risks or nutrition health risks.

Relating the Findings to the Literature

Many health professionals have attempted to explain the reasons for health behavior but have shown the task to be very complex and challenging (Schiller and Fox, 1999; Contento, 1995; Stainbrook & Green, 1982). Researchers have been able to explain only about 37 percent of the variance in healthy and unhealthy practices among selected variables (Ross, 1981; DiMarco 1985). Much unexplained variance still exists. Locus of control and health locus of control have been studied in past research investigations which have revealed significant but contradictory findings. While some studies show significant health differences among populations based on their locus of control orientations (Anger, 1988; Lefcourt, 1991; Koger, 1999), others reveal that no significant relationship exists between behaviors and locus of control (West, 1980; DiMarco, 1985; McGowan 1989. Other studies suggest that locus of control may be situation-specific in that beliefs may vary with respect to the behavior in question. An individual may possess an internal orientation in one situation and an external orientation in another (Rotter, 1966; Wallston and Wallston, 1978).

In recent years, health educators have become attracted to investigating a new generation of internal variables, such as attitudes, self-esteem, empowerment and stages

of change (Stainbrook and Green, 1982; Zimmerman, M., 1995; Prochaska, 1982). Anger (1988) found that social norms and attitude toward personal control over eating habits were significant components in explaining variation in locus of control. These studies recommend that future research examine the relationship between specific health behaviors or related health behaviors, behavior intention and overt behavior with respect to these variables.

This study attempts to fill in the gap by studying nutrition-related health behaviors and desire and effort to improve eating habits along with locus of control scores. The results of this study are consistent with the literature in that locus of control scores may be context specific, even within types of health risks and health behaviors (Wallston, et al.; 1978, 1981; Steptoe, 2001). A somewhat disappointing result was that neither health locus of control nor weight locus of control were strong independent variables in accounting for the variance in general or specific health status variables. The multidimensional health locus of control scale, which measures internal, powerful others, and chance reinforcements, did not demonstrate that it was a powerful element in explaining much of the variance in high risk or non high risk health status or in selected health behaviors such as smoking, overweight, depression and hypertension. However desire, efforts to improve and belief about one's health in general turned out to be strong contributors to the variance in health status. These results suggest a deeper and more basic level of understanding behavior change.

Recommendations

What Can WIC Learn from These Findings?

Inferences from this study can be channeled into health education and intervention methods. Studies show that more education is directly related to better life circumstances and life expectancy; therefore, the objective of health education is to develop learning activities which will trigger intrinsic motivation to engage in behaviors associated with a healthy lifestyle (Green, Kreuter, Deeds, & Partridge, 1980). This knowledge-attitudes-practice paradigm has evolved from evidence that the control and maintenance of chronic diseases involve complex methodologies (Schiller and Fox, 1999). Consequently, examination of variables such as health locus of control, beliefs about one's health status, desire and efforts, and the identification of their roles in particular health behaviors will serve as an insight into effective educational methodologies. Therefore, health education professionals should first determine the role and impact of these attitudinal and belief variables such as desire and effort before developing and implementing activities focusing on specific psychological constructs, such as health locus of control or stages of change. DiMarco (1985) found that variables such as these have largely been avoided by the health education profession in deference to building health education programs on a single popular theoretical framework.

The WIC program has recently begun nutrition intervention and assessment based on Prochaska's Stages of Change theory. The model assumes that a problem exists and there is a need to change. If the participant does not see her behavior or health status as a problem, the stages of change model categorizes her in the pre-contemplation stage, a stage in which she may be in denial or unaware that a problem exists. Results from this

study reveal that there may be another, deeper dimension (or precursor to pre-contemplation). For example, if one's health status has not caused her any discomfort socially or physically and she feels comfortable, e.g., with her weight, then she is neither in denial nor unaware. Instead she may be empowered at her current status, perhaps feeling that she could change if she so desired. This belief status is more likely to be found among internally-oriented participants regardless of their health status.

Anderson et al, (1994) suggested that locus of control and desires for control using the Multidimensional Health Locus of Control (MHLC) scales be examined more closely for possible overlap. This research study contributes to the literature by focusing on the relationship between locus of control, nutrition health status and two specific attitudinal variables: desire and general health belief, and an action variable: effort. A better understanding of the links among locus of control, desire and effort to improve eating habits and nutritional health status suggests the need for improved design of nutrition education programs. This research also supports WIC's policy that nutrition assessment should be client-centered. Practitioners should not only identify eating patterns that are associated with diet quality, but may also link these to psychosocial characteristics of WIC participants. Results of the study point to the possibility of better WIC methods of nutrition education delivery based on the participant's beliefs about their general health, desire and efforts to change.

Policy Implications

In the broader context of public administration, findings from this study and changes in service delivery can hopefully contribute to policy planning, effective service delivery, effective outcomes, and efficient use of resources. Recommended modifications

in the WIC program include enhancing the interview portion of the client's nutrition assessment, tailoring nutrition education topics based on the participant's desire and effort to improve and socioeconomic status, and broader delivery of nutrition education. Support for these recommendations is described in detail below.

First, more knowledge about the participants' psychosocial needs may help to empower clients to change behavior (Wallston and Wallston, 1978; Perkins and Zimmerman, 1995; Abusabha, 1999). Linking nutrition health status and participants' attitudes about their health and eating habits can help to improve nutrition health assessments and nutrition education. Program interventions should involve interviewing participants about their desire and efforts to improve their eating habits to learn information that may then serve as a positive motivator for change in specific health behaviors.

Second, nutrition education topics and referrals to other health services should be expanded and tailored to the client's general health beliefs, desire and effort to improve as well as their socioeconomic circumstances and anthropometric, blood-iron, medical or nutrition risk factors. In this study no significant differences were found between risk status (high risk or non-high risk) and locus of control beliefs. Therefore, the current practice of ordering nutrition education by risk status as an effective program element in WIC was thus not substantiated. Results of this study found that most participants believed that they are generally healthy, despite nutrition risk factors. These results suggest that some clients do not perceive their nutrition health status as a problem or may other stressors in their lives (which are indirectly related to health), such as lack of cash to pay electricity or heating bills, shelter concerns, stress, domestic or employment issues.

These stressors may take priority over improving dietary habits and may result in mothers' trading long-term benefits for short-term conveniences and stress reducers. Nutrition education topics and referral efforts could be improved to empower clients to create social and economic conditions that help behavior change occur more effectively (Kramer-LeBlanc and McMurry, 1998). WIC may also consider offering nutrition education along with other community based assistance programs to be more effective. Kendal et al (2002) found improved health status of WIC participants when services were collocated with managed-care organizations.

Third, nutrition education delivery strategies should be designed for each locus of control group: internally-oriented participants and externally-oriented participants (powerful other and chance believers) and those who desire to change versus those who do not. While results of this research study did not demonstrate a significant relationship between locus of control and health status, it did identify useful information about clients' own control belief. For example, findings suggests that WIC mothers may feel they have some control over behaviors related to eating habits, moderate control of weight, and less control over medical conditions. Additionally, the literature suggests that each of locus of control group learns differently. Therefore, nutrition education needs to have significantly different approaches in order to be effective. Nutrition education topics on meal preparation, for example, could be delivered in a less intensive environment (such as through the internet), to mothers who may feel empowered to make changes on their own (internally-oriented). Whereas, weight management education or education on specific medical conditions might require a facilitated group discussion or classroom format, for mothers who may need the support of others (externally-oriented). This

modified approach to nutrition education, based on locus of control orientation, may help to explain variations in program success such as why some WIC participants attend nutrition education classes and others do not, or why some clients may move from high risk (HR) status to non-high risk status.

Suggestions for Future Research

This research was a point-in-time study of adult WIC participants in Michigan. Results of the study are limited to WIC participants in Michigan and may not be generalizable to WIC participants in other states. Another limitation is that not all variables that may affect health status, behavior change and locus of control have been studied. Changes over time may produce dramatically different results, as locus of control orientation may be impacted by other environmental influences. Based on these limitations and the conclusions of this study, the following suggestions are proposed.

The inconsistency of results among various studies using the MHLOC scales calls for further research that is tailored specifically to nutrition health. Future research should focus on developing a specific nutrition locus of control assessment tool, and looking more critically at the relationship between nutrition locus of control and health status associated with eating behavior. Holt et al. (2000) also suggest research on tailored nutrition education messages.

The low variance associated with the scores on the three scales suggests a homogenous population, which reduces the probability of significant findings. Further research should focus more on diverse populations of color to assess how cultural characteristics related to nutrition locus of control orientation. This knowledge may also

shed light on the costs and benefits of food choices and how different demographic groups may discount the benefits of nutrition education intervention. For example, West (1980) interviewed both African American and Mexican Americans about their health beliefs and maintenance practices. It was found that both cultures believed that good health is dependent on God and that maintenance is primarily a precautionary measure and an individual responsibility, but not a guarantee even if healthy habits are formed. Holt et al., (2003) found more significant results among African Americans when using the God Locus of Control Scale, than other comparable studies using predominantly white populations.

McCarthy and Shrum (2001) evaluated locus of control and its relation to individualism and collectivism on environmental beliefs and behaviors in the context of consumer purchases and recycling beliefs. They found a correlation between individualistic cultures and internal locus of control orientation and collectivistic cultures and external locus of control orientation. Internally oriented individuals may be motivated by learning individualistic benefits or how their own behavior impacts society as a whole. Externally oriented people may on the other hand be motivated by messages that stress group (family) benefits and how society as whole will benefit from changed behaviors.

This study focused only on adult mothers in the WIC program because research shows that mothers' influence their children's nutrient in-take (Fisher et al., 2000). This study can be expanded to explore the influence of mothers' locus of control orientation and efforts to improve on their children's diets. Additionally, researchers may want to study first time adolescent mothers to determine if this group differs from first time adult

mothers in dietary patterns, desire and efforts to improve and the impact on their children's health.

The concepts of general health beliefs and health-over-time as they relate to assessment of health status should be explored more thoroughly. In 2001, the National Academy of Sciences (NAS) addressed the concepts of positive health beliefs and time as dimensions of health status and behavior. The research states that individuals with positive health beliefs tend to be more resistant to disease, recover more quickly and have better coping strategies (mentally). In their evaluation of quality of life and health status, Smith, Avis and Assmann (1999) found that clients often gave greater emphasis to mental health issues when rating quality of life, and to physical health issues when rating health status. This may suggest that WIC participants with little desire and effort to improve eating habits may be reacting to a lack of physical unhealthy symptoms.

NAS (2001), states that current wellness or illness must be considered together with prospects for the future. In WIC, participants' and nutrition practitioners' perception of health and time could have dramatic impact on the effectiveness of interventions. Nutrition education often consists of the long-term benefits of healthy eating habits, while WIC mothers may only be thinking in short-term intervals. For example, a WIC mother with iron deficiency may feel her health status is good today, and therefore may not be as concerned with long-term outcomes, thus, reinforcing a disconnection between nutrition education and meaningfulness to the client. Further research should be explored to determine how health-over-time perceptions impact behavior change interventions for both short-term results and long-term outcomes.

Summary

Past and current research on health locus of control theory consistently reports that health-related behavior is complex and dictated by many factors. Researchers must continue to strive for better measurement techniques in order to understand the conditions in which education and intervention programs might be most effective in bringing about change. On-going research is still needed to understand how to effectively use locus of control theory to maximize its benefits to help clients achieve positive results.

With respect to nutrition education, researchers suggest that efforts should not focus on one specific theory or variable (e.g., locus of control, or stages of change), but rather on aggregate effects of antecedents of health behavior.

APPENDIX A

INFORMED CONSENT DOCUMENT

Western Michigan University

School of Public Affairs and Administration

The Relationship between Locus of Control and Nutrition Health Status of WIC Adult Participants

Student Investigator: Damita J. Zweiback

Dear WIC participant:

My name is Damita Zweiback. I am a doctoral student at Western Michigan University (WMU) in Kalamazoo. I am studying health beliefs among WIC participants to learn how the WIC program can improve its services. One way to do this is to learn what participants think and feel about their health.

You have been invited to participate in this project. To participate you must complete a 1-page survey. The survey asks for the last grade you completed in school and about your beliefs about health. The information you give is confidential. That means that your name will not appear on the survey and papers will be stored in locked files. Every effort will be made to protect the risk of someone determining who you are and what you have said. Being in this study will not change your WIC benefits and you may stop participating at any time.

If you begin to feel uncomfortable while completing the survey, you may stop right away and ask to speak with a WIC staff person. You may also ask to complete the survey in private.

Your name and WIC ID **will not** be included in any reports about this study. These reports will be shared with staff at WMU and the State WIC Office in Lansing. If you have any questions or concerns about this study, or if you would like to obtain a copy of the general findings and your scores, you may contact me at 517-335-8545 or Dr. Peter Kobrak at WMU at 269-343-1825. You may also contact Dr. Mary Lagerwey, Chair of the Human Subjects Institutional Review Board at 269-387-8293 or Dr. Jack Luderer, WMU Vice President for Research at 269-387-8298 with any problems or concerns you have during the study. Your participation in this study will help to improve WIC services in Michigan.

This consent document has been approved for use for one year by the Human Subjects Institutional Review Board as indicated by the stamped date and signature of the board chair in the upper right corner. Do not participate in this study if the stamped date is more than one year old.

Your signature below indicates that you have read and/or had explained to you the purpose and requirements of the study and that you agree to participate.

Participant Signature: _____ Date:_____

Consent obtained by: _____ Date:_____

Initials of the Researcher (Damita J. Zweiback)

APPENDIX B

LOCUS OF CONTROL SCALES

(For simplification, all items have been merged into a single form in Appendix.)

WIC FAMILY ID#:_____**Today's Date:**_____

Highest School Grade Completed:_____**(1-15+)**

Instructions: Each item below is a belief statement about your medical condition with which you may agree or disagree. Beside each statement is a scale which ranges from strongly disagree (1) to strongly agree (6). For each item, we would like you to circle the number that represents the extent to which you agree or disagree with that statement. The more you agree with a statement, the higher will be the number you circle. The more you disagree with a statement, the lower will be the number you circle. Please make sure that you answer **EVERY ITEM** and that you circle **ONLY ONE** number per item. This is a measure of your personal beliefs; obviously, **THERE ARE NO RIGHT OR WRONG ANSWERS.**

1=STRONGLY DISAGREE (SD) 2=MODERATELY DISAGREE (MD) 3=SLIGHTLY DISAGREE (D)	4=SLIGHTLY AGREE (A) 5=MODERATELY AGREE (MA) 6=STRONGLY AGREE (SA)

			MD	D	A	MA	SA
1	If I get sick, it is my own behavior that determines how soon I get well again.	1	2	3	4	5	6
2	No matter what I do, if I am going to get sick, I will get sick.	1	2	3	4	5	6
3	Having regular contact with my physician is the best way for me to avoid illness.	1	2	3	4	5	6
4	Most things that affect my health happen to me by accident.	1	2	3	4	5	6
5	Whenever I don't feel well, I should consult a medically trained professional.	1	2	3	4	5	6
6	I am in control of my health.	1	2	3	4	5	6
7	My family has a lot to do with my becoming sick or staying healthy.	1	2	3	4	5	6
8	When I get sick, I am to blame.	1	2	3	4	5	6
9	Luck plays a big part in determining how soon I will recover from an illness.	1	2	3	4	5	6
10	Health professionals control my health.	1	2	3	4	5	6
11	My good health is largely a matter of good fortune.	1	2	3	4	5	6
12	The main thing which affects my health is what I myself do.	1	2	3	4	5	6
13	If I take care of myself, I can avoid illness.	1	2	3	4	5	6
14	Whenever I recover from an illness, it's usually because other people (for example, doctors, nurses, family, friends) have been taking good care of me.	1	2	3	4	5	6
15	No matter what I do, I 'm likely to get sick.	1	2	3	4	5	6
16	If it's meant to be, I will stay healthy.	1	2	3	4	5	6
17	If I take the right actions, I can stay healthy.	1	2	3	4	5	6
18	Regarding my health, I can only do what my doctor tells me to do.	1	2	3	4	5	6
19	In general, I spend a great deal of effort to improve my health.	1	2	3	4	5	6
20	Whether I gain, lose, or maintain my weight is entirely up to me.	1	2	3	4	5	6
21	Being the right weight is largely a matter of good fortune.	1	2	3	4	5	6
22	No matter what I intend to do, if I gain or lose weight, or stay the same in the near future, it is just going to happen.	1	2	3	4	5	6
23	If I eat properly and get enough exercise and rest, I can control my weight in the way I desire.	1	2	3	4	5	6

24	I want to improve my eating habits.	1	2	3	4	5	6
25	I have made a significant effort to change my eating habits	1	2	3	4	5	6
26	At the moment I am in excellent health.	1	2	3	4	5	6
27	In general, I am an extremely healthy person.	1	2	3	4	5	6

Source: Wallston, et. al., 1978; Saltzer, 1982

APPENDIX C

SAMPLE SCREENS FROM WIC M-TRACK DATABASE

<<<< Transaction Screen Management System 8V >>>>

PARTICIPANT INQUIRY

Participant ID: 002234553-01 Action Date: 11/21/2(
WIC Code: P Application Date: 09/30/2(
Last Name: [redacted] First Name: [redacted] MI:

Date of Birth: 10/24/1985 Sex: F
Racial/Ethnic: 1/2 Soc Sec Number: 000-00-0000
Medicaid Number: [redacted] DSS Status: 1
Recertification Date: 03/09/2003 Migrant Status: 2

---

* MEDICAL DATA *

Height: 061/05 In/16ths Weight: 153/00 lbs/oz
Head Circ.: / In/16th
Date of Bloodwork: 10/01/2002 HCT: 00.0 HGB: 10.0
Blood Pressure: -

RISK CATEGORIES:		REFERRAL CODES:	BREASTFEEDING	NUTRITION ED:
1) 201	High Risk: N	1) 52	Now: (Quarter)	Type: 2 Module: 00
2) 331	Prio Stat: 1	2) 04	Ever:	Eval: 1
3) 372		3) 00	How Long:	Prov Init: BJ
4) 400		4) 00	Formula Use:	Prov Cred: 02

APPENDIX D

LETTER OF APPROVAL FROM PROJECT SITE OFFICIAL

JOHN ENGLER
GOVERNOR

STATE OF MICHIGAN
DEPARTMENT OF COMMUNITY HEALTH
LANSING

JAMES K. HAVEMAN, JR
DIRECTOR

January 2, 2003

Western Michigan University
Human Subjects Institutional Review Board
251 W. Walwood Hall
Kalamazoo, MI 49008-5440

Re: Research Approval Letter

This letter confirms that Damita J. Zweiback, who is also a public health consultant with the Michigan Department of Community Health WIC Division, has been given conditional approval to gather data as described in the December, 2002 HSIRB application, for completion of a doctoral dissertation at Western Michigan University entitled "The Relationship Between Locus of Control and Nutrition Health Status of WIC Adult Participants".

The conditions of the approval relate to making changes in the research proposal as discussed with the WIC Data Coordinator and receiving approval from the Human Subjects Institutional Review Committee of the Michigan Department of Community Health. We find the overall direction of the proposal is sound and the results from the study may be found beneficial to program development and potentially improve client services.

Ms Zweiback will follow the protocol outlined below for competing this research project.

- The project dates are January 2, 2003 – December 31, 2003
- Ms Zweiback will seek volunteer agencies to assist in the data collection process and will obtain agency agreements.
- With the assistance of volunteer WIC agencies, Ms Zweiback will administer a 2-page paper and pencil survey to WIC participants for obtaining health locus of control data.
- Ms Zweiback will utilize the WIC M-TRACX database for obtaining existing client information.
- Ms Zweiback will keep all names and other identifying information of each participant of this study confidential.

Please do not hesitate to contact my office if additional information is required by calling 517 335-8951.

Sincerely,

Alethia Carr, Director
WIC Division
Michigan Department of Community Health

AC/cd

2150 APOLLO DRIVE • P.O. BOX 30195 • LANSING, MICHIGAN 48909
www.michigan.gov • (517) 335-8951

DCH-0751 (03/02)

APPENDIX E

HSIRB APPROVAL LETTER

Date: April 4, 2003

To: Peter Kobrak, Principal Investigator
Damita Zweiback, Student Investigator for dissertation

From: Mary Lagerwey, Chair Mary Lagerwey

Re: HSIRB Project Number: 03-02-12

This letter will serve as confirmation that the change to your research project "The Relationship between Locus of Control and Nutrition Health Status" requested in your memo dated April 2, 2003 (changes to consent form to conform with MDCH standards) has been approved by the Human Subjects Institutional Review Board.

The conditions and the duration of this approval are specified in the Policies of Western Michigan University.

Please note that you may **only** conduct this research exactly in the form it was approved. You must seek specific board approval for any changes in this project. You must also seek reapproval if the project extends beyond the termination date noted below. In addition if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the HSIRB for consultation.

The Board wishes you success in the pursuit of your research goals.

Approval Termination: March 20, 2004

Walwood Hall, Kalamazoo, MI 49008-5456
PHONE: (269) 387-8293 FAX: (269) 387-8276

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