

THE CORRELATES OF PHYSICAL ACTIVITY AND DIET QUALITY IN LOW-INCOME  
PREGNANT WOMEN: THE ECOLOGICAL MODEL APPROACH

By

Alicja B. Stannard

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## **PUBLIC ABSTRACT**

### **THE CORRELATES OF PHYSICAL ACTIVITY AND DIET QUALITY IN LOW-INCOME PREGNANT WOMEN: THE ECOLOGICAL MODEL APPROACH**

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Adequate physical activity (PA) and proper nutrition during pregnancy are important factors contributing to the health of the mother and the baby. Healthy pregnant women should engage in at least 150 minutes of moderate activity per week, if not accustomed to vigorous exercise (DHHS). Dietary recommendations for pregnant women are similar to the guidelines for 19-50 year old women: 2 cups of fruit, 2.5 cups of vegetables, 6 oz of grains, 5 oz of protein foods, 3 cups of dairy products, and five teaspoons of oils per day (USDA). Despite the well-established benefits of PA and proper nutrition during pregnancy, most women, particularly low-income pregnant women, do not meet the recommendations. Discrepancies between these recommended and actual behaviors occur due to various factors, which can be classified into three categories: personal (mother's age, socio-economic status, education, etc.), social (social support, social perceptions etc), and environmental (sense of community, access to facilities, etc.). The Ecological Model, a theoretical framework used previously to examine health behaviors, classifies these variables specifically into Intrapersonal (Personal), Interpersonal (Social), and Environmental factors. The overall purpose of this dissertation was to examine factors impacting PA and dietary behaviors in low-income pregnant women based on the Ecological Model framework. Specifically, this study assessed the Intrapersonal, Interpersonal, and Environmental factors that may impact levels of household PA (HPA), Job PA (JPA), Leisure-Time PA (LTPA), and diet quality (DQ).

A sample of low-income pregnant and postpartum women was recruited nationwide using the Research Match online system. Participants completed a questionnaire with five parts: 1) demographics, 2) correlates of PA, 3) correlates of DQ, 4) the International Physical Activity Questionnaire, and 5) a fruit and vegetable intake survey (FV). The questionnaire was self-administered and conducted online using the Qualtrics online platform. Data were categorized for all correlates and all outcome variables (HPA, JPA, LTPA, and DQ). Based on examined correlates, latent factors were created for each Intrapersonal, Interpersonal, and Environmental factor using Confirmatory Factor Analysis. Four Ecological Models were constructed using Structural Equation Modeling.

Data from 109 women were analyzed. LTPA guidelines were met by 42.2% of women and only 12% met FV guidelines. Median HPA was 28 MET-hrs/wk, median JPA 0.2 MET-hrs/wk, median LTPA 6.0 MET-hrs/wk and median FV intake 1.75 cups/day. No significant associations among latent Intrapersonal, Interpersonal, and Environmental factors for HPA, JPA, LTPA, and DQ behaviors were found. Results of this dissertation do not support the Ecological Model as analyzed. It is possible that this form of analysis might not capture the essence and the complexity of PA and DQ behaviors in the most accurate way. However, this analysis was the first attempt to examine the Ecological Model when using such approach in a low-income pregnant population. Future studies, examining larger samples could provide more support for the Ecological Model when considering PA and DQ behaviors during pregnancy.

## **ABSTRACT**

### **THE CORRELATES OF PHYSICAL ACTIVITY AND DIET QUALITY IN LOW-INCOME PREGNANT WOMEN: THE ECOLOGICAL MODEL APPROACH**

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Adequate physical activity (PA) and proper nutrition during pregnancy are important factors contributing to the health of the mother and the fetus. Despite the well-established benefits of PA and proper nutrition during pregnancy, many women do not meet the recommendations, particularly in low-income populations. Discrepancies between the recommended and actual behaviors occur due to various factors, which can be classified into Intrapersonal, Interpersonal, and Environmental variables, constructed according to the Ecological Model. The overall purpose of this dissertation was to examine factors impacting PA and dietary behaviors in low-income pregnant women based on the Ecological Model framework. Specifically, this study assessed the Intrapersonal, Interpersonal, and Environmental factors that may impact levels of household PA (HPA), Job PA (JPA), Leisure-Time PA (LTPA), and diet quality (DQ).

A convenience sample of low-income pregnant and postpartum was recruited nationwide using the Research Match online system. Enrolled participants completed a questionnaire comprised of five parts: 1) demographics, 2) correlates of PA, 3) correlates of DQ, 4) the International Physical Activity Questionnaire, and 5) a fruit and vegetable intake survey (FV). The questionnaire was self-administered and conducted online using the Qualtrics online platform. Descriptive statistics were preformed for all demographic data of the participants, all correlates of PA and diet, all PA data and FV score. Data was categorized for all correlated and all outcome variables (HPA, JPA, LTPA, and DQ). For each

outcome variable, three correlation matrices were created (one for each of the Intrapersonal, Interpersonal, and Environmental factors). Based on established criteria, significant variables were selected to be included in the confirmatory factor analysis (CFA). A CFA model for each Intrapersonal, Interpersonal, and Environmental latent factor was created and model fit was evaluated. Four structural equation models (SEM) models were created and evaluated for predicting HPA, JPA, LTPA, and DQ from the three latent factors.

A convenience sample of 158 women completed the survey with 109 providing complete data for analysis. Of these, median HPA was 28 MET-hrs/wk, median JPA 0.2 MET-hrs/wk, median LTPA 6.0 MET-hrs/wk and median FV intake 1.75 cups/day. While 43% met LTPA guidelines, only 12% met FV guidelines. No significant associations among latent Intrapersonal, Interpersonal, and Environmental factors for HPA, JPA, LTPA, and DQ behaviors were found. It is possible that the latent variables were not well specified by the correlates considered. However, this analysis was the first attempt to examine the Ecological model when using such latent factors in a pregnant population. Our findings suggest the Ecological Model as analyzed in this dissertation might not capture the essence and the complexity of PA and DQ behaviors in the most accurate way. Future studies, examining larger samples and more traditional low-income population of pregnant women could provide more support for the Ecological Model when considering PA and DQ behaviors during pregnancy.

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## TABLE OF CONTENTS

LIST OF TABLES.....	ix
LIST OF FIGURES.....	xi
KEY TO ABBERRIATIONS.....	xii
CHAPTER 1.....	1
INTRODUCTION.....	1
Research Aims... ..	2
REFERENCES.....	4
CHAPTER 2.....	6
REVIEW OF LITERARURE.....	6
Introduction.....	6
Ecological Model.....	7
Summary.....	9
Physical Activity During Pregnancy.....	11
Health Benefits of Physical Activity During Pregnancy.....	11
Physical Activity Habits in Pregnant Women.....	11
A Social Ecological Model of Physical Activity Correlates in Pregnancy.....	12
Intrapersonal Factors Affecting PA Participation.....	12
Relations between Socioeconomic Characteristics and PA Participation.....	13
Relations between Perceived Barriers to PA and Participation.....	16
Maternal Perceptions and Beliefs about PA during Pregnancy.....	16
Interpersonal Factors Affecting PA Participation.....	17
Influence of Social Support, Social Role Strain and Social Perceptions on PA during Pregnancy.....	18
Sources of Information on PA during Pregnancy.....	18
Social Support.....	19
Community/Institutional Factors Affecting PA Participation.....	20
Summary Current Literature on PA and Pregnancy.....	21
Limitations of Current Literature on PA and Pregnancy.....	21
Nutrition In Pregnant Women.....	22
The Use of the Diet Quality Index and Healthy Eating Index.....	22
Diet Quality of Pregnant Women .....	23
Intrapersonal Factors Affecting Diet Quality.....	24
Sociodemographic Factors Affecting Diet Quality.....	24
Knowledge of Nutrition Guidelines and Beliefs on Nutrition Affecting Diet Quality.....	25

Interpersonal Factors Affecting Diet Quality.....	26
Community/Institutional Factors Affecting Diet Quality.....	27
Limitations of Current Literature on Diet and Pregnancy.....	28
Summary of Current Literature on Diet and Pregnancy.....	28
Summary of PA and Diet Quality.....	29
REFERENCES.....	30
CHAPTER 3.....	38
METHODS.....	38
Research Design.....	38
Participants.....	38
Procedures.....	39
Recruitment.....	39
Questionnaires.....	39
Measurements.....	41
Outcome Variables.....	41
Physical Activity Assessment.....	41
Nutrition Assessment.....	43
Independent Variables.....	44
Intrapersonal Variables.....	44
Demographics.....	44
Health Status.....	45
Exercise Self-Efficacy.....	45
Nutrition Self-Efficacy.....	46
Lifestyle Beliefs.....	46
Interpersonal Variables.....	47
Social Support.....	47
Social Perceptions.....	47
Social Roles Strain.....	49
Sources of Physical Activity and Nutrition Information.....	50
Environmental Variables.....	51
Sense of Community.....	51
Healthy Eating Physical Environment.....	52
Barriers and Facilitators.....	52
Barriers to Participation in Physical Activity.....	52
Barriers to Healthy Nutrition.....	54
Facilitators of Physical Activity.....	55
Facilitators of Healthy Nutrition.....	56
Data Analyses.....	57
APPENDICES.....	62
Appendix A: Recruitment Email.....	63
Appendix B: Informed Consent Form.....	64
Appendix C: Screener Survey.....	66
Appendix D: Survey for Pregnant Women.....	74
Appendix E: Survey for Postpartum Women.....	107
Appendix F: IRB Approval.....	142

REFERENCES.....	143
CHAPTER 4.....	151
RESULTS.....	151
Description of Participants.....	151
Correlates of Physical Activity and Diet Quality.....	153
Barriers and Facilitators.....	160
PA and DQ Behaviors During Pregnancy.....	168
Evaluation of the Ecological Models.....	170
Specific Aim 1.....	170
Structural Equation Modeling.....	174
Specific Aim 2.....	176
Structural Equation Modeling.....	177
Specific Aim 3.....	179
Structural Equation Modeling.....	181
Specific Aim 4.....	183
Structural Equation Modeling.....	185
CHAPTER 5.....	187
DISCUSSION.....	187
Sample Characteristics.....	187
HPA Model.....	190
JPA Model.....	194
LTPA Model.....	196
Nutrition Model.....	199
Summary of All SEM Models.....	202
Outcome Measurement Tools.....	204
Study Limitations.....	208
Study Strengths.....	211
Future Research Directions.....	212
Conclusions.....	214
REFERENCES.....	215

## LIST OF TABLES

Table 2.1. Intrapersonal variables influencing PA level in diverse women according to the Social Ecological Model.....	13
Table 2.2. Interpersonal variables influencing PA level in diverse women according to the Social Ecological Model. ....	18
Table 2.3. Community/Institutional variables influencing PA level in diverse women according to the Social Ecological Model. ....	20
Table 2.4. Intrapersonal factors affecting nutritional habits in pregnant women based on the Social Ecological Model.....	24
Table 2.5. Interpersonal factors affecting nutritional habits in pregnant women based on the Social Ecological Model. ....	26
Table 2.6. Community/Institutional factors affecting nutritional habits in pregnant women based on the Social Ecological Model. ....	27
Table 3.1. Classification of the barriers to physical activity according to the Intrapersonal, Interpersonal, and Environmental factors of the Ecological Model. ....	54
Table 3.2. Classification of the barriers to healthy nutrition according to the Intrapersonal, Interpersonal, and Environmental factors of the Ecological Model. ....	55
Table 3.3. Classification of the facilitators of physical activity according to the Intrapersonal, Interpersonal, and Environmental factors of the Ecological Model. ....	56
Table 3.4. Classification of the facilitators of healthy nutrition according to the Intrapersonal, Interpersonal, and Environmental factors of the Ecological Model.....	57
Table 4.1. PA and DQ Intrapersonal variables for the total sample (n=109).....	155
Table 4.2. PA Interpersonal variables for the total sample (n=109).....	157
Table 4.3. PA Environmental variables for the total sample (n=109).....	158
Table 4.4. DQ Interpersonal variables for the total sample (n=109).....	159

Table 4.5. DQ Environmental variables for the total sample (n=109).....	160
Table 4.6. Reported barriers to PA organized according to the Intrapersonal, Interpersonal, and Environmental factors of the Ecological Model and ordered from the most frequently to least frequently endorsed (n=109).....	161
Table 4.7. Reported facilitators to PA organized according to the Intrapersonal, Interpersonal, and Environmental factors of the Ecological Model and ordered from the most frequently to least frequently endorsed (n=109).....	162
Table 4.8. Reported barriers to healthy eating organized according to the Intrapersonal, Interpersonal, and Environmental factors of the Ecological Model and ordered from the most frequently to least frequently endorsed (n=109) .....	164
Table 4.9. Reported facilitators to healthy eating organized according to the Intrapersonal, Interpersonal, and Environmental factors of the Ecological Model and ordered from the most frequently to least frequently endorsed (n=109). .....	165
Table 4.10. PA and DQ habits during pregnancy for the total sample (n=109).....	169
Table 4.11. Variables examined in the confirmatory factor analyses for HPA organized by initially selected and final variables included in the analyses. ....	171
Table 4.12. Results of confirmatory factor analysis of Intrapersonal, Interpersonal, and Environmental factors for HPA.....	173
Table 4.13. Variables examined in the confirmatory factor analyses for JPA organized by initially selected and final variables included in the analyses. ....	176
Table 4.14. Results of confirmatory factor analysis of Intrapersonal, Interpersonal, and Environmental factors for JPA.....	177
Table 4.15. Variables examined in the confirmatory factor analyses for LTPA organized by initially selected and final variables included in the analyses. ....	180
Table 4.16. Results of confirmatory factor analysis of Intrapersonal, Interpersonal, and Environmental factors for LTPA. ....	181
Table 4.17. Variables examined in the confirmatory factor analyses for DQ organized by initially selected and final variables included in the analyses.....	184
Table 4.18. Results of confirmatory factor analysis of Intrapersonal, Interpersonal, and Environmental factors for FV.....	184

## LIST OF FIGUERS

Figure 2.1. Ecological Model adapted from McLeroy et al 1988.....	10
Figure 4.1. Participant flowchart for the total sample. ....	152
Figure 4.2. Frequency of endorsing at least one frequent PA barrier and facilitator in the total sample (n=109). ....	167
Figure 4.3. Frequency of endorsing at least one frequent DQ barrier and facilitator in the total sample (n=109). ....	167
Figure 4.4. Frequency of LTPA and DQ behaviors for the total sample (n=109).....	170
Figure 4.5. Structural Equation Modeling for HPA based on the Ecological Model.....	175
Figure 4.6. Structural Equation Modeling for JPA based on the Ecological Model.....	178
Figure 4.7. Structural Equation Modeling for LTPA based on the Ecological Model.....	182
Figure 4.8. Structural Equation Modeling for DQ based on the Ecological Model.....	186

## KEY TO ABBREVIATIONS

ACOG	American Congress of Obstetricians and Gynecologists
BMI	Body Mass Index
BRFSS	Behavioral Risk Factor Surveillance System
CFA	Confirmatory Factor Analysis
CFI	Cooperative Fit Index
CI	Confidence Interval
DHHS	U.S. Department of Health and Human Services
DQ	Diet Quality
DQI	Diet Quality Index
DWLS	Diagonally Weighted Least Square estimator
EFA	Exploratory Factor Analysis
FFQ	Food Frequency Questionnaire
FV	Fruits and Vegetables
HEI	Healthy Eating Index
HPA	Household Physical Activity
IPAQ	International Physical Activity Questionnaire
JPA	Job-Related Physical Activity
MET	Metabolic Equivalents
NHANES	National Health and Nutrition Examination Survey
LTPA	Leisure-Time Physical activity
PA	Physical Activity

P-ESES	Pregnancy-Exercise Self-Efficacy Scale
PPAQ	Pregnancy Physical Activity Questionnaire
PIN	Pregnancy, Infection, and Nutrition study
RMSEA	Root Mean Square Error of Approximation
SES	Socioeconomic Status
SEM	Structural Equation Modeling
TLI	Tucker Lewis Index
WIC	Women, Infants and Children Supplementary Food Program
WRMR	Weighted Root Mean Square Residual

## CHAPTER 1

### INTRODUCTION

Adequate physical activity (PA) and proper nutrition during pregnancy are important factors contributing to the health of the mother and the fetus. Despite the well-established benefits of PA and proper nutrition during pregnancy, many women do not meet the recommendations [1-3]. Discrepancies between the recommended and actual behaviors occur due to various factors, which can be classified into Intrapersonal, Interpersonal, and Community/Institutional variables, constructed according to the Ecological Model. Some review articles have attempted to bring together results from original studies that examined different correlates of PA, but only one quantitative study has attempted to examine Intrapersonal, Interpersonal and Community factors within the same population [4-6]. No quantitative studies have examined the variables impacting PA and diet quality (DQ) in low- income pregnant women based on the Ecological Model [7]. Since both low-income populations and pregnant women face population specific challenges to PA and healthy diet, using the Ecological Model to describe barriers to health behaviors operating across multiple levels may provide valuable information for future behavioral intervention programs targeting lifestyle changes. Additionally, most studies examining PA have focused primarily on the leisure-time PA (LTPA) but not other types of PA, such as household PA (HPA) and job PA (JPA). Thus, the purpose of this dissertation is to determine the significant factors impacting the level of HPA, JPA, LTPA, and DQ in low-income pregnant women based on the Ecological Model framework.

The Ecological Model variables examined in this dissertation will consist of the following factors and corresponding variables:

- Intrapersonal factors: age, education, employment status, residency status, parity, self-perceived health status, knowledge of PA and nutrition, lifestyle beliefs, self-efficacy, intrapersonal barriers, and facilitators.
- Interpersonal factors: social support, social roles, social perceptions and sources of information on PA and nutrition, as well as interpersonal barriers and facilitators.
- Community factors: safety, access to facilities, sense of community, and community barriers and facilitators.

### **Research Aims**

**Specific Aim 1.** To construct an Ecological Model predicting HPA from Intrapersonal, Interpersonal, and Environmental factors by identifying the latent variables loading on the factors.

**H 1. 1.** It is hypothesized that Intrapersonal and Interpersonal factors will be significant for HPA level.

**Specific Aim 2.** To construct an Ecological Model predicting JPA from the Intrapersonal, Interpersonal, and Environmental factors by identifying the latent variables loading on the factors.

**H 2. 1.** It is hypothesized that Intrapersonal, Interpersonal, and Environmental factors will be significant for JPA; however Intrapersonal factors will be more significant than Interpersonal and Environmental factors for JPA level.

**Specific Aim 3.** To construct an Ecological Model predicting LTPA from the Intrapersonal, Interpersonal, and Environmental factors by identifying the latent variables loading on the factors.

**H 3. 1.** It is hypothesized that Intrapersonal, Interpersonal, and Environmental factors will be significant for LTPA level; however, Intrapersonal and Interpersonal factors will be more significant than Environmental factors for LTPA level.

**Specific Aim 4.** To construct an Ecological Model predicting DQ from the Intrapersonal, Interpersonal, and Environmental factors by identifying the latent variables loading on the factors.

**H 4. 1.** It is hypothesized that Intrapersonal, Interpersonal, and Environmental factors will be significant for DQ; however, Intrapersonal and Interpersonal factors will be more significant than Environmental factors for DQ.

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## CHAPTER 2

### REVIEW OF LITERATURE

#### **Introduction**

While many factors impact the health of pregnant women and the fetus, physical activity (PA) and proper nutrition improve the health and well being of expecting mothers. Healthy pregnant women should engage in at least 150 minutes of moderate activity per week, if not accustomed to vigorous exercise [8]. Women who regularly exercise at high intensity are encouraged to continue with their activities and to maintain open communication with health care providers throughout the pregnancy [9]. Dietary recommendations for pregnant women are similar to the guidelines for 19-50 year old women: 1.5 cups of fruit, 2.5 cups of vegetables, 6 oz of grains, 5 oz of protein foods, 3 cups of dairy products, and five teaspoons of oils (USDA). According to the Dietary Guidelines for Americans (2010), pregnant women should maintain an appropriate energy balance, and they are encouraged to gain weight within the 2009 Institute of Medicine (IOM) gestational weight gain guidelines, which vary based on pre-pregnancy weight status [10, 11].

Despite the well-established benefits of proper nutrition and PA, many women of childbearing age do not meet appropriate nutritional status before, during, and after pregnancy[1]. In addition, epidemiological data from the National Health and Nutrition Examination Survey (NHANES) reported that only 15% of pregnant women meet PA recommendations[3]. These discrepancies between recommended and actual behaviors occur due to a variety of factors. The Ecological model has been proposed to explain health

behavior; however, it is unknown how this framework applies to PA and the nutritional habits of low-income pregnant women.

### **Ecological Model**

The Ecological Model is a comprehensive approach that acknowledges the influence of multiple factors on health behavior and health outcomes. The first Ecological Model, presented by McLeroy and colleagues, focused on the various factors affecting the behavior of an individual [12]. This model is characterized by multiple physical and sociocultural environmental factors classified into five levels: Intrapersonal, Interpersonal, Institutional, Community, and Public Policy (Figure 2.1). Intrapersonal factors refer to the characteristics of an individual, such as knowledge, attitudes, behaviors, and skills. Interpersonal factors include social support systems, such as family, friends, and work groups, as well as formal and informal social networks. Institutional factors include social institutions with organizational characteristics and formal rules and regulations. Community factors are comprised of relationships among organizations, and among institutional and formal networks within defined boundaries. Lastly, Public Policy refers to local, state, and national laws and policies [12]. Various adaptations of the ecological model have been derived from the original model, in order to capture the multilevel approach of specific health behaviors [13, 14]. Well-developed models can identify determinants important for a given behavior and allow researchers to determine interactions among variables and plan effective health interventions.

Previous work has examined the usefulness of the Ecological model on the determinants of PA within a variety of populations. For example, Fleury and Lee [5] provided a descriptive review of the literature on the determinants of PA among African

American women in the context of the Social Ecological Model. The review identified a number of variables within Intrapersonal, Interpersonal, Community, and Organizational factors that could serve as potential leverage points for interventions, based on the authors' qualitative review of the literature. The main Intrapersonal factors related to PA behavior were socioeconomic status, education level, motivational variables, and women's perception of functional ability. Interpersonal factors focused predominantly on social support and social norms. Among the Community factors, access to safe and affordable facilities as well as available resources were considered the most relevant for promotion of PA. Motivation to participate in PA and social support were found to be highly related to increased PA [7]. Limited data was found for the associations between PA and employment status, costs associated with participation in PA, and the implementation of specific PA programs in the community. Although this review was the first Socio-Ecological framework to provide knowledge on various factors impacting PA levels in African American women, participation in PA during pregnancy may be related to additional factors.

The Socio-Ecological Model has been applied less commonly to nutrition. One literature review of twelve descriptive studies examined the factors influencing fruit and vegetable intake among low-income African Americans in the context of the Socio-Ecological Model [6]. Taste preferences, habits, and nutrition knowledge and skills were identified as the main Intrapersonal factors affecting the intake of fruits and vegetables. Culture, social traditions, role expectations, and the dietary patterns of peers, friends and family were described as relevant determinants for Interpersonal factors. Food access and availability were identified as most important Organizational/Community and Public

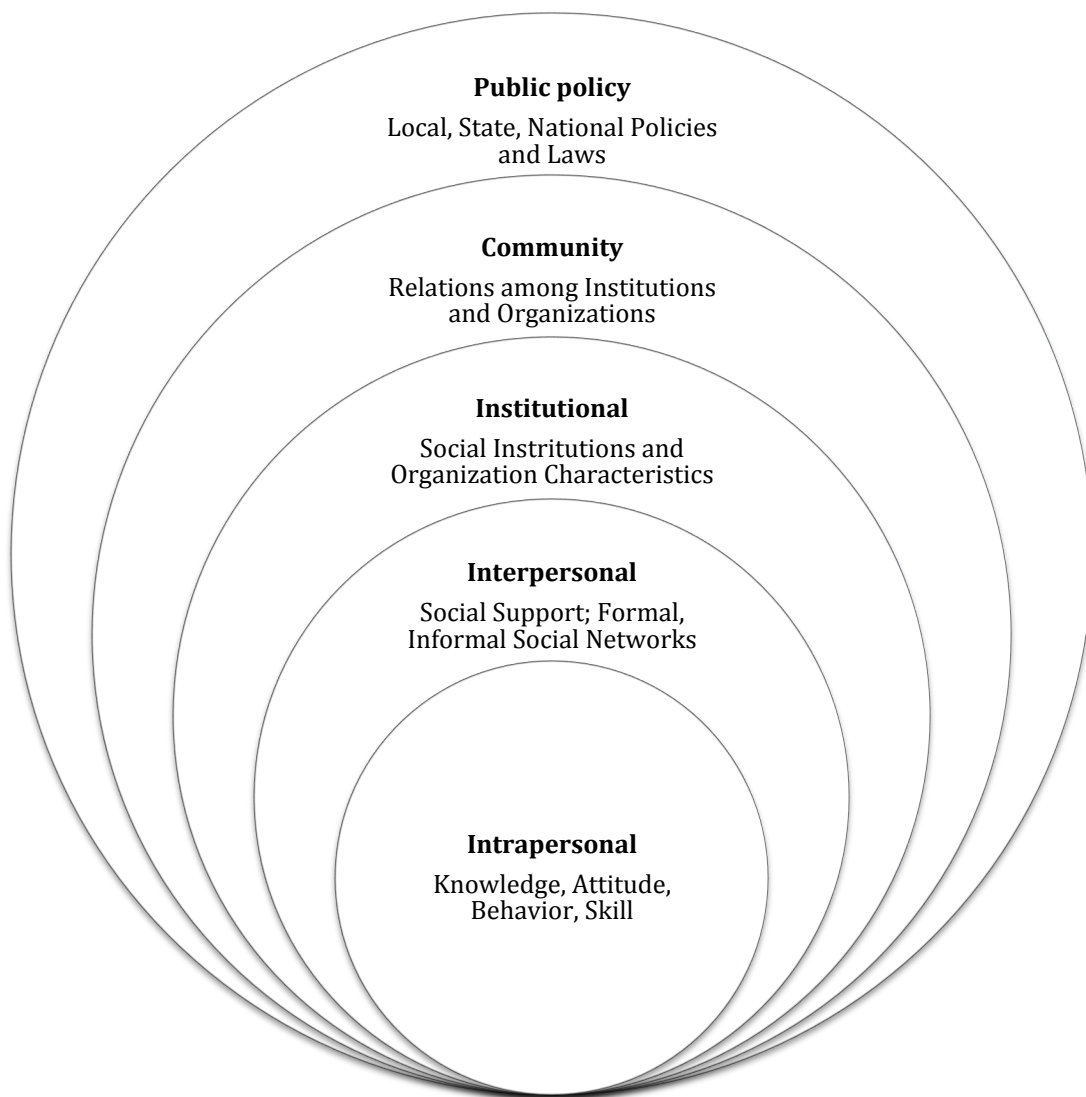
Policy factors. It is expected that these factors will be relevant to pregnant low-income women; however, healthy eating during pregnancy may be associated with additional influences.

An ecological model focusing on the determinants of both PA and nutrition for pregnant low-income women has not been developed. In addition, all previously examined Ecological Models focus on PA, in general, without investigating the associations between various types of PA, such as job PA (JPA), household PA (HPA) and leisure-time PA (LTPA).

### **Summary**

Proper nutrition and PA have an impact on fetal development and maternal health. Since low-income populations are less likely to meet nutrition guidelines and to meet PA recommendation [15], a model examining the determinants of PA and DQ in low-income pregnant women is needed. The Ecological Model is a valuable framework allowing one to identify the determinants of PA and nutrition; however, this model has not been extensively studied in regards to these behaviors among pregnant women.

**Figure 2.1. Ecological Model adapted from McLeroy et al 1988.**



## **Physical Activity During Pregnancy**

### **Health Benefits of Physical Activity During Pregnancy**

Physical activity (PA) is associated with health benefits for the mother and the fetus [16-18]. Leisure-time physical activity (LTPA) during pregnancy has been associated with reduced risk of preeclampsia [19-21], gestational diabetes mellitus [20-22], and preterm birth [19], as well as improved mood and self-esteem [23]. A few studies have demonstrated the benefits of PA on the fetus, such as optimal birth size [24-26], lower fat mass, and better neurobehavioral maturation [27]. Additionally, some evidence has demonstrated PA during pregnancy being associated with lighter and leaner offspring at the age of five compared to women who stopped exercising during pregnancy [28]. Thus, there are both short-term and long-term health benefits of PA during pregnancy.

### **Physical Activity Habits in Pregnant Women**

Despite well-established health benefits, the majority of pregnant women do not meet the recommended amount of PA [8]. Moreover, recent studies have demonstrated that pregnant women are less active than their non-pregnant counterparts [15, 29-31]. Percentage of women who have reported any exercise prior pregnancy has ranged between 63-87.4%, depending on population studied [15]. Participation decreased during pregnancy to only 38-78.4% demonstrating a wide range [15]. Population-based nationwide survey data shows that only 16-23% of pregnant women meet PA guidelines [3, 30]. Despite low participation in PA, there has been a tendency of increased involvement in PA during pregnancy over the last 15 years [3] with approximately two thirds of women reporting some PA during pregnancy [30]. The most common mode of exercise is walking, being preferred by 40-43% of women [3, 32, 33], followed by aerobics classes [32-34],

recreational activities [3], and swimming [32]. Muscle strengthening activities are less common, with only approximately 10% of pregnant women reporting participation [3]. As pregnancy progresses, there is a tendency to decrease the amount of PA with the highest amount of PA participation in the first trimester compared to the third trimester [3, 15].

The majority of research on PA in pregnant women has focused on middle to high socioeconomic status (SES) Caucasian women, but PA behaviors are different between ethnicities and SES [5]. Little is known about the correlates influencing participations in PA in low SES diverse population of pregnant women.

### **A Social Ecological Model of Physical Activity Correlates in Pregnancy**

Symons Downs et al. [4] reviewed empirical evidence for the determinants of prenatal PA in the context of the Ecological Model. In contrary to Fleury and Lee review, the proposed Ecological Model for determinants of prenatal PA was classified into only three factors instead of four: Intrapersonal, Interpersonal, and Environmental/Policy factors [4]. Education, income, parity, prepregnancy BMI, beliefs, attitudes' and decisional balance were identified as the main Intrapersonal factors affecting PA during pregnancy. Social support, social norms, and role modeling were the main Interpersonal factors influencing prenatal PA. Access to facilities, availability of childcare, and the safety of the neighborhood were identified as important Environmental/Policy factors for prenatal PA[4]. It is likely that many of these same factors are relevant to the pregnant low-income population, but there may be several unique influences on PA during pregnancy in low-income population since most of the evidence on PA during pregnancy is based on mid-to-high income Caucasian women. In addition, all evidence focuses on the participation in leisure-time or exercise PA; however, the correlates of job-related or household/caregiving

PA have not been investigated. The following review of correlates of PA during pregnancy is organized according to the Intrapersonal, Interpersonal and Community/Organizational factors of the Social Ecological.

**Intrapersonal Factors Affecting PA Participation.** Intrapersonal factors considered in this dissertation are presented in Table 2.1.

**Table 2.1. Intrapersonal variables influencing PA level in diverse women according to the Social Ecological Model.**

Factor of the Social Ecological Model	Correlates of PA	Supporting Evidence for Pregnant Women
Intrapersonal	Higher Socioeconomic Status	Strong
	Higher Education	Strong
	Nulliparity	Strong
	Higher Self-Efficacy	Strong
	Barriers to Participation	Strong
	Intrapersonal- health-related (Examples: muscle/joint pain, nausea/vomiting etc.)	
	Intrapersonal- non-health-related (Examples: low motivation, too tired)	
	Knowledge, Attitude and Beliefs about PA	Weak
	Self-perceived Health Status	Weak
	Age	Weak
	Marital Status	Weak
	Employment Status	Weak

*Strong- consistent evidence supporting the correlate of PA*

*Moderate- moderate evidence supporting the correlate of PA*

*Weak- low evidence for the support of the correlate*

*NE- Not investigated in pregnant women*

**Relations between Socioeconomic Characteristics and PA Participation.** Studies investigating the influence of Intrapersonal factors on PA in pregnant women have focused primarily on socioeconomic and sociodemographic characteristics, such as age, education level, employment, marital status, parity, socioeconomic status (SES), and ethnicity. It is

unclear whether maternal age is associated with PA level during pregnancy [15]. A few studies indicated that younger mothers under the age of 25 are twice as likely to meet PA recommendations compared to older women [30, 32, 35]. In contrast, several studies have found no relationship between maternal age and PA, while others indicated a positive relationship [15]. The discrepancies between these findings could be related to different cut-off points for classifying women as younger or older (cut-offs between 24 and 35 years old), as well as to differences in the SES of the examined samples. As far as education level, some studies have indicated that mothers with at least a high school diploma are more physically active, compared to mothers who did not complete high school, by up to three fold; however, five studies did not find this association [15].

It is unclear whether marital status and employment status are associated with PA levels during pregnancy [15]. Most studies do not find an association between PA and marital status, but two large studies, the Behavioral Risk Factors Surveillance System and the National Maternal and Infant Health Survey, found married women to be more active than single women [32, 35], while the evidence from the National Health and Nutrition Examination Survey (NHANES) data found single and divorced women to be 1.5 times more active than single women [30]. It is possible that barriers to and facilitators of PA, as well as Community factors, influence these patterns.

Inconclusive associations between employment status and PA levels might occur due to inconsistent types of questions asked regarding employment. Some studies have examined the associations classifying women as employed or unemployed, while other studies have classified women as unemployed, working part-time, or working full-time[15]. It is possible that providing the number of actual hours worked during a typical week

would better reflect the associations between employment status and PA levels. In addition, the physical demands of jobs can have an impact on PA levels and they should be addressed in low-income pregnant women.

Parity has been found to be consistently associated with PA levels. Primiparous women are 60% more likely to be active than multiparous women [32]. Not having children at home is associated with increased PA, compared to women who take care of children [15], while having other children results in lower PA levels [36]. These trends have been demonstrated by both retrospective [37] and prospective studies [34]. In addition, women with multiple gestation are also less likely to be physically active, compared to women with singleton pregnancies [32].

Race and ethnicity has been consistently associated with PA levels. According to the NHANES data, ethnic minorities show lower levels of moderate to vigorous PA compared to non-Hispanic white pregnant women [3, 15]. Hispanic pregnant women engage in less PA by 70%, compared to that Caucasian counterparts [29], while African American women are 40% less active than non-Hispanic white women [38]. A prospective cohort of Hispanic pregnant women from the Massachusetts area found most activities to be related to household/caregiving (50-60%), and less than 10% to LTPA [39]. Interestingly, in this sample of 1,355 gravidas, women with more children were 85% less likely to become inactive during pregnancy. Smaller studies on diverse population of pregnant women have shown that socioeconomic status is positively correlated with PA level during pregnancy [15, 29, 40]. This trend seems to be similar in the United States, Canada, Norway, and New Zealand [15, 28, 37, 40].

***Relations between Perceived Barriers to PA and Participation.*** A small number of studies have addressed perceived barriers to PA, and most research has included qualitative studies on selective populations. Despite numerous Intrapersonal barriers to PA for pregnant women, fatigue, lack of time, and physical limitations (such as swollen ankles and size of the belly) were the three most commonly reported barriers [31, 41, 42]. A prospective study found nausea and vomiting to be common barriers during early pregnancy [41]. In addition to these pregnancy specific barriers to PA, low-income women present additional barriers to PA. A qualitative study performed with twenty-six low-income African American women revealed their lack of motivation to exercise, feelings of fatigue, and low energy as important barriers to PA in low-income populations [43].

***Maternal Perceptions and Beliefs about PA during Pregnancy.*** Because perceived barriers to exercise are important for understanding patterns of PA during pregnancy, the perceived benefits to PA explain PA levels of gravidas as well. Pregnant women vary in their views of the perceived benefits of PA [44]. Inactive women have reported fewer perceived benefits of PA during pregnancy [40], but regardless of PA level, women have reported more benefits than barriers to PA. Common benefits of PA are psychological outlook and improved physical performance[40]. A study of seventy-two post partum women reported that PA during pregnancy improved the mood of 32.8% of the women, increased energy (30%), aided in maintaining fitness level (21.6%), and helped with weight control (18.9%) [45]. In addition, higher self-esteem was associated with higher level PA [46]. Higher self-efficacy was positively associated with perceived benefits, while lower self-efficacy was associated with a greater number of reported barriers [40].

However, this area requires more investigation, especially in ethnically diverse and lower SES populations.

Several studies have examined women's beliefs on the safety of PA during pregnancy. Among 158 Australian women in a prospective cohort, those who believed that low to moderate exercise was unsafe exercised less, while women who believed that gentle exercise was unsafe exercised at lower intensity during pregnancy [31]. Safety concerns regarding higher intensity of exercise were negatively associated with the perceived amount and intensity of PA [31].

In a relatively diverse population of 296 pregnant women, lower education, non-Caucasian ethnicity, and low income were associated with feeling unsafe/unsure about PA during pregnancy [29]. The same study showed eighty-eight percent of women believing moderate exercise was safe but only 36% thought that vigorous exercise was safe [29]. In a larger cohort of 1306 women from the Pregnancy, Infection, and Nutrition (PIN) study, 78% of women felt that women can continue regular exercise during pregnancy, while 68% felt that those who never exercised before could begin being physically active. Additionally, almost all women believed in the benefits of light PA, 73% in the benefits of moderate PA, but only 15% in the benefits of vigorous PA during pregnancy [47]. A different study found that women were concerned that exercise might hurt the baby [48], especially after having fertility treatments or a previous miscarriage [49].

**Interpersonal Factors Affecting PA Participation.** Intrapersonal factors considered in this dissertation are presented in Table 2.2.

**Table 2.2. Interpersonal variables influencing PA level in diverse women according to the Social Ecological Model.**

<b>Factor of the Social Ecological Model</b>	<b>Correlates of PA</b>	<b>Supporting Evidence for Pregnant Women</b>
Interpersonal	Social Support	Strong
	Social Norms	Weak
	Sources of Information	Weak
	Social Perceptions	NE
	Social Role Strain	NE

*Strong- consistent evidence supporting the correlate of PA*

*Moderate- moderate evidence supporting the correlate of PA*

*Weak- low evidence for the support of the correlate*

*NE- Not investigated in pregnant women*

***Influence of Social Support, Social Role Strain and Social Perceptions on PA during Pregnancy.*** Interpersonal factors impacting the activity of pregnant women have not been studied as extensively as Intrapersonal factors. Strong and consistent evidence supports associations between the social support of friends and family and increased PA during pregnancy [4, 50, 51]. Social role strain and Social Perceptions have received little attention in pregnant women. Social Perceptions are defined as social perceptions that could be relevant to PA status and healthy eating. Ainsworth et al. examined these factors in 917 African American predominantly low-income women [7]. Higher score on social perceptions scale indicates more favorable evaluation of women who exercised. Women scoring higher on the Social Perceptions scale exercised more. To our knowledge, social roles strain and social perceptions have not been examined in pregnant women.

***Sources of Information on PA during Pregnancy.*** Although pregnant women are encouraged to maintain communication with health care providers regarding PA during

pregnancy (DHHS, 2008), many women rely on alternative sources of information. Only a couple of studies considered the sources of information on PA among pregnant women. One qualitative study examined women's perceptions of health care providers' advice on PA during pregnancy. Most women received little or no advice from health care providers on PA during pregnancy, or only vague PA recommendations, or were only encouraged to walk for PA [52].

Only one study examined 293 pregnant and postpartum women on the use of the Internet for health information[53]. Half of the sample used the Internet as a resource; 78% of these women reported increasing PA as a result of web searching and higher confidence for being physically active, compared to women who did not use the Internet. The use of the Internet increased confidence in talking to a health care provider about their concerns. All women viewed Google and Yahoo! Sources, but only half of those women trusted the information, and approximately a third of those women reported using government websites [53]. Although the selections of resources based on this study seems encouraging, the study used a convenience sample of non-diverse educated women from a Midwestern metropolitan. The use of the Internet and other means of information on healthy lifestyle in low-income population have not been investigated.

***Social Support.*** The most common Interpersonal barrier to PA during pregnancy is lack of social support [40, 48, 54, 55]. Lower family support for PA, combined with lower self-efficacy, was associated with a greater number of barriers reported by pregnant women. In addition, previously sedentary women reported fewer perceived benefits and more perceived barriers of PA, compared to active women [40]. A qualitative study on low-

income African-American pregnant women found the lack of social support as the most common barrier to PA [54].

### **Community/Institutional Factors Affecting PA Participation.**

Community/Institutional factors considered in this dissertation are presented in Table 2.3.

Various factors within a community have been associated with PA levels in pregnant women. Two qualitative studies found that access to childcare, access to exercise facilities and neighborhood safety were related to increased PA level in pregnant women [4].

Although the sense of community has not been examined in pregnant women, it might be a factor affecting the PA level in low-income pregnant women.

**Table 2.3. Community/Institutional variables influencing PA level in diverse women according to the Social Ecological Model.**

<b>Factor of the Social Ecological Model</b>	<b>Correlates of PA</b>	<b>Supporting Evidence for Pregnant Women</b>
Community/ Institutional	Safety	Moderate
	Access to Affordable Facilities	Moderate
	Resources	Moderate
	Design of Neighborhood	Moderate
	Sense of Community	Weak

*Strong- consistent evidence supporting the correlate of PA*

*Moderate- moderate evidence supporting the correlate of PA*

*Weak- low evidence for the support of the correlate*

*NE- Not investigated in pregnant women*

Common environmental barriers to PA for pregnant women have included neighborhood safety and access to facilities [42]. A study examining barriers to exercise in

the 27-30 weeks of gestation women found unsafe environment to be an important barrier to exercise [42]. In addition, low-income African American women face additional barriers to exercise, including information bias (lack of health care provider guidance), resource barriers (financial constraints, lack of facilities in the neighborhood) and socio-cultural barriers (cultural influence)[54].

### **Summary Current Literature on PA and Pregnancy**

Although being physically active while pregnant is associated with health benefits for the mother and the baby, most gravidas do not meet PA recommendations [30]. Socioeconomic factors are important determinants of PA during pregnancy, with younger, nulliparous, Caucasian, and educated women exercising more [15]. A large volume of research has focused on examining middle- to high-income Caucasian gravidas, but less attention has been given to low SES pregnant women. Low-income diverse women show low PA levels but they spend more time in household and caregiving activities compared to their Caucasian higher SES counterparts [56]. Although the benefits of PA during pregnancy are well documented, a large number of women do not receive advice from health care providers regarding PA [52].

### **Limitations of Current Literature on PA and Pregnancy**

More studies are needed to examine the beliefs and barriers to exercise in low-income women [43, 54]. In addition, very few studies have applied theoretical frameworks to studying PA habits in pregnant women. The Social Ecological Model has been used as a framework in one study on barriers to PA [42]; however, most research has considered only the Intrapersonal factors of the model. Future studies should examine Interpersonal

factors, such as social and cultural influences, on PA level in pregnant women, as well as the impact of Community/Institutional factors among low-income gravidas. Lastly, it is important to understand determinants of non leisure-time PA, including household/caregiving and job-related PA, in order to plan more effective interventions among low-income pregnant women.

### **Nutrition in Pregnant Women**

Maintaining a healthy diet during pregnancy is important for the health of the mother and the fetus. Although nutrient intake, such as folic acid prior to pregnancy, impacts early development of the fetus, optimal nutrient intake during pregnancy is associated with a healthy progression of the pregnancy and better pregnancy outcomes for the mother and the baby [57]. The Dietary Guidelines for Americans 2010 encourages women to gain weight according to the 2009 IOM guidelines by consuming at least 2 cups of fruit daily, 2.5 cups of vegetables, 6 oz of grains, 5.5 oz of protein foods, 3 cups of dairy, and 27g of oils based on a 2000 kcal diet [10]. The Healthy Eating Index (HEI) and the Diet Quality Index (DQI), described below, are commonly used nutrition assessment tools for DQ.

#### **The Use of the Diet Quality Index and Healthy Eating Index**

The DQI is a dietary assessment tool developed by Bodnar and Siega-Ritz [58]. The assessment is validated for pregnant women (DQI-P), and it includes eight components scored on a scale from 0 to 80, with a higher score reflecting higher DQ. The DQI components consist of: percent recommended servings of grains, vegetables, and fruits;

percent recommendations for foliate, iron, and calcium; percent energy from fat; and meal/snack patterning score [58].

The HEI is a valid tool for assessing conformance with federal dietary guidelines [2]. It was originally developed in 1995 by the Center of Nutrition Policy and Promotion, revised in 2006, and updated in 2012 to reflect the 2010 Dietary Guidelines for Americans. The assessment covers twelve dietary components, including total fruit; whole fruit; total vegetables; greens and beans (dark-green vegetables and beans and peas); whole grains; dairy (all milk and soy beverages); total protein foods; seafoods and plant proteins; fatty acids (ratio of poly- and mono-unsaturated fat to saturated fat); refined grains; sodium; and empty calories. A total score of 0-100 is provided, considering food density based scores, and is set using age-sex specific recommendations that are similar per 1000 kcal. A higher HEI score reflects higher DQ and closer compliance with the USDA guidelines. HEI is commonly used to monitor the DQ of the US population and its low-income subpopulation. It is best suited for 24 hour recalls, but can be used with FFQ [59]. HEI has been adapted for use in pregnant population to include increased iron and folic acid recommendations for pregnant women. The alternative HEI-pregnancy (AHEI-P) was developed based on a 130-point scale, with 0-10 points scoring the quality of intake of 13 types of foods and nutrients, where alcohol was excluded, and calcium, folic acid and iron intake were included in the assessments [60].

### **Diet Quality of Pregnant Women**

Many pregnant women do not meet nutrient recommendations. One study on 2,282 Canadian pregnant women found that only 2.5% of participants met all recommendations for nutrient intake based on the DQI-P assessment[61]. However, the percentages of

women meeting recommendations varied based on the country where the data was collected, and the ethnicity and socio-economic status of the gravidas [58, 62-64]. Two large cohorts of American pregnant women scored an average of 70% using the DQI-P and AHEI-P measures [58, 63]. Understanding the determinants of nutritional habits in the context of the Ecological Model is needed to describe the factors impacting DQ among pregnant women (Tables 2.4-2.6).

**Intrapersonal Factors Affecting Diet Quality.** Intrapersonal factors considered in this dissertation are presented in Table 2.4.

**Table 2.4. Intrapersonal factors affecting nutritional habits in pregnant women based on the Social Ecological Model.**

<b>Factors of the Social Ecological Model</b>	<b>Correlates of diet quality</b>	<b>Supporting Evidence for Pregnant Women</b>
Intrapersonal	Income	Strong
	Socioeconomic Status	Strong
	Education Level	Strong
	Parity	Moderate
	Age	Moderate
	Residency status	Weak
	Self-efficacy	Weak
	Knowledge and Beliefs	Inconsistent
	Barriers	Inconsistent

*Strong- consistent evidence supporting the correlate of diet quality*

*Moderate- moderate evidence supporting the correlate of diet quality*

*Weak- low evidence for the support of the correlate*

*NE- Not investigated*

**Sociodemographic Factors Affecting Diet Quality.** Certain Intrapersonal characteristics have been demonstrated to be associated with DQ (Table 2.4). Lower socioeconomic status is generally associated with a lower percentage of women meeting

dietary guidelines, particularly for fresh fruits and vegetables [65] (3). The mean score of the DQI-P for low-income pregnant women is between 50 and 60, but it is consistently lower than the recommended score of at least 80 in a large sample size of 5,862 pregnant women [62, 64]. Women who are older, married, live 350% above the poverty line, are nulliparous and are high school graduates have higher DQI-P scores [58, 61]. In addition, higher consumption of vegetables is typically associated with higher income, higher education level, and increased age [6]. Only one study examined diet quality based on immigrant status and it found women who lived in Canada for less than five years had higher DQ scores compared to women residing in Canada for at least five years [61]. A qualitative study of 21 overweight and obese women found that living in a multigenerational household limited perceived control over food choices [66].

***Knowledge of Nutrition Guidelines and Beliefs on Nutrition Affecting Diet Quality.*** Although knowledge of proper nutrition during pregnancy varies among pregnant women, better knowledge of nutrition recommendations during pregnancy did not translate into better DQ in a sample of 109 Canadian women attending free prenatal clinics [67]. African American low-income pregnant women believed that consumption of fruits and vegetables was healthy for the pregnancy outcome but they chose to consume high fat and high sodium products due to taste, cost, and convenience [66]. In addition, misconceptions concerning food quality leads to overconsumption of certain foods, such as fruit juice, because women perceived these foods as healthy [66].

Social support appears to positively impact DQ during pregnancy. Support from family and friends is associated with improved dietary quality during early pregnancy [67,

68]. Examining both Interpersonal barriers and facilitators to healthy eating habits in pregnant women could clarify the role of social support on DQ.

**Interpersonal Factors Affecting Diet Quality.** Interpersonal factors considered in this dissertation are presented in Table 2.5.

**Table 2.5. Interpersonal factors affecting nutritional habits in pregnant women based on the Social Ecological Model.**

<b>Factors of the Social Ecological Model</b>	<b>Correlates of diet quality</b>	<b>Supporting Evidence for Pregnant Women</b>
Interpersonal	Number of Adults in Household	Moderate
	Social Support	Moderate
	Source of Information	Weak
	Social Roles Social Perceptions	NE NE

*Strong- consistent evidence supporting the correlate of diet quality*

*Moderate- moderate evidence supporting the correlate of diet quality*

*Weak- low evidence for the support of the correlate*

*NE- Not investigated*

Sources of nutrition information may affect DQ. Although a smaller qualitative study of fifty-eight participants found pregnant women were overwhelmed by the amount of nutritional information they received from healthcare providers [52], a systematic review of the quality of nutrition information in gravidas found that women are not receiving sufficient nutrition education during pregnancy [69]. Examining the sources of nutritional knowledge should be addressed in low SES populations since they are less likely to meet nutritional recommendations.

### Community/Institutional Factors Affecting Diet Quality.

Community/Institutional factors considered in this dissertation are presented in Table 2.6.

**Table 2.6. Community/Institutional factors affecting nutritional habits in pregnant women based on the Social Ecological Model.**

Community/Institutional	Cost	Strong
	Nutrition Education	Moderate
	Convenience	Inconsistent

*Strong- consistent evidence supporting the correlate of diet quality*

*Moderate- moderate evidence supporting the correlate of diet quality*

*Weak- low evidence for the support of the correlate*

*NE- Not investigated*

Certain Community/Institutional factors (from now referred to as Environmental factors) play a role in DQ. Studies have found that food environment is related to obesity and diet in the general population, but the proximity of fast food restaurants to pregnant women's homes was not a significant factor determining DQ in Canadian gravidas [61]. A qualitative study of 28 foreign-born low-income Hispanic women living in inner city NY found that the presence of farmers markets increased the consumption of fruits, vegetables, and meats [70]. However, the cost of food was a significant environmental barrier to purchasing more fruits and vegetables during pregnancy in a sample of 92 low-income diverse women [65]. Although healthcare providers perceived nutritional education as important, they did not provide the services due to the lack of time or limited resources [69].

### **Limitations of Current Literature on Diet and Pregnancy**

Although a number of studies have examined various predictor variables in terms of DQ [58, 61, 62, 64], more research is needed to establish the relationships between the variables. In addition, one study found a difference between residency status in Canadian gravidas [61], suggesting a cultural component important in DQ that has not been explored extensively in the US population. Lastly, the Ecological Model has been explored in terms of nutritional factors for general population but specific factors relevant to low-income pregnant women, in the context of the Ecological Model, have not been systematically examined.

### **Summary of Current Literature on Diet and Pregnancy**

Strong evidence exists to support the associations between healthy nutrition and the following variables: socioeconomic status, income, education, and the cost of food. A balanced diet is important for the health of the mother and the baby. Although dietary guidelines for pregnant women are well established, many women do not meet the recommendations, particularly for fruits and vegetables. The quality of diet is directly associated with socioeconomic status, education, and parity, as well as with other Intrapersonal and Interpersonal factors. Knowledge of proper nutrition varies between pregnant women and is often inadequately provided by the health care providers. Also, self-efficacy has not been addressed in the context of DQ in pregnant women and evaluation of DQ not only fruit and vegetable intake, will be important to examine among pregnant low-income women. Research is needed for examining specific Intrapersonal, Interpersonal, and Environmental factors impacting diet in pregnant women, in order to design effective intervention programs, particularly in low-income population.

## **Summary of PA and Diet Quality**

Factors determining either PA level or nutrition habits have been described primarily by literature reviews [4-6], and no study examined Intrapersonal, Interpersonal, and Environmental determinants of PA on the same population of pregnant women [7]. Examining the correlates of PA and nutrition on one sample of pregnant low-income population can clarify some of the conflicting information regarding determinants of PA and nutrition, such as the impact of employment status, marital status, knowledge of PA and nutrition, social roles and environmental factors. Many studies mentioned in the reviews discussed studies from different populations, various population sizes, different study designs and samples from even different countries, making the evaluation of relevant factors problematic. This particularly affected Interpersonal and Environmental variables as culturally specific variables potentially influence these factors the most. Additionally, all reviews of the Ecological Models on PA have focused on general PA level; thus examining PA related to job, household and LTPA can allow us to better understand the influence of determinants during pregnancy in low-income population. Furthermore, only one model examining the determinants of nutrition has been described in a low-income population, but it focused on fruit and vegetable intake, without evaluating DQ. No nutritional model of DQ has been developed for pregnant women. This dissertation will describe influences on PA and diet among pregnant low-income women using the first three factors of the Ecological Model: Intrapersonal, Interpersonal, and Environmental factors. Since both low-income women and pregnant women face population specific challenges to PA and healthy diet, the Ecological Model examining various aspects of PA and DQ can provide valuable information for future behavioral intervention programs targeting lifestyle changes.

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## CHAPTER 3

### METHODS

#### **Research Design**

This dissertation research consisted of a cross-sectional design involving a national convenience sample of pregnant and postpartum low-income women in order to assess Intrapersonal, Interpersonal, and Environmental factors associated with types of PA performed and DQ during pregnancy. This design allowed for a broad recruitment of pregnant low-income women, in order to provide a valuable first look at the correlates of PA and DQ based on the Ecological Model framework in this population. Further, online recruitment increased sample size and decreased subject burden typically associated with on-site data collection.

#### **Participants**

Low-income pregnant and postpartum women were recruited using the Research Match online system. Research Match is a free not-for-profit online registry for researchers and volunteers interested in partaking in research studies. Over 79,900 volunteers are registered with Research Match in the United States, with 71.1% of volunteers being females, as of 7/30/15. At the time of participant recruitment, the Research Match database included 37,050 female volunteers of childbearing age (18-45 years old). Inclusion criteria for participation in the study were maternal age  $\geq 18$  years, being pregnant at the time of recruitment or  $\leq 1$  year post partum, proficiency in English, and being low-income (determined by current self-reported WIC eligibility or a gross income reported at or below 185% of the US Poverty Income Guidelines, based on household size). Postpartum women were included in the study in order to increase sample size. Women

≤1 year postpartum were instructed to answer all questions in regards to their habits at mid-pregnancy.

## **Procedures**

**Recruitment.** Using Research Match, a recruitment email was sent to randomly selected 18-45 year old women volunteers in June, July and August of 2015. Recruitment emails included a brief study description, the approximate time commitment associated with study participation, study inclusion criteria, and information about the incentives for completion of the study (Appendix A). Volunteers interested in the study received a recruitment screener survey via email, which included an informed consent form (Appendix B) followed by a questionnaire addressing eligibility criteria, such as pregnancy status, time since last pregnancy (for postpartum women), WIC eligibility, number of adults and children living in the household, state of residency, and annual household income (Appendix C). For women not reporting current WIC eligibility, household size and income data were used to determine low-income status based on the 2014 Federal Register information. Individuals not meeting the inclusion criteria received a courtesy message acknowledging their interest in the study but not meeting the study criteria. Participants meeting the inclusion criteria received a follow up email with a link to the self-administered online survey.

**Questionnaires.** Enrolled participants completed a questionnaire comprised of five parts: 1) demographics, 2) correlates of PA, 3) correlates of nutrition, 4) the International Physical Activity Questionnaire (IPAQ), and 5) a fruit and vegetable intake survey (FV). The questionnaire was self-administered and conducted online using the Qualtrics online platform. Two versions of the questionnaire were developed: one for pregnant women and

one for postpartum women (Appendices D and E). The postpartum questionnaire was identical to the pregnancy questionnaire, except that it prompted women to recall their mid pregnancy behaviors and attitudes of their most recent pregnancy. The questionnaire for the postpartum women contained a few extra questions about birth outcomes (data not reported).

All communication with study participants was conducted via ResearchMatch, Qualtrics platform and email in order to provide participants with survey links. The use of ResearchMatch and the Qualtrics systems enabled investigators to obtain the collected data over a secure channel. Additionally, after completion of the study, participants had an option to provide a mailing address in order to receive a \$20 gift card as compensation for their time. The study was approved by Michigan State University Institutional Review Board prior to data collection (Appendix F). The surveys were piloted individually among seven individuals prior to distribution to study participants. Five non-pregnant individuals provided written feedback after taking the survey online. Two pregnant women meeting study inclusion criteria completed the survey on a tablet and provided face-to-face feedback to the survey administrator present during the session. Feedback from the pilot was used to make necessary adjustments in question wording and electronic formatting of the survey. In order to unify vocabulary across all questionnaires used in this study and to simplify the survey for the participants, the word “exercise” was replaced with “physical activity” in all instances when adapting validated instruments.

## Measurements

### Outcome Variables

**Physical Activity Assessment.** Self-reported physical activity data were accessed by a long version of the IPAQ. The IPAQ consists of five sections on specific domains of activities, such as work, transportation, household activities including gardening, leisure-time activity, and sitting time [71]. Within each domain, time, frequency, and intensity were recalled to estimate the total time spent in each type of activity. Total PA was calculated based on domain specific scores. IPAQ PA variables were rated separately for walking, moderate- intensity and vigorous- intensity activities (see Appendices D and E). Examples of moderate and vigorous PA, as well as domains of PA, were included in the IPAQ questionnaire instructions. Pregnant women were asked to report their PA from the last seven days. When completing the IPAQ, postpartum women were prompted to recall a typical week at mid-pregnancy.

The IPAQ was not developed to assess PA in pregnant woman, but was primarily evaluated in a diverse population of 15-69 year old adults. However, the Pregnancy Physical Activity Questionnaire (PPAQ) assessing PA in pregnant women does not have as strong reliability and validity data as the IPAQ does in term of the variables of interest. The PPAQ shows poor criterion validity for activity types when compared against the CSA actigraph [72]. The Spearman correlation coefficient between the PPAQ and CSA actigraph ranged between -0.12 – 0.14 for HPA, and between -0.10 – 0.42 for JPA, depending on the actigraph cut points [72]. An acceptable range of validity was found only for exercise ( $r=0.30 - 0.48$  depending on actigraph cut points) and for Total PA ( $r=0.08 - 0.43$ ). Since our study is interested in examining the types of activities such as JPA and HPA, the IPAQ,

instead of the PPAQ, will be used to assess PA in this study. The IPAQ showed good test-retest reliability with coefficients of 0.79 for Total PA and above 0.74 for Job related PA and (90% IC 0.79-0.82) of 0.79. The IPAQ validity against a log book was good:  $r=0.64$  for JPA,  $r=0.47$  for HPA, and  $r=0.58$  for leisure time PA in healthy adults [73].

For the purpose of this dissertation, only selected domains of PA obtained from the International Physical Activity Questionnaire (IPAQ) were analyzed in the context of the Ecological Model variables. Specifically, the Household, House Maintained and Caring for Family domain (HPA), the Job-Related Physical Activity domain (JPA) as well as the Recreation, Sport and Leisure-Time Physical Activity domain (LTPA) were evaluated in the context of the variables relevant to the Ecological Model. The transportation domain was analyzed only for the purpose of descriptive statistics (median and range) and to calculate Total PA. Additionally, data obtained from the IPAQ on the intensity of specific activities, such as the amount of walking, moderate-intensity activities and vigorous-intensity activities, were used only to calculate volume of activity in MET-minutes per week and to generate the descriptive statistics of the sample.

According to the IPAQ scoring protocol, PA data obtained from the IPAQ was calculated as MET-minutes per week [74], using reported frequency and duration, combined with assigned MET values. Estimated MET values were multiplied by reported durations in minutes and frequencies in days per week. The MET values prescribed for the IPAQ are as follows:

- Walking: 3.3 MET (JPA), 3.3 (LTPA), 3.3 (transportation)
- Moderate: 4.0 MET (JPA), 3.0 (HPA-inside chores), 4.0 (HPA-yard chores), 5.5 (HPA-vigorous), 4.0 (LTPA), 6.0 (transportation-cycling)

- Vigorous: 8.0 MET (JPA), 8.0 (LTPA)

MET-min per week values for each domain were calculated by summing walking, moderate, and vigorous MET-min per week scores within the domain.

Total PA in MET-min per week was computed by summing Total JPA, Total HPA, Total LTPA PA, and Total Transportation PA in MET-min per week scores. The data were reported as continuous variables in MET-min per week and converted to MET-hr per week for further analysis. Based on the IPAQ scoring protocol, minimum values for duration of PA included in the calculations were at least 10 minutes of a specific activity. Any responses of less than 10 minutes were scored as zero. Additionally, any sum of activities greater than 960 minutes (16 hours) per day was excluded from the analysis [74]. Women achieving at least 495 MET-min/week of LTPA (at least 150min of walking) were classified as meeting recommendations.

**Nutrition Assessment.** The Fruit and Vegetable intake questionnaire was used to assess DQ during pregnancy. The FV scores were obtained from the National Cancer Institute Five-Factor Screener [75]. This questionnaire was selected for this study because it is low burden to participants, it was validated against the 24- hours dietary recall, and was developed to be administered on a computer [75] This assessment consists of nine questions asking about different types of foods eaten or drank in the last 30 days. Participants were asked to indicate how frequently they consumed each food item in the past 30 days: never, 1-3 times last month, 1-2 times per week, 3-4 times per week, 5-6 times per week, 1 time per day, 2 times per day, 3 times per day, 4 times, per day, or 5 or more times per day (Appendices D and E). Postpartum participants were prompted to recall a typical diet in mid-pregnancy. The screener for FV intake including fries showed

good validity when compared with 24-hour dietary recall. The difference between the 24-hour recall and screener survey was -0.15 ( $r^2$ ) while de-attenuated Pearson Correlation Coefficient was 0.74 and Standard Error of Estimate 0.070 units [75].

The FV questionnaire was scored based on a standard protocol [75]. The frequency reported categorically was converted to the number of times consumed per day and multiplied by participant's age and gender specific portion sizes for each frequency. Lastly, serving sizes of FV were established by multiplying the sum of foods predicting servings and estimated regression coefficients in order to obtain cups of fruits and vegetables per day [75]. Participants consuming at least 5 cups of FV per day were classified as meeting FV intake recommendation.

## **Independent Variables**

### **Intrapersonal Variables**

**Demographics.** Selected items included age (years), height (feet, inches), prepregnancy and current pregnancy weight or mid-pregnancy weight for postpartum women (pounds), education level (some high school, high school diploma/GAD, some college, college graduate), relationship status (married/single/in a relationship), race (White, African American, Asian, Hispanic/Latino, Hawaiian/Pacific Islander, Native/American Indian), and employment status (any/none). Pre pregnancy BMI was calculated from self-reported height and weight information and classified into the following categories: underweight ( $<18.5 \text{ kg/m}^2$ ), normal ( $18.5\text{-}24.9 \text{ kg/m}^2$ ), overweight ( $25\text{-}29.9 \text{ kg/m}^2$ ) or obese ( $>30 \text{ kg/m}^2$ ). Additionally, information on smoking (any/none) and alcohol use (any/none) prior to and during pregnancy was obtained (see Appendices D and E for complete surveys). Women were also asked to indicate parity, number of

pregnancies, and if they had the following health problems: gestational diabetes, pregnancy induced hypertension, preeclampsia, or were on bedrest.

Currently pregnant women reported their gestational week or trimester of pregnancy (first trimester=  $\leq 13$  weeks, second trimester= 14-26 weeks, third trimester=  $\geq 27$ ). Postpartum women were asked to provide information on the number of months since delivery, gestational length of most recent delivery, type of delivery (vaginal/cesarean), birth weight of the baby (pounds and ounces), and maternal weight at the time of birth (pounds) (See Appendix E).

**Health Status.** Overall health status was assessed by one question that asked women to rate their health as excellent, very good, good, fair, or poor [5]. This question was used to assess health status in a population of non-pregnant women by Ainsworth et al. when examining various correlates of PA within the context of the Ecological Model [7]. Health status variables was categorized into three categories: excellent/very good, good, and fair/poor.

**Exercise Self-Efficacy.** The Pregnancy-Exercise Self-Efficacy Scale (P-ESES) developed by Bland et al. [76] was used to assess exercise self-efficacy during pregnancy (see Appendices D and E). Women were asked to rate their exercise self-efficacy during pregnancy for 10-items on a 5-pt scale, ranging from 1 (strongly agree) to 5 (strongly disagree). A total mean score was calculated based on provided responses, with total possible scores ranging from 1 to 5. Internal consistency (Alpha) of P-ESES was previously established as good, with an overall Cronbach's alpha coefficient of 0.838 with an exception of question 8, which was excluded from the analysis [76]. Construct validity of the P-ESES determined through a nonrated extrapolatory principal component factor analysis was

acceptable at 0.407-0.71 [76]. Exercise self-efficacy was categorized into High (mean score = 3-5) or Low (mean score = 1-2.9) categories.

**Nutrition Self-Efficacy.** The scale consisted of six questions asking women to report how confident they are regarding the consumption of fruits and vegetables as an indicator of healthy nutrition. Healthy eating self-efficacy for each question was assessed by a 5-point Likert scale from 1 (not confident) to 5 (extremely confident). A total mean score was calculated based on provided responses, with total possible scores ranging from 1 to 5. Reliability of the scale was previously established as good with an Intraclass Correlation Coefficient of 0.70 (CI 95% 0.52-0.82)[77]. Validity of the scale was assessed by comparing healthy eating self-efficacy scores against dietary intake as assessed by the FFQ (Cronbach's alpha of 0.83)[77]. FV self-efficacy was categorized into High (mean score = 3-5) or Low (mean score = 1-2.9) categories.

**Lifestyle Beliefs.** Women rated the importance of performing 10 health behaviors during pregnancy on a 5-point Likert scale, ranging from 1 (not important at all) to 5 (very important), previously used by Clarke et al. (2003) [48]. One item on this questionnaire was modified from "How important is it for a pregnant woman to not drink much alcohol" by deleting the word "much" (See Appendices D and E). A composite score was calculated by summing provided responses, with the total score ranging from 10-50. Higher total scores indicated attitudes that placed more importance on engaging in healthy lifestyle behaviors. The questionnaire was originally developed as an assessment of PA beliefs in general. Data on the reliability and validity of the survey are not available, but the scale was used in previous studies to assess lifestyle beliefs in general and in the female

populations [48]. Lifestyle beliefs were categorized into High (score = 30-50) or Low (score = 10-29) categories.

### **Interpersonal Variables**

**Social Support.** The social support scale for LTPA consisted of 13 questions, and it prompted subjects to recall the frequency of supportive behaviors from friends and family during the previous three months (or at mid-pregnancy) (Appendices D and E) [78]. For each item, women rated their social support of friends and family on a 5-point Likert scale, ranging from 1 (none) to 5 (very often). Social Support was scored separately for friends and family by summing ratings to individual items. Social Support was scored by summing 10 questions (1 through 6 and 10 through 13) for a score ranging from 10 to 50 [78]. Three questions (7-9) were excluded from the analysis based on the scoring protocol [78]. Evidence for test-retest reliability was 0.79 for Social Support scale for Friends and 0.77 for Family while internal consistency (Cronbach's alpha) was 0.84 and 0.91 respectively [13, 78, 79]. Social Support for Friends and Social Support for Family were categorized separately into High (score = 30-50) or Low (score = 10-29) categories.

The healthy eating social support scale consisted of six questions (Appendices D and E). The answers to each question consisted of a 5-point Likert scale, ranging from 1 (almost never) to 5 (almost always). According to standard scoring procedures, a total mean score between 1 and 5 was calculated by averaging responses to individual items. The intraclass correlation coefficient examining the reliability of the scale has been shown to be 0.68 [77]. Healthy eating social support was categorized into High (mean score = 3-5) or Low (mean score = 1-2.9) categories.

**Social Perceptions.** Social Perceptions for PA was assessed by a scale originally developed by Lengacher et al. [80] and modified by Eyler et al. [81] to adapt questions to a population of diverse 20-50 year-old women. A previous study has shown good reliability of the Social Perceptions scale for PA among a sample of 344 women (ICC=0.68; 95% CI, 0.61-0.74) [56]. The assessment of Social Perceptions included two types of questions (see Appendices D and E). The first set of items included three questions on women's familiarity with people who are physically active. Although the original scale included only two questions on familiarity with active people, the current investigators added one question specific to pregnancy: "Do you know any pregnant women who are physically active". The answers to each question were rated a 4-pt scale corresponding to the following options: a lot, some, a few, and none at all.

A second set of questions examining the Social Perceptions asked women to rate their feelings and reactions to seeing pregnant women being physically active. These five questions were modified by Eyler et al. [81] from the original study [80]. In our study, the questions were further modified to apply to the pregnant population. Phrasing "If I see a women exercising" was replaced by "If I see a pregnant woman being physically active" in all questions. All five questions included a 4-point Likert scale, ranging from 1 (strongly agree) to 4 (strongly disagree). One of the original statements, "When I see a pregnant woman exercising, I think she has diabetes", was replaced by "If I saw a pregnant women being physically active, I think she would be hurting the baby" (see Appendices D and E). Based on the 4-point Likert scale answers, a composite score was calculated by summing responses to all five questions. Both sets of questions (familiarity with physical activity and perceptions of active women) were combined creating a mean score ranging between

1 to 4, which was consistent with a scoring method used by Eyler et al [81]. Higher scores indicated more favorable evaluations of women who were active. Social Perceptions scores for PA were categorized into High (mean score = 2.5-4) or Low (mean score = 1-2.4) categories.

In the absence of a similar Social Perceptions scale for nutrition, the investigators modified the Social Perceptions scale for PA to evaluate the relationship between social perceptions and DQ. These questions were structured similarly to the Social Perceptions scale used to evaluate PA and the expression "being physically active" was replaced by "eating healthy". Face validity of the Social Perceptions scale for healthy eating habits was established by two nutrition content experts. Social Perceptions for healthy eating scoring was calculated the same as described above for Social Perceptions of PA (mean score ranging from 1-4). Social Perceptions scores for healthy eating were categorized into High (mean score = 2.5-4) or Low (mean score = 1-2.4) categories.

**Social Roles Strain.** Social roles strain for PA was assessed by the scale originally developed by Lengacher et al [80] and modified by Eyler et al [81] to tailor the questions to a population of diverse 20-50 year-old women. The scale consisted of nine Likert scale items on statements such as "If you wanted to be physically active, childcare responsibilities would get in the way" and "If you wanted to be physically active, what your partner or husband might think about you would get in the way" (see Appendices D and E). The answers to each statement ranged from 1 (strongly agree) to 4 (strongly disagree). A mean score was calculated by averaging provided responses, with total possible scores ranging from 1 to 4 [56]. A higher score indicated a lower social role strain. A previous

study of a diverse group of 20-50 year old women reported a good reliability of the scale (ICC=0.64, 95% CI, 0.56-0.71) [56]. The Social Roles Strain variable was categorized into High (mean score = 2.5-4) or Low (mean score = 1-2.4) categories.

In the absence of a similar Social Roles Strain scale assessing nutrition, the investigators modified the existing Social Roles Strain scale for PA to evaluate the relationship between social strain and DQ. Each statement from the Social roles scale was modified by replacing “If you wanted to be physically active,...” by “If you wanted to eat healthy,...”. In addition, two statements were removed, due to not being relevant to healthy eating: “..., household tasks like cooking and cleaning would get in the way” and “..., feeling guilty for taking time for yourself would get in the way”. However, one statement specific to food culture was added: “If you wanted to eat healthy, feeling guilty for giving up certain cultural/comfort foods would get in the way”. The answers to each statement ranged from 1 (strongly agree) to 4 (strongly disagree). A mean score was calculated based on the provided responses, with total possible scores ranging from 1 to 4. Face validity of the Social Roles scale for healthy eating habits was established by two nutrition content experts. The Social Roles Strain score for nutrition was categorized into High (mean score = 2.5-4) or Low (mean score = 1-2.4) categories.

**Sources of Physical Activity and Nutrition Information.** Women were asked to identify all possible sources of information they used when seeking advice on nutrition or PA during pregnancy. Results from a quantitative study of sources of information on PA during pregnancy indicated that the most common sources of information are: books/magazines, health professionals, and friends/family [48]. More recent studies have examined the use of the Internet by pregnant women [53] and health care providers’ role

in the education of pregnant women on PA and proper nutrition [82]. Based on these results, a list of possible sources of information was created, grouping online sources into blogs/social media, .gov websites, and .com sources. Other sources of information included health care practitioners', friends/family, books/magazines and WIC. A list of eight possible sources of information on PA and a list of eight possible sources of information on nutrition was provided to the participants. Women were asked to check all options that applied to them (see Appendices D and E). Most frequently used sources of information were used in further analyses. The sources of information were classified into Yes/No categories depending whether a participant indicated using a particular source. Binary variable (Yes/No) was also created for responses "do not look" for information.

### **Environmental Variables**

**Sense of Community.** The sense of community was examined by using the sense of community perception scale [83] that has shown good reliability among non-pregnant women (ICC=0.79) [56]. One question, "Your neighbors can be counted on to help if someone is destructive to property in your neighborhood" was removed from the original list of four questions as it was not related directly to the outcome variables. Therefore, the questionnaire used for our study included three Likert scale questions regarding the safety of the neighborhood with responses ranging from 1 (strongly agree) to 4 (strongly disagree). A total mean score was calculated based on provided responses, with total possible scores ranging from 1 to 4. The Sense of Community was categorized into High (mean score = 2.5-4) or Low (mean score = 1-2.4) categories.

In addition to the Sense of Community scale, four questions were asked regarding safety, attending community functions, religious activities in the community, and

socialization with other pregnant women [81, 84]. These questions included Yes/No answers and were analyzed separately from the Likert scale type questions. These four questions as well as the Sense of Community score were used for analysis of both PA and DQ Environmental factors.

**Healthy Eating Physical Environment.** The scale consisted of four questions asking women to indicate how strongly they agree with each question. Specific questions asked women about: (1) having at least one healthy selection to choose from at work, (2) having a wide variety of fresh fruits and vegetables where they shop, (3) having good prices of fruits and vegetables at the stores, and (4) having good quality of fruits and vegetables where they shop. Each item was rated on a 5-point Likert scale (1 indicated “Strongly disagree” and 5 “Strongly agree”). A mean score was calculated based on provided responses, with total possible scores ranging from 1 to 5. Test-retest reliability of the scale was considered good with Intraclass Correlation Coefficient of 0.77 (CI 95% 0.63-0.86)[77]. Validity of the scale was assessed by comparing healthy eating environment scores against dietary intake as assessed by the FFQ (Cronbach’s alpha of 0.68)[77]. The Healthy Eating Physical Environment was categorized into High (mean score = 3-5) or Low (mean score = 1-2.9) categories.

## **Barriers and Facilitators**

**Barriers to Participation in Physical Activity.** Possible barriers to PA during pregnancy included a comprehensive list of 22 barriers reported by previous qualitative studies [42, 45, 50, 54, 55, 85]. Women were asked to rate each barrier on a 3-point scale with 1 indicating “not at all”, 2 indicating “somewhat” and 3 indicating “frequently”.

Additionally, women were able to name a barrier that frequently got in a way from being

physically active during pregnancy but was not included in a provided list (Appendices D and E). The barriers were classified into three categories according to the Ecological model: Intrapersonal, Interpersonal, and Environmental correlates of PA (Table 3.1).

Barriers to PA were scored two ways. Each scoring method examined barriers separately for Intrapersonal, Interpersonal, and Environmental classifications. The first method, created a High/Low barrier variable by classifying each participant who identified at least one barrier as “frequent” (score 3) as a High Barrier category. Participants were classified as Low Barrier when they only rated all barriers as either 1 “not at all” or 2 “somewhat”. For descriptive purposes, we also counted the sum of barriers each participant indicated as frequent (score 3), which created a continuous score ranging from 0 to the value corresponding to the number of total barriers in each Intrapersonal, Interpersonal, and Environmental category.

**Table 3.1. Classification of the barriers to physical activity according to the Intrapersonal, Interpersonal, and Environmental factors of the Ecological Model.**

<b>Barrier Classification</b>	<b>Specific Barrier Example</b>
<b>Intrapersonal</b>	Too tired Lack of sleep Shortness of breath Muscle/joint pain Concern with pregnancy complications Harm to the baby Nausea/vomiting Low motivation Lack of time Lack of enjoyment of being physically active Lack of knowledge about appropriate PA Cost of being physically active
<b>Interpersonal</b>	Lack of childcare Lack of family support Lack of friends' support Overly protective family members Conflicting advice from others Isolation from other people
<b>Environmental</b>	Weather Season of the year Lack of outdoor spaces to be active Lack of indoor spaces to be active

**Barriers to Healthy Nutrition.** Barriers to a healthy diet during pregnancy included a list of 16 selected barriers to healthy eating reported previously [66]. Women asked to rate each barrier to healthy eating on a 3-point Likert with 1 indicating “not at all”, 2 indicating “somewhat” and 3 indicating “frequently”. Additionally, women were able to name a barrier that frequently got in a way of eating healthy during pregnancy but was not included on a provided list. Similarly to PA barriers, all nutrition related barriers were classified into three categories as according to the Ecological Model: Intrapersonal, Interpersonal, and Environmental barriers (Table 3.2). Barriers to healthy nutrition were scored using the same two methods as described for PA barriers.

**Table 3.2. Classification of the barriers to healthy nutrition according to the Intrapersonal, Interpersonal, and Environmental factors of the Ecological Model.**

<b>Barrier Classification</b>	<b>Specific Barrier Example</b>
<b>Intrapersonal</b>	Too tired Lack of sleep Lack of time Do not enjoy eating healthy Lack of knowledge about appropriate nutrition Cost Cravings Food aversions Nausea/vomiting Low motivation
<b>Interpersonal</b>	Lack of family support Lack of friends' support Conflicting advise from others Isolation from other people
<b>Environmental</b>	Season of the year Lack of access to healthy foods

**Facilitators of Physical Activity.** Facilitators of PA included a comprehensive list of 14 selected motivators reported previously in qualitative studies [45, 86]. Women were asked to rate each facilitator that applied to them during pregnancy on a 3-point Likert scale with 1 indicating “would not help”, 2 indicating “help a little”, and 3 indicating “help a lot”. Additionally, women were able to name a facilitator that helped them be more physically active during pregnancy but was not included in the provided list. All pregnancy facilitators were classified into Intrapersonal, Interpersonal, and Environmental facilitators of PA (Table 3.3).

Scoring of the facilitators of PA was performed similarly to scoring of the barriers to PA. Two scoring methods were used to classify participants into High/Low Facilitator categories. Each scoring method examined facilitators separately for Intrapersonal, Interpersonal, and Environmental classifications. The first scoring method classified each

participant who identified at least one facilitator as “help a lot” (score 3) as a High Facilitator. Participants were classified as Low Facilitator when they rated all relevant facilitators as either 1 “would not help” or 2 “help a little”. For descriptive purposes, we also counted the sum of facilitators each participant indicated as “help a lot” (score 3), which created a continuous score ranging from 0 to the value corresponding to the number of total facilitators in each Intrapersonal, Interpersonal, and Environmental category.

**Table 3.3. Classification of the facilitators of physical activity according to the Intrapersonal, Interpersonal, and Environmental factors of the Ecological Model.**

<b>Classification</b>	<b>Specific Example of Facilitators</b>
<b>Intrapersonal</b>	More money More time Easier labor Self-motivation or will-power Healthier diet Fun activities
<b>Interpersonal</b>	Support from family Support from a friend Support of other pregnant women Childcare Doctor’s advice
<b>Environmental</b>	Access to facilities Transportation Good weather

**Facilitators of Healthy Nutrition.** Facilitators of nutrition included a list of 14 selected motivators for pregnant women adapted from previous studies [55, 87] and expanded by additional facilitators that investigators found relevant for pregnant women such as: having a healthy baby. Facilitators to healthy nutrition were evaluated the same way as facilitators to PA on a 3-point Likert scale with 1 indicating “would not help”, 2 indicating “help a little”, and 3 indicating “help w lot”. Additionally, women were able to name a facilitator that helped them eat healthier during pregnancy but was not included in

a provided list. All pregnancy facilitators were classified into Intrapersonal, Interpersonal, and Environmental facilitators of PA (Table 3.4). Facilitators of healthy nutrition were scored using the same two methods as described for PA facilitators.

**Table 3.4. Classification of the facilitators of healthy nutrition according to the Intrapersonal, Interpersonal, and Environmental factors of the Ecological Model.**

<b>Classification</b>	<b>Specific Example of Facilitators</b>
<b>Intrapersonal</b>	Having a healthy baby Having more money Self-motivation or will-power Feeling more energized Not feeling sluggish Having more energy to cook Having someone to cook for me Exercising
<b>Interpersonal</b>	Support from family Support from a friend Support from recently pregnant women Doctor's advice
<b>Environmental</b>	Better access to healthy foods Consistent food supply

## **Data Analyses**

Descriptive statistics and basic sample comparisons were performed using IBM® SPSS® Statistics Version 23.0 software. Confirmatory Factors Analyses (CFA) and Structural Equation Modeling (SEM) were performed using R software and Lavaan package 0.5-15 in R Studio version 3.2.1. For each analysis, alpha level was set at  $p < 0.05$  to determine statistical significance. Descriptive statistics, including means, medians, and standard deviations or percentages, were performed for all demographic data of the participants, all correlates of PA and diet, all PA data and FV score. Distributions of all potential predictor variables were determined and frequency of categories occurring in less than 10% of the sample were collapsed for future analysis.

*Specific Aim 1:* To construct the Ecological Model predicting HPA from the Intrapersonal, Interpersonal and Environmental factors by identifying the latent variables loading on the factors.

This aim was accomplished by: (1) creating three correlation matrices, one for each of the Intrapersonal, Interpersonal, and Environmental factors, (2) selecting variables to include in the CFA based on established criteria, (3) evaluating model fit for each of the CFAs for each of the Intrapersonal, Interpersonal, and Environmental factors, (4) selecting appropriate CFA models, one for each of the factors, and (5) performing SEM on latent variables created in the CFAs and evaluating factor loading for predicting HPA.

Intrapersonal latent variables were composed of some combination of the following variables: age, education, race, pre pregnancy BMI, being on Medicaid, being on WIC, any job, self-perceived health status, pregnancy related health problems, parity, times pregnant, pre pregnancy smoking, pre pregnancy drinking, pregnancy drinking, lifestyle beliefs, PA self- efficacy as well as Total PA and FV intake. Interpersonal latent variables was composed of some combination of the following variables: social support of friends, social support of family, social role strains, social perceptions, PA sources of information from internet .com websites, PA sources of information from the healthcare provider and not seeking information about PA during pregnancy. Environmental latent variables were composed of some combination of the following variables: sense of community, feeling safe, attending community events, attending religious services, and socializing with pregnant women. Each of the variables was defined by questionnaire items. Participants' age was classified into the following categories: 18-24, 25-29, 30-34, or +35. The outcome variable, HPA, was classified into High/Low categories by using a median split.

In steps 1 and 2 of analyses (evaluation of correlational matrices and selection of variables for CFA), all correlations  $>0.8$  were evaluated due to high degree of overlap between the variables. From the two variables, the one correlated with a larger number of other variables was retained for further analysis, while the other variable was dropped. After that evaluation, any variables that significantly correlated with at least one other variable were entered into the CFA model. The exception to this rule was made for the Intrapersonal factors due to a large number of variables in this category. Due to the sample size, only up to 11 variables could be entered into the CFA model for Intrapersonal factors. Those variables were selected by examining the number of significant correlations, and the variables associated with the highest number of correlates were entered into the CFA. To assess model fit for the CFA, Chi-square statistics, Confirmatory Fit Index (CFI), Tucker-Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA), and Weighted Root Mean Residual (WRMR) for categorical data [88]. For Chi-square statistics, model fit was considered a good fit when  $p$  value  $>0.05$  so null hypothesis would not be rejected. However, due to a sample size ( $n < 200$ ) this fit index is not the most reliable indicator of model fit and is rarely used in applied research as a single indicator of model fit [89]. Therefore, primarily CFI, TFI, and RMSEA were used to determine model fit. CFI and TLI values close to or greater than 0.95 were accepted, with  $>0.95$  indicating good model fit [89]. RMSEA values below  $<0.06$  with 90% confidence interval below  $<0.08$  were indicative of a well-specified model and values  $\geq 0.1$  were rejected. Models not meeting above criteria with re-specified using modification indices and theoretical postulations [90]. WRMR  $<0.8$  indicated good model fit [89].

SEM was used to propose the model of HPA predictors. The model consisted of three latent factors: Intrapersonal, Interpersonal, and Environmental. Each of the three latent variables was defined by respective Intrapersonal, Interpersonal, and Environmental factors determined in the CFA. The same model fit indices were assumed as in the CFA. Diagonally Weighted Least Squares (DWLS) were used to estimate the model parameters.

*Specific Aim 2:* To construct the Ecological Model predicting JPA from the Intrapersonal, Interpersonal and Environmental factors by identifying the latent variables loading on the factors.

Same analysis as in Aim 1 was used to assess factors predicting JPA. JPA was categorized into High/Low categories by using a median split.

*Specific Aim 3:* To construct the Ecological Model predicting LTPA from the Intrapersonal, Interpersonal and Environmental factors by identifying the latent variables loading on the factors.

Same analysis as in Aim 1 was used to assess factors predicting LTPA overall. The analysis also included additional LTPA specific variables specific for three latent variables. The additional variables included PA barriers and facilitators for Intrapersonal, Interpersonal, and Environmental factors as well as access to facilities for Environmental factors only. LTPA was classified into 2 categories: Meeting/Not Meeting recommendation of at least 495 MET-min/wk.

Specific Aim 4: To construct the Ecological Model predicting DQ from the Intrapersonal, Interpersonal and Environmental factors by identifying the latent variables loading on the factors.

Same analysis as in Aim 1 was used to assess factors predicting DQ. However, the CFA model included diet specific three latent variables: Intrapersonal, Interpersonal and Environmental variables. Similarly to Aims 1-3, the Intrapersonal latent variable was composed of some combination of the following variables: age, education, race, pre pregnancy BMI, being on Medicaid, being on WIC, any job, self-perceived health status, pregnancy related health problems, parity, times pregnant, pre pregnancy smoking, pre pregnancy drinking, pregnancy drinking, lifestyle beliefs, FV self- efficacy, barriers, facilitators as well as Total PA and LTPA. The Interpersonal latent variable was composed of some combination of the following variables: healthy eating social support, social roles, social perceptions, sources of information on nutrition from internet .com websites, sources of information on nutrition from the healthcare provider, not seeking information about nutrition during pregnancy, barriers, and facilitators. The Environmental latent variables was composed of some combination of the following variables: healthy eating environment, sense of community, attending community events, attending religious services, and socializing with pregnant women, barriers, and facilitators. Each of the variables was defined by questionnaire items. DQ was classified into 2 categories: Meeting/Not meeting daily recommendations of 5 cups of fruits and vegetables.

## **APPENDICES**

## APPENDIX A: Recruitment Email

Recruitment Message for Research Match
<p>A research team with Michigan State University in East Lansing, MI believes you might be a good match for the following study:</p> <p>Are you currently pregnant, or have you recently had a baby in the past 12 months?</p> <p>If so, we are seeking input about your experience.</p> <p>Pregnancy is a special time in woman's life. We would like to invite you to participate in a research study on lifestyle behaviors and attitudes during pregnancy. The purpose of the study is to understand physical activity patterns, nutritional habits and various personal, social, and environmental influences impacting pregnant women. The study is being conducted by the Department of Kinesiology at Michigan State University.</p> <p>In order to be considered for this study, you need to be at least 18 years old and qualify for WIC (the Supplemental Nutrition Program for Women, Infants and Children) . If you decide you are interested, we will contact you to ask you a few more questions to see if you qualify for the study.</p> <p>If you fit the study requirements, you will be sent a link to an online survey that contains questions about your pregnancy experience. Once this survey is completed you will receive a \$20 gift card for your time.</p> <p>If you are interested in this study and having the research team contact you directly, please select the "Yes, I'm interested" link below. By clicking the "Yes, I'm interested" link, your contact information will be released to the research team. If you select the "no, thanks." Link or do not respond to this study message, your contact information will not be released to the research team.</p> <p>QUICK LINK OPTIONS: YES      QUICK LINK OPTION: NO</p> <p>Thank-you for your interest in ResearchMatch.</p>

V14.1 (4-8-14)

## APPENDIX B: Informed Consent Form

### Participant Informed Consent Form

You are being invited to participate in a research study about the lifestyle behaviors and attitudes during pregnancy. Researchers are required to provide a consent form to inform you about the research study, to convey that participation is voluntary, to explain risks and benefits of participation, and to empower you to make an informed decision. You should feel free to ask the researchers any questions you may have.

#### Purpose of the Study

This research project's main purpose is to understand physical activity patterns, nutrition habits and various personal, social and environmental influences impacting low-income pregnant women.

#### Eligibility Criteria

To participate, you must be 18 years or older, be proficient in English, have an income below 185% of US poverty line, and be currently pregnant or delivered a baby within the last 12 months.

#### Study Protocol

Your participation will consist of taking a short survey to ensure you meet the study criteria. When you qualify for the study, our researchers will send you an email with a link to an online survey. The survey will take you 25-45 minutes to complete. You will be asked a series of questions on your pregnancy, physical activity, nutrition, as well as social support, barriers you face and other factors influencing your pregnancy habits. Upon completion of the survey, you will be asked if you would like to complete an additional survey regarding nutrition during pregnancy. If you will be willing to complete another survey, our researchers will contact you via email with a link to an additional survey on nutrition that would take 20-30 min. Total time commitment for completing the entire study including a screener survey, main survey, and an additional nutrition survey will take approximately 70-90 minutes. If you choose to not take the second nutrition survey, the total time commitment is 40-60 minutes. If you meet study criteria and provide your mailing address you will receive a \$20 gift card as compensation for your time.

#### Benefits of Participation in the Study

There may be no potential personal benefits to you, however, your participation in this study may help others in the future. Your participation in this study will assist us in better understanding about behaviors and attitudes towards physical activity and nutrition during pregnancy.

#### Risks of Participation in the Study

The risks associated with your participation are minimal, as you will be using your own electronic device with an ability to connect to the Internet in order to complete the study. Risk is limited to releasing your mailing address to the researchers so that you can receive your gift card(s) for completing the study.

This consent form was approved by a Michigan State University Institutional Review Board. Approved 06/18/15 – valid through 06/17/16. This version supersedes all previous versions. IRB # 15-613.

### **Privacy and Confidentiality**

The data for this project will be kept confidential. Your privacy will be protected to the maximum extent allowable by law.

*a. Data collection.* Data collected from the surveys will be collected on password-protected ResearchMatch and Qualtrics servers.

*b. Data coding.* When data collection is completed (within approximately 2 months), data for all subjects will be uploaded from the servers.

*c. Data storage.* Data will be stored confidentially on a password-protected computer as a password protected file.

*d. Identifiable data.* Upon completion of the survey, you will be asked for a name and address where the researchers could send you a gift card for completing the study. This information will only be used to mail your gift card and will not be associated with your answers. Only your zip code will be associated with your responses.

*e. Data access.* Access to identifiable data will be limited to the principal investigator and study coordinator. There are situations in which a researcher may be compelled to break the confidentiality of subjects (e.g., at the request of MSU Human Research Protection Program) thus no absolute guarantees of confidentiality are possible. Records relating to research such as informed consent documents and identifiable information will be stored for three years following completion of the research as password-protected files.

### **Voluntary Participation**

Your participation in this research study is completely voluntary. You may choose not to participate and/or you may withdraw at any point during the study if you change your mind. If you choose not to provide your mailing address at the end of the survey, we will not be able to mail you the gift cards.

### **Contact Information of the Researchers**

The researchers for this project are: Alicja Stannard, Dr. Lanay Mudd, Dr. James Pivarnik, Dr. Lorraine Weatherspoon, and Dr. Jean Kerver at Michigan State University. If you have any questions about the research study, please contact Alicja Stannard at 815-501-7340, stanna10@msu.edu. If you have concerns or questions about this study, such as scientific issues, how to do any part of it, or to report an injury, please contact Alicja Stannard at 308 W Circle Drive 134, East Lansing, MI 48823, (stanna10@msu.edu or 815- 501-7340.

If you have questions about your rights as a research participant, would like to obtain information or would like to register a complaint about this study, you may contact the Michigan State University's Human Research Protection Program, 408 W. Circle Dr., Room 207 Olds Hall, East Lansing, MI, 48823, (517- 355-2180 or irb@msu.edu).

**By clicking AGREE button below, you indicate your voluntary consent to begin this research by completing a screener survey.**

☐ Agree (*Agree will lead them to the screener survey*)

☐ Do NOT Agree (*will lead them to a screen thanking them for their interest*)

This consent form was approved by a Michigan State University Institutional Review Board.  
Approved 06/18/15 – valid through 06/17/16. This version supersedes all previous versions. IRB # 15-613.

## APPENDIX C: Screener Survey

Q1 Informed Consent Form (*Full text displayed in Appendix B*).

- ☐ Agree
- ☐ Do NOT Agree

If Do NOT Agree Is Selected, Then Skip To End of Survey

Q2 Are you at least 18 years old?

- ☐ Yes
- ☐ No

If No Is Selected, Then Skip To Thank you for partic...

Q3 Are you currently pregnant?

- ☐ Yes
- ☐ No

If Yes Is Selected, Then Skip To Do you qualify for the Women, Infants...

Q45 Did you have a baby within the last 12 months?

- ☐ Yes
- ☐ No

If No Is Selected, Then Skip To Thank you for partic...

Q4 Do you qualify for the Women, Infants, and Children (WIC) program?

- ☐ Yes
- ☐ No
- ☐ I don't know

If Yes Is Selected, Then Skip To Thank you for partic...

Q5 What state do you live in?

- ☐ Alaska
- ☐ Hawaii
- ☐ Other US State

Q6 How many people live in your household (include children and adults)?

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7
- ☐ 8
- ☐ 9
- ☐ 10
- ☐ 11
- ☐ 12+

Answer If What state do you live in? Other US State Is Selected And How many people live in your household (include children and adults)?; 1 Is Selected

Q7 What is your annual household income?

- ☐ At or below \$21,774.50
- ☐ Above \$21,774.50

If At or below \$21,774.50 Is Selected, Then Skip To Thank you for participating in the su...If Above \$21,774.50 Is Selected, Then Skip To Thank you for participating in the su...

Answer If What state do you live in? Other US State Is Selected And How many people live in your household (include children and adults)?&nbsp; 2 Is Selected

Q9 What is your annual household income?

- ☐ At or below \$29,470.50
- ☐ Above \$29,470.50

If At or below \$29,470.50 Is Selected, Then Skip To Thank you for partic...If Above \$29,470.50 Is Selected, Then Skip To Thank you for partic...

Answer If What state do you live in? Other US State Is Selected And How many people live in your household (include children and adults)?&nbsp; 3 Is Selected

Q10 What is your annual household income?

- ☐ At or below \$37,166.50
- ☐ Above \$37,166.50

If At or below \$37,166.50 Is Selected, Then Skip To Thank you for partic...If Above \$37,166.50 Is Selected, Then Skip To Thank you for partic...

Answer If What state do you live in? Other US State Is Selected

Q11 What is your annual household income?

- ☐ At or below \$44,862.50
- ☐ Above \$44,862.50

If At or below \$44,862.50 Is Selected, Then Skip To Thank you for participating in the su...If Above \$44,862.50 Is Selected, Then Skip To Thank you for participating in the su...

Answer If What state do you live in? Other US State Is Selected And How many people live in your household (include children and adults)?&nbsp; 5 Is Selected

Q12 What is your annual household income?

- ☐ At or below \$52,558.50
- ☐ Above \$52,558.50

If At or below \$52,558.50 Is Selected, Then Skip To Thank you for partic...If Above \$52,558.50 Is Selected, Then Skip To Thank you for partic...

Answer If What state do you live in? Other US State Is Selected

Q13 What is your annual household income?

- ☐ At or below \$60,254.50
- ☐ Above \$60,254.50

If At or below \$60,254.50 Is Selected, Then Skip To Thank you for participating in the su...If Above \$60,254.50 Is Selected, Then Skip To Thank you for participating in the su...

Answer If What state do you live in? Other US State Is Selected

Q14 What is your annual household income?

- ☐ At or below \$67,950.50
- ☐ Above \$67,950.50

If At or below \$67,950.50 Is Selected, Then Skip To Thank you for participating in the su...If Above \$67,950.50 Is Selected, Then Skip To Thank you for participating in the su...

Answer If What state do you live in? Other US State Is Selected

Q15 What is your annual household income?

- ☐ At or below \$75,646.50
- ☐ Above \$75,646.50

If At or below \$75,646.50 Is Selected, Then Skip To Thank you for participating in the su...If Above \$75,646.50 Is Selected, Then Skip To Thank you for participating in the su...

Answer If What state do you live in? Other US State Is Selected

Q16 What is your annual household income?

- ☐ At or below \$79,806.50
- ☐ Above \$79,806.50

If At or below \$79,806.50 Is Selected, Then Skip To Thank you for participating in the su...If Above \$79,806.50 Is Selected, Then Skip To Thank you for participating in the su...

Answer If What state do you live in? Other US State Is Selected

Q17 What is your annual household income?

- ☐ At or below \$83,966.50
- ☐ Above \$83,966.50

If At or below \$83,966.50 Is Selected, Then Skip To Thank you for participating in the su...If Above \$83,966.50 Is Selected, Then Skip To Thank you for participating in the su...

Answer If What state do you live in? Other US State Is Selected

Q18 What is your annual household income?

- ☐ At or below \$88,126.50
- ☐ Above \$88,126.50

If At or below \$88,126.50 Is Selected, Then Skip To Thank you for partic...If Above \$88,126.50 Is Selected, Then Skip To Thank you for partic...

Answer If What state do you live in? Other US State Is Selected

Q19 What is your annual household income?

- ☐ At or below \$92,286.50
- ☐ Above \$92,286.50

If At or below \$92,286.50 Is Selected, Then Skip To Thank you for partic...If Above \$92,286.50 Is Selected, Then Skip To Thank you for partic...

Answer If What state do you live in? Alaska Is Selected

Q20 What is your annual household income?

- ☐ At or below \$27,232
- ☐ Above \$27,232

If At or below \$27,232 Is Selected, Then Skip To Thank you for participating in the su...If Above \$27,232 Is Selected, Then Skip To Thank you for participating in the su...

Answer If What state do you live in? Alaska Is Selected

Q21 What is your annual household income?

- ☐ At or below \$36,852
- ☐ Above \$36,852

If At or below \$36,852 Is Selected, Then Skip To Thank you for participating in the su...If Above \$36,852 Is Selected, Then Skip To Thank you for participating in the su...

Answer If What state do you live in? Alaska Is Selected

Q22 What is your annual household income?

- ☐ At or below \$46,472
- ☐ Above \$46,472

If At or below \$46,472 Is Selected, Then Skip To Thank you for participating in the su...If Above \$46,472 Is Selected, Then Skip To Thank you for participating in the su...

Answer If What state do you live in? Alaska Is Selected

Q23 What is your annual household income?

- ☐ At or below \$56,092
- ☐ Above \$56,092

If At or below \$56,092 Is Selected, Then Skip To Thank you for participating in the su...If Above \$56,092 Is Selected, Then Skip To Thank you for participating in the su...

Answer If What state do you live in? Alaska Is Selected

Q24 What is your annual household income?

- ☐ At or below \$65,712
- ☐ Above \$65,712

If At or below \$65,712 Is Selected, Then Skip To Thank you for participating in the su...If Above \$65,712 Is Selected, Then Skip To Thank you for participating in the su...

Answer If What state do you live in? Alaska Is Selected

Q25 What is your annual household income?

- ☐ At or below \$75,332
- ☐ Above \$75,332

If At or below \$75,332 Is Selected, Then Skip To Thank you for participating in the su...If Above \$75,332 Is Selected, Then Skip To Thank you for participating in the su...

Answer If What state do you live in? Alaska Is Selected

Q26 What is your annual household income?

- ☐ At or below \$84,952
- ☐ Above \$84,952

If At or below \$84,952 Is Selected, Then Skip To Thank you for participating in the su...If Above \$84,952 Is Selected, Then Skip To Thank you for participating in the su...

Answer If What state do you live in? Alaska Is Selected

Q27 What is your annual household income?

- ☐ At or below \$94,572
- ☐ Above \$94,572

If At or below \$94,572 Is Selected, Then Skip To Thank you for participating in the su...If Above \$94,572 Is Selected, Then Skip To Thank you for participating in the su...

Answer If What state do you live in? Alaska Is Selected

Q29 What is your annual household income?

- ☐ At or below \$99,772
- ☐ Above \$99,772

If At or below \$99,772 Is Selected, Then Skip To Thank you for partic...If Above \$99,772 Is Selected, Then Skip To Thank you for partic...

Answer If What state do you live in? Alaska Is Selected

Q30 What is your annual household income?

- ☐ At or below \$104,972
- ☐ Above \$104,972

If At or below \$104,972 Is Selected, Then Skip To Thank you for participating in the su...If Above \$104,972 Is Selected, Then Skip To Thank you for participating in the su...

Answer If What state do you live in? Alaska Is Selected

Q31 What is your annual household income?

- ☐ At or below \$110,172
- ☐ Above \$110,172

If At or below \$110,172 Is Selected, Then Skip To Thank you for partic...If Above \$110,172 Is Selected, Then Skip To Thank you for partic...

Answer If What state do you live in? Alaska Is Selected

Q28 What is your annual household income?

- ☐ At or below \$115,372
- ☐ Above \$115,372

If At or below \$115,372 Is Selected, Then Skip To Thank you for partic...If Above \$115,372 Is Selected, Then Skip To Thank you for partic...

Answer If What state do you live in? Hawaii Is Selected

Q32 What is your annual household income?

- ☐ At or below \$26,067.50
- ☐ Above \$26,067.50

If At or below \$26,067.50 Is Selected, Then Skip To Thank you for participating in the su...If Above \$26,067.50 Is Selected, Then Skip To Thank you for participating in the su...

Answer If What state do you live in? Hawaii Is Selected

Q33 What is your annual household income?

- ☐ At or below \$33,910.50
- ☐ Above \$33,910.50

If At or below \$33,910.50 Is Selected, Then Skip To Thank you for participating in the su...If Above \$33,910.50 Is Selected, Then Skip To Thank you for participating in the su...

Answer If What state do you live in? Hawaii Is Selected

Q34 What is your annual household income?

- ☐ At or below \$42,753.50
- ☐ Above \$42,753.50

If At or below \$42,753.50 Is Selected, Then Skip To Thank you for participating in the su...If Above \$42,753.50 Is Selected, Then Skip To Thank you for participating in the su...

Answer If What state do you live in? Hawaii Is Selected

Q35 What is your annual household income?

- ☐ At or below \$51,596.50
- ☐ Above \$51,596.50

If At or below \$51,596.50 Is Selected, Then Skip To Thank you for participating in the su...If Above \$51,596.50 Is Selected, Then Skip To Thank you for participating in the su...

Answer If What state do you live in? Hawaii Is Selected

Q36 What is your annual household income?

- ☐ At or below \$60,439.50
- ☐ Above \$60,439.50

If At or below \$60,439.50 Is Selected, Then Skip To Thank you for participating in the su...If Above \$60,439.50 Is Selected, Then Skip To Thank you for participating in the su...

Answer If What state do you live in? Hawaii Is Selected

Q37 What is your annual household income?

- ☐ At or below \$69,282.50
- ☐ Above \$69,282.50

If At or below \$69,282.50 Is Selected, Then Skip To Thank you for participating in the su...If Above \$69,282.50 Is Selected, Then Skip To Thank you for participating in the su...

Answer If What state do you live in? Hawaii Is Selected

Q38 What is your annual household income?

- ☐ At or below \$78,125.50
- ☐ Above \$78,125.50

If At or below \$78,125.50 Is Selected, Then Skip To Thank you for participating in the su...If Above \$78,125.50 Is Selected, Then Skip To Thank you for participating in the su...

Answer If What state do you live in? Hawaii Is Selected

Q39 What is your annual household income?

- ☐ At or below \$86,986.50
- ☐ Above \$86,986.50

If At or below \$86,986.50 Is Selected, Then Skip To Thank you for participating in the su...If Above \$86,986.50 Is Selected, Then Skip To Thank you for participating in the su...

Answer If What state do you live in? Hawaii Is Selected

Q40 What is your annual household income?

- ☐ At or below \$91,766.50
- ☐ Above \$91,766.50

If At or below \$91,766.50 Is Selected, Then Skip To Thank you for participating in the su...If Above \$91,766.50 Is Selected, Then Skip To Thank you for participating in the su...

Answer If What state do you live in? Hawaii Is Selected

Q41 What is your annual household income?

- ☐ At or below \$96,546.50
- ☐ Above \$96,546.50

If At or below \$96,546.50 Is Selected, Then Skip To Thank you for participating in the su...If Above \$96,546.50 Is Selected, Then Skip To Thank you for participating in the su...

Answer If What state do you live in? Hawaii Is Selected

Q42 What is your annual household income?

- ☐ At or below \$101,326.50
- ☐ Above \$101,326.50

If At or below \$101,326.50 Is Selected, Then Skip To Thank you for partic...If Above \$101,326.50 Is Selected, Then Skip To Thank you for partic...

Answer If What state do you live in? Hawaii Is Selected

Q43 What is your annual household income?

- ☐ At or below \$106,106.50
- ☐ Above \$106,106.50

If At or below \$106,106.50 Is Selected, Then Skip To Thank you for partic...If Above \$106,106.50 Is Selected, Then Skip To Thank you for partic...

Q8 Thank you for participating in the survey. Our researchers will contact you if you meet study criteria.

If Thank you for participating... Is Displayed, Then Skip To End of Survey

## APPENDIX D: Survey for Pregnant Women

You are being invited to participate in a survey on the Lifestyle Behaviors and Attitudes during pregnancy. The survey will take approximately 25-45 minutes. Please ensure you have time to complete the survey. The answers will be automatically saved. You will be able to return to the survey within a week from now, however, it would be preferable if you could complete the entire survey at this time. You will be compensated for your time. At the end of the survey, you will be asked to provide your mailing address in order to receive a \$20 gift card. Please answer the questions completely best to your knowledge.

Today's date (*generated electronically*)

How many weeks pregnant are you currently?  
\_\_\_\_\_ number of weeks

How old are you?  
\_\_\_\_\_ in years

What race do you consider yourself to be? (Mark all that apply)

- ☐ White
- ☐ Black or African American
- ☐ Asian
- ☐ American Indian or Alaskan Native
- ☐ Native Hawaiian or Other Pacific Islander
- ☐ Hispanic or Latino
- ☐ I do not wish to provide this information

What is your highest education level?

- ☐ Some high school
- ☐ HS diploma/GED
- ☐ Some college
- ☐ College graduate

What is your relationship status?

- ☐ Married
- ☐ Divorced/separated
- ☐ Widowed
- ☐ Single and not living with a romantic partner
- ☐ Single and living with a romantic partner

Are you on Medicaid?

- ☐ Yes
- ☐ No

Are you enrolled in the WIC program?

- ☐ Yes
- ☐ No
- ☐ I don't know

On average, how many hours per week do you work during your pregnancy? Include any paid full time and part time job you have.

\_\_\_\_\_ Hours per week

How long have you lived in the United States?

- ☐ Less than 5 years
- ☐ More than 5 years
- ☐ My whole life

What country did you live before moving to the United States?

What is your height?

Feet	<input type="radio"/> 4	<input type="radio"/> 5	<input type="radio"/> 6	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Inches	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5	<input type="radio"/> 6	<input type="radio"/> 7	<input type="radio"/> 8	<input type="radio"/> 9	<input type="radio"/> 10	<input type="radio"/> 11

What was your pre pregnancy weight?

\_\_\_\_\_ in lbs

What is your current weight?

\_\_\_\_\_ in lbs

How many times have you been pregnant (including recent pregnancy)?

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6+

How many children do you have?

- ☐ 0
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6+

How many miscarriages did you have?

- ☐ 0
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6+

How many adults live in your household (including you)?

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6+

Would you say that in general your health is:

- ☐ Excellent
- ☐ Very good
- ☐ Good
- ☐ Fair
- ☐ Poor

Check if you currently experience any of the following:

- ☐ Gestational diabetes
- ☐ Hypertension
- ☐ Preeclampsia
- ☐ Require bedrest

Do you currently smoke?

- ☐ Yes
- ☐ No

Do you currently drink alcohol?

- ☐ Yes
- ☐ No

Did you smoke before pregnancy?

- ☐ Yes
- ☐ No

Did you drink alcohol before pregnancy?

- ☐ Yes
- ☐ No

### **PHYSICAL ACTIVITY QUESTIONNAIRE**

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the last 7 days. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport. Think about all the vigorous and moderate activities that you did the last 7 days. Vigorous physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Moderate activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal.

**PART 1: JOB-RELATED PHYSICAL ACTIVITY.** The first section is about your work. This includes paid jobs, farming, volunteer work, course work, and any other unpaid work that you did outside your home. Do not include unpaid work you might do around your home, like housework, yard work, general maintenance, and caring for your family. These are asked in Part 3.

How much time did you usually spend on one of those days doing vigorous physical activities as part of your work?

Hours per day (complete hours) \_\_\_\_\_ (selection 0-16)

Minutes per day (in addition to hours above) \_\_\_\_\_ (selection 0-59)

Do you have any paid or unpaid work outside your home?

- ☐ Yes
- ☐ No

The next questions are about all the physical activity you did in the last 7 days as part of your paid or unpaid work. This does not include traveling to and from work. During the last 7 days, how many days did you do vigorous physical activities like heavy lifting, digging, heavy construction, or climbing up stairs as part of your work? Think about only those physical activities that you did for at least 10 minutes at a time.

- ☐ 0
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7

Again, think about only those physical activities that you did for at least 10 minutes at a time. During the last 7 days on how many days did you do moderate physical activities like carrying light loads as part of your work? Please do not include walking.

- ☐ 0
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7

How much time did you usually spend on one of those days doing moderate physical activities as part of your work?

Hours per day (complete hours) \_\_\_\_\_ (selection 0-16)

Minutes per day (in addition to hours above) \_\_\_\_\_ (selection 0-59)

During the last 7 days, on how many days did you walk for at least 10 minutes at a time as part of your work? Please do not count any walking you did to travel to or from work.

- ☐ 0
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7

How much time did you usually spend on one of those days walking as part of your work?

Hours per day (complete hours) \_\_\_\_\_ (selection 0-16)

Minutes per day (in addition to hours above) \_\_\_\_\_ (selection 0-59)

## **PART 2: TRANSPORTATION PHYSICAL ACTIVITY**

These questions are about how you traveled from place to place, including to places like work, stores, movies, and so on.

During the last 7 days, on how many days did you travel in a motor vehicle like a train, bus, car, or tram?

- ☐ 0
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7

How much time did you usually spend on one of those days traveling in a train, bus, car, tram, or other kind of motor vehicle?

Hours per day (complete hours) \_\_\_\_\_ (selection 0-16)

Minutes per day (in addition to hours above) \_\_\_\_\_ (selection 0-59)

Now think only about the bicycling and walking you might have done to travel to and from work, to do errands, or to go from place to place. During the last 7 days, on how many days did you bicycle for at least 10 minutes at a time to go from place to place?

- ☐ 0
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7

How much time did you usually spend on one of those days to bicycle from place to place?

Hours per day (complete hours) \_\_\_\_\_ (selection 0-16)

Minutes per day (in addition to hours above) \_\_\_\_\_ (selection 0-59)

During the last 7 days, on how many days did you walk for at least 10 minutes at a time to go from place to place?

- ☐ 0
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7

How much time did you usually spend on one of those days walking from place to place?

Hours per day (complete hours) \_\_\_\_\_ (selection 0-16)

Minutes per day (in addition to hours above) \_\_\_\_\_ (selection 0-59)

### **PART 3: HOUSEWORK, HOUSE MAINTENANCE, AND CARING FOR FAMILY**

This section is about some of the physical activities you did in the last 7 days in and around your home, like housework, gardening, yard work, general maintenance work, and caring for your family.

Think about only those physical activities that you did for at least 10 minutes at a time.

During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, chopping wood, shoveling snow, or digging in the garden or yard?

- ☐ 0
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7

How much time did you usually spend on one of those days doing vigorous physical activities in the garden or yard?

Hours per day (complete hours) \_\_\_\_\_ (selection 0-16)

Minutes per day (in addition to hours above) \_\_\_\_\_ (selection 0-59)

Again, think about only those physical activities that you did for at least 10 minutes at a time. During the last 7 days, on how many days did you do moderate activities like carrying light loads, sweeping, washing windows, and raking in the garden or yard?

- ☐ 0
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7

How much time did you usually spend on one of those days doing moderate physical activities in the garden or yard?

Hours per day (complete hours) \_\_\_\_\_ (selection 0-16)

Minutes per day (in addition to hours above) \_\_\_\_\_ (selection 0-59)

Once again, think about only those physical activities that you did for at least 10 minutes at a time. During the last 7 days, on how many days did you do moderate activities like carrying light loads, washing windows, scrubbing floors and sweeping inside your home?

- ☐ 0
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7

How much time did you usually spend on one of those days doing moderate physical activities inside your home?

Hours per day (complete hours) \_\_\_\_\_ (selection 0-16)

Minutes per day (in addition to hours above) \_\_\_\_\_ (selection 0-59)

#### **PART 4: RECREATION, SPORT, AND LEISURE-TIME PHYSICAL ACTIVITY**

This section is about all the physical activities that you did the last 7 days, solely for recreation, sport, exercise or leisure. Please do not include any activities you have already mentioned.

Not counting any walking you have already mentioned, during the last 7 days, on how many days did you walk for at least 10 minutes at a time in your leisure time?

- ☐ 0
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7

How much time did you usually spend on one of those days walking in your leisure time?

Hours per day (complete hours) \_\_\_\_\_ (selection 0-16)

Minutes per day (in addition to hours above) \_\_\_\_\_ (selection 0-59)

Think about only those physical activities that you did for at least 10 minutes at a time. During the last 7 days, on how many days did you do vigorous physical activities like aerobics, running, fast bicycling, or fast swimming in your leisure time?

- ☐ 0
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7

How much time did you usually spend on one of those days doing vigorous physical activities in your leisure time?

Hours per day (complete hours) \_\_\_\_\_ (selection 0-16)

Minutes per day (in addition to hours above) \_\_\_\_\_ (selection 0-59)

Again, think about only those physical activities that you did for at least 10 minutes at a time. During the last 7 days, on how many days did you do moderate physical activities like bicycling at a regular pace, swimming at a regular pace, and doubles tennis in your leisure time?

- ☐ 0
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7

How much time did you usually spend on one of those days doing moderate physical activities in your leisure time?

Hours per day (complete hours) \_\_\_\_\_ (selection 0-16)

Minutes per day (in addition to hours above) \_\_\_\_\_ (selection 0-59)

## **PART 5: TIME SPENT SITTING**

The last questions are about the time you spend sitting while at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading or sitting or lying down to watch television. Do not include any time spent sitting in a motor vehicle that you have already told me about. During the last 7 days, how much time did you usually spend sitting on a weekday?

Hours per day (complete hours) \_\_\_\_\_ (selection 0-16)

Minutes per day (in addition to hours above) \_\_\_\_\_ (selection 0-59)

Did your health care provider encourage you to be physically active during pregnancy?

☐ Yes

☐ No

Did your health care provider advise you to limit or avoid physical activity during pregnancy?

☐ Yes

☐ No

Please describe the reasons why your health care provided prescribed you to limit or avoid physical activity.

### Lifestyles Beliefs

The following questions ask your opinion on different types of behaviors during pregnancy. There is no right or wrong answers. Please answer these questions the best you can. 1= you think this behavior is not important for pregnant woman 5= you think this behavior is very important for pregnant woman

	(not at all) 1	2	3	4	5 (very)
get a good night's sleep	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
not smoke	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
not drink alcohol	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
rest and relax	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
avoid worrying too much	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
get out and about	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
avoid getting overweight	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
exercise regularly	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
avoid fatty foods	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
have an active lifestyle	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

### Physical Activity Habits

This section will focus on physical activity and nutrition habits during pregnancy. Please rate how strongly you agree with the following statements. I am confident that I can:

	(strongly agree) 1	2	3	4	(strongly disagree) 5
Overcome barriers and challenges to physical activity if I try hard enough.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Find the means and ways to be physically active during pregnancy.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Accomplish physical activity goals that I set.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Confronted with a barrier to physical activity, I can find several solutions to overcome this barrier.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be physically active when I am tired.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be physically active even when I am feeling depressed.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be physically active without the support of my family or friends.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be physically active without consulting my physician.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Motivate myself to start being physical activity again after I've stopped for a while.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be physically active even if I had no access to a gym, exercise, training, or rehabilitation facility.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

### Social Support- Physical Activity

Below is a list of things people might do or say to someone who is trying to engage in regular physical activity. If you are not trying to be physically active during your pregnancy, then some of the questions may not apply to you, but please read and give an answer to every question.

Please rate each question twice. Under family, rate how often anyone living in your household has said or done what is described during the last three months of your pregnancy. Under friends, rate how often your friends, acquaintances, or coworkers has said or done what is described during the last three months.

Please write one number from the following rating scale in each space:

None      rarely      a few times      often      very often  
1          2          3          4          5

	Friends					Family				
	None	Rarely	A few times	Often	Very often	None	Rarely	A few times	Often	Very often
Be physically active with me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Offered to be physically active with me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gave me helpful reminders to be physically active ("Are you going to exercise tonight?").	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gave me encouragement to stick with my physical activity program.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Changed their schedule so we could be physically active together.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Discussed being physically active with me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Complained about the time I spend being	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

physically active.										
Criticized me or made fun of me for being physically active.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gave me rewards for being physically active (brought me something or gave me something I like).	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Planned for to be physically active on recreational outings.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Helped plan activities around my physical activity.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Asked me for ideas on how they can get more physical activity.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Talked about how much they like to be physically active.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## Social Perceptions

	A lot	Some	A few	None at all
Do you know any people who are physically active?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you see people being physically active in your neighborhood?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you know any pregnant women who are physically active?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please indicate if you agree with the following statements on a scale of 1-4:  
(strongly agree) 1 2 3 4 (strongly disagree)

If I saw a pregnant women be physically active:

	1 (strongly agree)	2	3	4 (strongly disagree)
it would make me feel guilty.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would want to be physically active, too.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would think she would be hurting the baby.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would think she is selfish.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would think she is showing off.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please indicate if you agree with the following statements on a scale of 1-4:  
 (strongly agree) 1 2 3 4 (strongly disagree)  
 If you wanted to be physically active:

	(strongly agree) 1	2	3	4 (strongly disagree)
household tasks like cooking and cleaning would get in the way.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
childcare responsibilities would get in the way.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
elder care responsibilities would get in the way.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
work would get in the way.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
feeling guilty for taking time for yourself would get in the way.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
what your partner or husband might think about you would get in the way.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
what other people might think about you would get in the way.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
community obligations or activities would get in the way.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
you would need to put more effort into organizing your time.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Where do you get most of information on physical activity during pregnancy? (check all that apply)

- ☐ Books
- ☐ Magazines
- ☐ Health care professionals
- ☐ Friends and family
- ☐ Social media and blogs
- ☐ Internet (.com websites)
- ☐ Internet (.org, .gov websites)
- ☐ WIC brochures and website
- ☐ I don't look for information on physical activity during pregnancy

	(strongly agree) 1	2	3	(strongly disagree) 4
Your neighborhood is a good place for you and your family to live.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Your neighbors can be counted on to help if someone is physically threatened or injured.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Law enforcement can be counted on if there is trouble in the neighborhood.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Rate how much you agree with the following statements regarding the community where you live.

Please answer the following questions.

	Yes	No
Do you regularly attend any neighborhood, community or social group meeting such as block watches, parent teacher associations etc?	<input type="radio"/>	<input type="radio"/>
Do you regularly attend any religious services and functions?	<input type="radio"/>	<input type="radio"/>
Do you regularly socialize with other pregnant women?	<input type="radio"/>	<input type="radio"/>
In your community, are there places you could go to exercise if you wanted to?	<input type="radio"/>	<input type="radio"/>

This section will focus on the barriers to participation in physical activity. Think about the barriers you face during your pregnancy and rate them based on your experiences during current pregnancy.

	Not at all	Somewhat	Frequently
Too tired	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of sleep	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Shortness of breath	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Muscle/joint pain	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Concern with pregnancy complications	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Harm to the baby	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nausea/vomiting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Low motivation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do not enjoy being physically active	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of childcare	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of knowledge about appropriate physical activity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of family support	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of friends' support	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Overly protective family members	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Conflicting advice from others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Isolation from other people	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Weather	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Season of the year	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of outdoor spaces to be active	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of indoor spaces to be active	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cost of being physically active	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Is there anything else that frequently gets in a way from being physically active during pregnancy but was not mentioned above? If nothing else, please leave blank.

What would it take to get you to be more physically active during pregnancy? Please rate the following factors based on your recent pregnancy. If you already are physically active a lot, what helps you to do this?

	Would not help	Help a little	Help a lot
More time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
More money	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Access to facilities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Support from family	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Support from a friend	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Childcare	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Doctor's advice	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Transportation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Self-motivation or will-power	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Support from another pregnant woman	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Good weather	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Healthier diet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Knowing it leads to earlier labor	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fun Activities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Is there anything else that would help you be more physically active during pregnancy but was not mentioned above? If nothing else, please leave blank.

### **Fruit and Vegetable Consumption**

These questions are about the different kinds of foods you ate or drank during the PAST MONTH, that is, the past 30 days. When answering, please include meals and snacks eaten at home, at work or school, in restaurants, and anyplace else.

During the past month... How often did you drink 100% FRUIT JUICE, such as orange, mango, apple, and grape juices? Do NOT count fruit drinks. Do NOT include fruit drinks with added sugar, like Kool-aid;, Hi-C;, lemonade, cranberry cocktail, Gatorade;, Tampico;, and Sunny Delight;.

- ☐ Never
- ☐ 1 -3 times last month
- ☐ 1-2 times per week
- ☐ 3-4 times per week
- ☐ 5-6 times per week
- ☐ 1 time per day
- ☐ 2 times per day
- ☐ 3 times per day
- ☐ 4 times per day
- ☐ 5 times per day
- ☐ Don't know

During the past month... How often did you eat FRUIT? COUNT fresh, frozen, or canned fruit. Do NOT count juices.

- ☐ Never
- ☐ 1 -3 times last month
- ☐ 1-2 times per week
- ☐ 3-4 times per week
- ☐ 5-6 times per week
- ☐ 1 time per day
- ☐ 2 times per day
- ☐ 3 times per day
- ☐ 4 times per day
- ☐ 5 times per day
- ☐ Don't know

During the past month . . . How often did you eat a green leafy or lettuce SALAD, with or without other vegetables?

- ☐ Never
- ☐ 1 -3 times last month
- ☐ 1-2 times per week
- ☐ 3-4 times per week
- ☐ 5-6 times per week
- ☐ 1 time per day
- ☐ 2 times per day
- ☐ 3 times per day
- ☐ 4 times per day
- ☐ 5 times per day
- ☐ Don't know

During the past month . . . How often did you eat FRENCH FRIES, home fries, or hash brown potatoes?

- ☐ Never
- ☐ 1 -3 times last month
- ☐ 1-2 times per week
- ☐ 3-4 times per week
- ☐ 5-6 times per week
- ☐ 1 time per day
- ☐ 2 times per day
- ☐ 3 times per day
- ☐ 4 times per day
- ☐ 5 times per day
- ☐ Don't know

During the past month . . . How often did you eat other WHITE POTATOES? COUNT baked potatoes, boiled potatoes, mashed potatoes and potato salad.

- ☐ Never
- ☐ 1 -3 times last month
- ☐ 1-2 times per week
- ☐ 3-4 times per week
- ☐ 5-6 times per week
- ☐ 1 time per day
- ☐ 2 times per day
- ☐ 3 times per day
- ☐ 4 times per day
- ☐ 5 times per day
- ☐ Don't know

During the past month . . . How often did you eat COOKED DRIED BEANS, such as fried beans, baked means, bean soup, and pork and beans? Do NOT include green beans.

- ☐ Never
- ☐ 1 -3 times last month
- ☐ 1-2 times per week
- ☐ 3-4 times per week
- ☐ 5-6 times per week
- ☐ 1 time per day
- ☐ 2 times per day
- ☐ 3 times per day
- ☐ 4 times per day
- ☐ 5 times per day
- ☐ Don't know

During the past month . . . Not counting what you just told me about (lettuce salads, white potatoes, cooked dried beans), and not counting rice, how often did you eat OTHER VEGETABLES?

- ☐ Never
- ☐ 1 -3 times last month
- ☐ 1-2 times per week
- ☐ 3-4 times per week
- ☐ 5-6 times per week
- ☐ 1 time per day
- ☐ 2 times per day
- ☐ 3 times per day
- ☐ 4 times per day
- ☐ 5 times per day
- ☐ Don't know

During the past month . . . How often did you have TOMATO SAUCES such as spaghetti sauce or pizza with tomato sauce?

- ☐ Never
- ☐ 1 -3 times last month
- ☐ 1-2 times per week
- ☐ 3-4 times per week
- ☐ 5-6 times per week
- ☐ 1 time per day
- ☐ 2 times per day
- ☐ 3 times per day
- ☐ 4 times per day
- ☐ 5 times per day
- ☐ Don't know

During the past month . . . How often did you have SALSA?

- ☐ Never
- ☐ 1 -3 times last month
- ☐ 1-2 times per week
- ☐ 3-4 times per week
- ☐ 5-6 times per week
- ☐ 1 time per day
- ☐ 2 times per day
- ☐ 3 times per day
- ☐ 4 times per day
- ☐ 5 times per day
- ☐ Don't know

Nutrition There are many things that can get in the way of choosing to eat 5 fruits and vegetables each day. Rate HOW CONFIDENT you are that you can do the following using the scale below.

	Not at all Confident	Somewhat Confident	Moderately Confident	Very Confident	Extremely Confident
Eat 5 servings of fruits and vegetables everyday?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Drink 100% fruit juice instead of soda or fruit punch?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Eat fruits and vegetables for a snack instead of chips or candy?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Eat fruits and vegetables when eating out at a restaurant?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Eat fruits and vegetables when I am upset or having a bad day?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Eat fruits and vegetables when I am at a social event?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How often in the last 30 days has your family or friends done the following?

	Almost Never	Once Awhile	Sometimes	Often	Almost always
Encourage you to eat healthy foods.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Discuss the benefits of eating healthy foods.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Remind you to choose healthy foods.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Share ideas on healthy eating.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Eat healthy meals with you.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Complain about eating healthy foods.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please answer the following questions.

	A lot	Some	A few	None
Do you know any people who eat healthy?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you know any pregnant women who eat healthy?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please rate the following statements on a scale from 1-4  
 (strongly agree) 1 2 3 4 (strongly disagree)  
 If you wanted to eat healthy:

	(strongly agree) 1	2	3	(strongly disagree) 4
childcare responsibilities would get in the way.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
elder care responsibilities would get in the way.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
work would get in the way.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
feeling guilty for giving up certain foods would get in the way.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
what your partner or husband might think about you would get in the way.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
what other people might think about you would get in the way.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
community obligations or activities would get in the way.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
you would need to put more effort into organizing your time.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Where do you get most of information on nutrition during pregnancy? (check all that apply)

- ☐ Books
- ☐ Magazines
- ☐ Health care professionals
- ☐ Friends and family
- ☐ Social media and blogs
- ☐ Internet (.com websites)
- ☐ Internet (.gov, .org websites)
- ☐ WIC brochures and websites
- ☐ I don't look for information on nutrition during pregnancy

Please answer the following questions considering your current pregnancy. Indicate how strongly you agree with each item using the following scale:

	Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
There is at least one option at work where I have healthy selections to choose from.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There is a wide variety of fresh fruits and vegetables where I shop.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The fruits and vegetables where I shop are at good prices.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The fruits and vegetables where I shop are good quality.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

This section will focus on the barriers to healthy nutrition. Think about the barriers you face during your pregnancy and rate them based on your experiences during recent pregnancy.

	Not at all	Somewhat	Frequently
too tired	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
lack of sleep	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
low motivation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
lack of time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
do not enjoy eating healthy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
lack of knowledge about appropriate nutrition	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
lack of family support	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
lack of friends support	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
conflicting advice from others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
isolation from other people	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
season of the year	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
cravings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
food aversions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
nausea/vomiting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
lack of access to healthy foods	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
cost	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Is there anything else that frequently gets in a way from eating healthy during pregnancy but was not mentioned above? If nothing else, please leave blank.

What would it take to get you to eat healthier during pregnancy? Please rate the following factors based on your recent pregnancy. If you already eat healthy, what helps you to do this?

	Would not help	Help a little	Help a lot
having a healthy baby	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
more money	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
support from family	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
support from friends	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
support from other pregnant women	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
doctor's advice	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
better access to healthy foods	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
self-motivation or will-power	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
exercising	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
feeling more energized	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
not feeling sluggish	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
consistent food supply	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
having more energy to cook	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
having someone cook for me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Is there anything else that would help you eat healthier during pregnancy but was not mentioned above? If nothing else, please leave blank.

Thank you for completing the survey. We appreciate your responses and would like to compensate you for your time. Please provide the mailing address so we could send you a \$20 gift card. This information will be kept confidential and used only to send you the gift card.

Name  
Address  
City State  
Postal Code

Would you be interested in completing an additional survey? It would take additional 30-40 minutes and you would receive an additional \$10 gift card. The additional questionnaire will ask you about the foods you ate during the past 3 months. If you click "yes", a link to the survey will be sent to you in a separate email within the next 2-3 days.

- ☐ Yes  
☐ No

## APPENDIX E: Survey for Postpartum Women

You are being invited to participate in a survey on the Lifestyle Behaviors and Attitudes during pregnancy. The survey will take approximately 25-45 minutes. Please ensure you have time to complete the survey. The answers will be automatically saved. You will be able to return to the survey within a week from now, however, it would be preferable if you could complete the entire survey at this time. You will be compensated for your time. At the end of the survey, you will be asked to provide your mailing address in order to receive a \$20 gift card. Please answer the questions completely best to your knowledge.

Today's Date *(generated electronically)*

How many weeks pregnant were you when delivered your recent baby? If you don't remember, please leave blank.

\_\_\_\_\_ number of weeks

If number of weeks Is Not Empty, Then Skip To How long ago did you deliver your rec...

Was your baby:

- ☐ Preterm
- ☐ Full-term

How long ago did you deliver your recent baby?

Months \_\_\_\_\_ (selection 1-12)

Weeks \_\_\_\_\_ (selection 1-4)

What type of delivery did you have?

- ☐ Vaginal
- ☐ C-section

How much did your baby weigh at birth?

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
pounds	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ounces	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How much did you weigh when your baby was born?

\_\_\_\_\_ Click to write Choice 1

How old are you?

\_\_\_\_\_ in years

What race do you consider yourself to be? (Mark all that apply)

- ☐ White
- ☐ Black or African American
- ☐ Asian
- ☐ American Indian or Alaskan Native
- ☐ Native Hawaiian or Other Pacific Islander
- ☐ Hispanic or Latino
- ☐ I do not wish to provide this information

What is your highest education level?

- ☐ Some high school
- ☐ HS diploma/GED
- ☐ Some college
- ☐ College graduate

What is your relationship status?

- ☐ Married
- ☐ Divorced/separated
- ☐ Widowed
- ☐ Single and not living with a romantic partner
- ☐ Single and living with a romantic partner

Are you on Medicaid?

- ☐ Yes
- ☐ No

Are you enrolled in the WIC program?

- ☐ Yes
- ☐ No
- ☐ I don't know

On average, how many hours per week did you work during your pregnancy? Include any paid full time and part time job you have.

\_\_\_\_\_ Hours per week

How long have you lived in the United States?

- ☐ Less than 5 years
- ☐ More than 5 years
- ☐ My whole life

Answer If How long have you lived in the United States? Less than 5 years Is Selected Or How long have you lived in the United States? More than 5 years Is Selected

What country did you live in before moving to the United States?

What is your height?

Feet	<input type="radio"/> 4	<input type="radio"/> 5	<input type="radio"/> 6	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Inches	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5	<input type="radio"/> 6	<input type="radio"/> 7	<input type="radio"/> 8	<input type="radio"/> 9	<input type="radio"/> 10	<input type="radio"/> 11

What was your pre pregnancy weight?

\_\_\_\_\_ in lbs

What is your current weight?

\_\_\_\_\_ in lbs

How many times have you been pregnant (including recent pregnancy)?

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6+

How many children do you have?

- ☐ 0
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6+

How many miscarriages did you have?

- ☐ 0
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6+

How many adults live in your household (including you)?

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6+

Would you say that in general your health is:

- ☐ Excellent
- ☐ Very good
- ☐ Good
- ☐ Fair
- ☐ Poor

Check if you experienced any of the following during your recent pregnancy:

- ☐ Gestational diabetes
- ☐ Hypertension
- ☐ Preeclampsia
- ☐ Require bedrest

Did you smoke during pregnancy?

- ☐ Yes
- ☐ No

Did you drink alcohol during pregnancy?

- ☐ Yes
- ☐ No

Did you smoke before pregnancy?

- ☐ Yes
- ☐ No

Did you drink alcohol before pregnancy?

- ☐ Yes
- ☐ No

### **PHYSICAL ACTIVITY QUESTIONNAIRE**

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active during a typical week of your pregnancy in second trimester. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you did at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport. Think about all the vigorous and moderate activities that you did during a typical week of pregnancy. Vigorous physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Moderate activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal.

#### **PART 1: JOB-RELATED PHYSICAL ACTIVITY**

The first section is about your work. This includes paid jobs, farming, volunteer work, course work, and any other unpaid work that you did outside your home. Do not include unpaid work you might do around your home, like housework, yard work, general maintenance, and caring for your family. These are asked in Part 3.

Did you have any paid or unpaid work outside your home?

- ☐ Yes
- ☐ No

If No Is Selected, Then Skip To

PART 2: TRANSPORTATI...

The next questions are about all the physical activity you did during a typical week of pregnancy as part of your paid or unpaid work. This does not include traveling to and from work. During a typical week of pregnancy, how many days did you do vigorous physical activities like heavy lifting, digging, heavy construction, or climbing up stairs as part of your work? Think about only those physical activities that you did for at least 10 minutes at a time.

- ☐ 0
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7

If 0 Is Selected, Then Skip To How much time did you usually spend o...

How much time did you usually spend on one of those days doing vigorous physical activities as part of your work?

Hours per day (complete hours) \_\_\_\_\_ (selection 0-16)

Minutes per day (in addition to hours above) \_\_\_\_\_ (selection 0-59)

Again, think about only those physical activities that you did for at least 10 minutes at a time. During a typical week of pregnancy, on how many days did you do moderate physical activities like carrying light loads as part of your work? Please do not include walking.

- ☐ 0
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7

If 0 Is Selected, Then Skip To During the last 7 days, on how many d...

How much time did you usually spend on one of those days doing moderate physical activities as part of your work?

Hours per day (complete hours) \_\_\_\_\_ (selection 0-16)

Minutes per day (in addition to hours above) \_\_\_\_\_ (selection 0-59)

During a typical week of pregnancy, on how many days did you walk for at least 10 minutes at a time as part of your work? Please do not count any walking you did to travel to or from work.

- ☐ 0
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7

If 0 Is Selected, Then Skip To PART 2: TRANSPORTATION PHYSICAL ACTI...

How much time did you usually spend on one of those days walking as part of your work?

Hours per day (complete hours) \_\_\_\_\_ (selection 0-16)

Minutes per day (in addition to hours above) \_\_\_\_\_ (selection 0-59)

## **PART 2: TRANSPORTATION PHYSICAL ACTIVITY**

These questions are about how you traveled from place to place, including to places like work, stores, movies, and so on. During a typical week of pregnancy, on how many days did you travel in a motor vehicle like a train, bus, car, or tram?

- ☐ 0
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7

If 0 Is Selected, Then Skip To Now think only about the bicycling an...

How much time did you usually spend on one of those days traveling in a train, bus, car, tram, or other kind of motor vehicle?

Hours per day (complete hours) \_\_\_\_\_ (selection 0-16)

Minutes per day (in addition to hours above) \_\_\_\_\_ (selection 0-59)

Now think only about the bicycling and walking you might have done to travel to and from work, to do errands, or to go from place to place. During a typical week of pregnancy, on how many days did you bicycle for at least 10 minutes at a time to go from place to place?

- ☐ 0
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7

If 0 Is Selected, Then Skip To During the last 7 days, on how many ...

How much time did you usually spend on one of those days to bicycle from place to place?

Hours per day (complete hours) \_\_\_\_\_ (selection 0-16)

Minutes per day (in addition to hours above) \_\_\_\_\_ (selection 0-59)

During a typical week of pregnancy, on how many days did you walk for at least 10 minutes at a time to go from place to place?

- ☐ 0
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7

If 0 Is Selected, Then Skip To PART 3: HOUSEWORK, HOUSE MAINTENANCE,...

How much time did you usually spend on one of those days walking from place to place?

Hours per day (complete hours) \_\_\_\_\_ (selection 0-16)

Minutes per day (in addition to hours above) \_\_\_\_\_ (selection 0-59)

### **PART 3: HOUSEWORK, HOUSE MAINTENANCE, AND CARING FOR FAMILY**

This section is about some of the physical activities you did during a typical week of pregnancy in and around your home, like housework, gardening, yard work, general maintenance work, and caring for your family.

Think about only those physical activities that you did for at least 10 minutes at a time. During a typical week of pregnancy, on how many days did you do vigorous physical activities like heavy lifting, chopping wood, shoveling snow, or digging in the garden or yard?

- ☐ 0
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7

How much time did you usually spend on one of those days doing vigorous physical activities in the garden or yard?

Hours per day (complete hours) \_\_\_\_\_ (selection 0-16)

Minutes per day (in addition to hours above) \_\_\_\_\_ (selection 0-59)

Again, think about only those physical activities that you did for at least 10 minutes at a time. During a typical week of pregnancy, on how many days did you do moderate activities like carrying light loads, sweeping, washing windows, and raking in the garden or yard?

- ☐ 0
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7

If 0 Is Selected, Then Skip To Once again, think about only those ph...

How much time did you usually spend on one of those days doing moderate physical activities in the garden or yard?

Hours per day (complete hours) \_\_\_\_\_ (selection 0-16)

Minutes per day (in addition to hours above) \_\_\_\_\_ (selection 0-59)

Once again, think about only those physical activities that you did for at least 10 minutes at a time. During a typical week of pregnancy, on how many days did you do moderate

activities like carrying light loads, washing windows, scrubbing floors and sweeping inside your home?

- ☐ 0
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7

If 0 Is Selected, Then Skip To PART 4: RECREATION, SPORT, AND LEISUR...

How much time did you usually spend on one of those days doing moderate physical activities inside your home?

Hours per day (complete hours) \_\_\_\_\_ (selection 0-16)

Minutes per day (in addition to hours above) \_\_\_\_\_ (selection 0-59)

#### **PART 4: RECREATION, SPORT, AND LEISURE-TIME PHYSICAL ACTIVITY**

This section is about all the physical activities that you did during a typical week of pregnancy, solely for recreation, sport, exercise or leisure. Please do not include any activities you have already mentioned. Not counting any walking you have already mentioned, during a typical week of pregnancy, on how many days did you walk for at least 10 minutes at a time in your leisure time?

- ☐ 0
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7

If 0 Is Selected, Then Skip To Think about only those physical activ...

How much time did you usually spend on one of those days walking in your leisure time?

Hours per day (complete hours) \_\_\_\_\_ (selection 0-16)

Minutes per day (in addition to hours above) \_\_\_\_\_ (selection 0-59)

Think about only those physical activities that you did for at least 10 minutes at a time. During a typical week of pregnancy, on how many days did you do vigorous physical activities like aerobics, running, fast bicycling, or fast swimming in your leisure time?

- ☐ 0
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7

If 0 Is Selected, Then Skip To Again, think about only those physica...

How much time did you usually spend on one of those days doing vigorous physical activities in your leisure time?

Hours per day (complete hours) \_\_\_\_\_ (selection 0-16)

Minutes per day (in addition to hours above) \_\_\_\_\_ (selection 0-59)

Again, think about only those physical activities that you did for at least 10 minutes at a time. During a typical week of pregnancy, on how many days did you do moderate physical activities like bicycling at a regular pace, swimming at a regular pace, and doubles tennis in your leisure time?

- ☐ 0
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7

If 0 Is Selected, Then Skip To PART 5: TIME SPENT SITTING The last...

How much time did you usually spend on one of those days doing moderate physical activities in your leisure time?

Hours per day (complete hours) \_\_\_\_\_ (selection 0-16)

Minutes per day (in addition to hours above) \_\_\_\_\_ (selection 0-59)

## PART 5: TIME SPENT SITTING

The last questions are about the time you spent sitting while at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading or sitting or lying down to watch television. Do not include any time spent sitting in a motor vehicle that you have already told me about. During a typical week of pregnancy, how much time did you usually spend sitting on a weekday?

Hours per day (complete hours) \_\_\_\_\_ (selection 0-16)

Minutes per day (in addition to hours above) \_\_\_\_\_ (selection 0-59)

Did your health care provider encourage you to be physically active during pregnancy?

☐ Yes

☐ No

Did your health care provider advise you to limit or avoid physical activity during pregnancy?

☐ Yes

☐ No

Answer If	Did your health care provider advise you to limit or avoid physical activity during pregnancy? Yes Is Selected
-----------	--

Please describe the reasons why your health care provided prescribed you to limit or avoid physical activity.

### Lifestyles Beliefs

The following questions ask your opinion on different types of behaviors during pregnancy. There is no right or wrong answers. Please answer these questions the best you can.

1= you think this behavior is not important for pregnant woman 5= you think this behavior is very important for pregnant woman

	(not at all) 1	2	3	4	5 (very)
get a good night's sleep	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
not smoke	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
not drink alcohol	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
rest and relax	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
avoid worrying too much	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
get out and about	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
avoid getting overweight	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
exercise regularly	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
avoid fatty foods	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
have an active lifestyle	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

### Physical Activity Habits

This section will focus on physical activity and nutrition habits during pregnancy. Please rate how strongly you would have agreed with the following statements when you were in the middle of your last pregnancy. I am confident that I could:

	(strongly agree) 1	2	3	4	(strongly disagree) 5
Overcome barriers and challenges to physical activity if I try hard enough.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Find the means and ways to be physically active during pregnancy.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Accomplish physical activity goals that I set.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Confronted with a barrier to physical activity, I can find several solutions to overcome this barrier.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be physically active when I am tired.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be physically active even when I am feeling depressed.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be physically active without the support of my family or friends.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be physically active without consulting my	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

<p>physician.</p> <p>Motivate myself to start being physical activity again after I've stopped for a while.</p> <p>Be physically active even if I had no access to a gym, exercise, training, or rehabilitation facility.</p>	○	○	○	○	○
	○	○	○	○	○

### Social Support- Physical Activity

Below is a list of things people might do or say to someone who is trying to engage in regular physical activity. If you were not trying to be physically active during your pregnancy, then some of the questions may not apply to you, but please read and give an answer to every question. Please rate each question twice. Under family, rate how often anyone living in your household said or did what is described during the middle of your pregnancy. Under friends, rate how often your friends, acquaintances, or coworkers said or did what is described during the middle of your pregnancy. Please write one number from the following rating scale in each space:

None      rarely      a few times      often      very often  
1          2          3          4          5

	Friends					Family				
	None	Rarely	A few times	Often	Very often	None	Rarely	A few times	Often	Very often
Be physically active with me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Offered to be physically active with me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gave me helpful reminders to be physically active ("Are you going to exercise tonight?").	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gave me encouragement to stick with my physical activity program.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Changed their schedule so we could be physically active together.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Discussed being physically active with me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Complained about the time I spend being physically	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

active.										
Criticized me or made fun of me for being physically active.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gave me rewards for being physically active (brought me something or gave me something I like).	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Planned for to be physically active on recreational outings.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Helped plan activities around my physical activity.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Asked me for ideas on how they can get more physical activity.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Talked about how much they like to be physically active.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## Social Perceptions

During your recent pregnancy:

	A lot	Some	A few	None at all
Did you know people who were physically active?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Did you see people being physically active in your neighborhood?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Did you know any pregnant women who were physically active?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Think again about your recent pregnancy. Please indicate if you agree with the following statements on a scale of 1-4:

(strongly agree) 1 2 3 4 (strongly disagree)

If saw a pregnant women be physically active:

	1 (strongly agree)	2	3	4 (strongly disagree)
it would make me feel guilty.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would want to be physically active, too.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would think she would be hurting the baby.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would think she is selfish.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would think she is showing off.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please indicate if you agree with the following statements on a scale of 1-4:

(strongly agree) 1 2 3 4 (strongly disagree)

When you were pregnant, if you wanted to be physically active:

	(strongly agree) 1	2	3	4 (strongly disagree)
household tasks like cooking and cleaning would get in the way.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
childcare responsibilities would get in the way.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
elder care responsibilities would get in the way.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
work would get in the way.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
feeling guilty for taking time for yourself would get in the way.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
what your partner or husband might think about you would get in the way.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
what other people might think about you would get in the way.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
community obligations or activities would get in the way.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
you would need to put more effort into organizing your time.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Where do you get most of information on physical activity during pregnancy? (check all that apply)

- ☐ Books
- ☐ Magazines
- ☐ Health care professionals
- ☐ Friends and family
- ☐ Social media and blogs
- ☐ Internet (.com websites)
- ☐ Internet (.org, .gov websites)
- ☐ WIC brochures and website
- ☐ I don't look for information on physical activity during pregnancy

Rate how much you agree with the following statements regarding the community where you lived when you were recently pregnant.

	(strongly agree) 1	2	3	(strongly disagree) 4
Your neighborhood is a good place for you and your family to live.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Your neighbors can be counted on to help if someone is physically threatened or injured.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Law enforcement can be counted on if there is trouble in the neighborhood.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please think about your recent pregnancy and answer the following questions.

	Yes	No
Did you regularly attend any neighborhood, community or social group meetings such as block watches, parent teacher associations etc?	<input type="radio"/>	<input type="radio"/>
Did you regularly attend any religious services and functions?	<input type="radio"/>	<input type="radio"/>
Did you regularly socialize with other pregnant women?	<input type="radio"/>	<input type="radio"/>
In your community, are there places you could go to exercise if you wanted to?	<input type="radio"/>	<input type="radio"/>

This section will focus on the barriers to participation in physical activity. Think about the barriers you faced during your pregnancy and rate them based on your experiences during recent pregnancy.

	Not at all	Somewhat	Frequently
Too tired	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of sleep	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Shortness of breath	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Muscle/joint pain	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Concern with pregnancy complications	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Harm to the baby	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nausea/vomiting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Low motivation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Did not enjoy being physically active	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of childcare	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of knowledge about appropriate physical activity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of family support	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of friends' support	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Overly protective family members	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Conflicting advice from others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Isolation from other people	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Weather	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Season of the year	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of outdoor spaces to be active	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of indoor spaces to be active	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cost of being physically active	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Was there anything else that frequently got in a way from being physically active during pregnancy but was not mentioned above? If nothing else, please leave blank.

What would it take to get you to be more physically active during your recent pregnancy? Please rate the following factors based on your recent pregnancy. If you already were physically active a lot, what helped you to do this?

	Would not help	Help a little	Help a lot
More time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
More money	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Access to facilities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Support from family	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Support from a friend	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Childcare	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Doctor's advice	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Transportation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Self-motivation or will-power	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Support from another pregnant woman	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Good weather	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Healthier diet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Knowing it leads to earlier labor	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fun Activities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Was there anything else that would help you be more physically active during pregnancy but was not mentioned above? If nothing else, please leave blank.

### **Fruit and Vegetable Consumption**

These questions are about the different kinds of foods you ate or drank during a typical month of your mid pregnancy. When answering, please include meals and snacks eaten at home, at work or school, in restaurants, and anyplace else.

During a typical month of your mid pregnancy: How often did you drink 100% FRUIT JUICE, such as orange, mango, apple, and grape juices? Do NOT count fruit drinks. Do NOT include fruit drinks with added sugar, like Kool-aid, Hi-C, lemonade, cranberry cocktail, Gatorade, Tampico, and Sunny Delight.

- ☐ Never
- ☐ 1 -3 times per month
- ☐ 1-2 times per week
- ☐ 3-4 times per week
- ☐ 5-6 times per week
- ☐ 1 time per day
- ☐ 2 times per day
- ☐ 3 times per day
- ☐ 4 times per day
- ☐ 5 times per day
- ☐ Don't know

During a typical month of your mid pregnancy: How often did you eat FRUIT? COUNT fresh, frozen, or canned fruit. Do NOT count juices.

- ☐ Never
- ☐ 1 -3 times per month
- ☐ 1-2 times per week
- ☐ 3-4 times per week
- ☐ 5-6 times per week
- ☐ 1 time per day
- ☐ 2 times per day
- ☐ 3 times per day
- ☐ 4 times per day
- ☐ 5 times per day
- ☐ Don't know

During a typical month of your mid pregnancy: How often did you eat a green leafy or lettuce SALAD, with or without other vegetables?

- ☐ Never
- ☐ 1 -3 times per month
- ☐ 1-2 times per week
- ☐ 3-4 times per week
- ☐ 5-6 times per week
- ☐ 1 time per day
- ☐ 2 times per day
- ☐ 3 times per day
- ☐ 4 times per day
- ☐ 5 times per day
- ☐ Don't know

During a typical month of your mid pregnancy: How often did you eat FRENCH FRIES, home fries, or hash brown potatoes?

- ☐ Never
- ☐ 1 -3 times per month
- ☐ 1-2 times per week
- ☐ 3-4 times per week
- ☐ 5-6 times per week
- ☐ 1 time per day
- ☐ 2 times per day
- ☐ 3 times per day
- ☐ 4 times per day
- ☐ 5 times per day
- ☐ Don't know

During a typical month of your mid pregnancy: How often did you eat other WHITE POTATOES? COUNT baked potatoes, boiled potatoes, mashed potatoes and potato salad.

- ☐ Never
- ☐ 1 -3 times per month
- ☐ 1-2 times per week
- ☐ 3-4 times per week
- ☐ 5-6 times per week
- ☐ 1 time per day
- ☐ 2 times per day
- ☐ 3 times per day
- ☐ 4 times per day
- ☐ 5 times per day
- ☐ Don't know

During a typical month of your mid pregnancy: How often did you eat COOKED DRIED BEANS, such as fried beans, baked means, bean soup, and pork and beans? Do NOT include green beans.

- ☐ Never
- ☐ 1 -3 times per month
- ☐ 1-2 times per week
- ☐ 3-4 times per week
- ☐ 5-6 times per week
- ☐ 1 time per day
- ☐ 2 times per day
- ☐ 3 times per day
- ☐ 4 times per day
- ☐ 5 times per day
- ☐ Don't know

During a typical month of your mid pregnancy: Not counting what you just told me about (lettuce salads, white potatoes, cooked dried beans), and not counting rice, how often did you eat OTHER VEGETABLES?

- ☐ Never
- ☐ 1 -3 times per month
- ☐ 1-2 times per week
- ☐ 3-4 times per week
- ☐ 5-6 times per week
- ☐ 1 time per day
- ☐ 2 times per day
- ☐ 3 times per day
- ☐ 4 times per day
- ☐ 5 times per day
- ☐ Don't know

During a typical month of your mid pregnancy: How often did you have TOMATO SAUCES such as spaghetti sauce or pizza with tomato sauce?

- ☐ Never
- ☐ 1 -3 times per month
- ☐ 1-2 times per week
- ☐ 3-4 times per week
- ☐ 5-6 times per week
- ☐ 1 time per day
- ☐ 2 times per day
- ☐ 3 times per day
- ☐ 4 times per day
- ☐ 5 times per day
- ☐ Don't know

During a typical month of your mid pregnancy: How often did you have SALSA?

- ☐ Never
- ☐ 1 -3 times per month
- ☐ 1-2 times per week
- ☐ 3-4 times per week
- ☐ 5-6 times per week
- ☐ 1 time per day
- ☐ 2 times per day
- ☐ 3 times per day
- ☐ 4 times per day
- ☐ 5 times per day
- ☐ Don't know

## Nutrition

There are many things that can get in the way of choosing to eat 5 fruits and vegetables each day. Rate HOW CONFIDENT you are that you could do the following using the scale below. Please think back about your mid pregnancy.

	Not at all Confident	Somewhat Confident	Moderately Confident	Very Confident	Extremely Confident
Eat 5 servings of fruits and vegetables everyday?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Drink 100% fruit juice instead of soda or fruit punch?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Eat fruits and vegetables for a snack instead of chips or candy?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Eat fruits and vegetables when eating out at a restaurant?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Eat fruits and vegetables when I am upset or having a bad day?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Eat fruits and vegetables when I am at a social event?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How often, in the middle of your pregnant, did your family or friends do the following?

	Almost Never	Once Awhile	Sometimes	Often	Almost always
Encouraged you to eat healthy foods.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Discussed the benefits of eating healthy foods.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reminded you to choose healthy foods.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Shared ideas on healthy eating.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ate healthy meals with you.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Complained about eating healthy foods.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please answer the following questions.

	A lot	Some	A few	None
Did you know any one that ate healthy?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Did you know any pregnant women that ate healthy?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please rate the following statements on a scale from 1-4  
 (strongly agree) 1 2 3 4 (strongly disagree)  
 Think about your recent pregnancy. If you wanted to eat healthy:

	(strongly agree) 1	2	3	(strongly disagree) 4
childcare responsibilities would get in the way.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
elder care responsibilities would get in the way.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
work would get in the way.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
feeling guilty for giving up certain foods would get in the way.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
what your partner or husband might think about you would get in the way.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
what other people might think about you would get in the way.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
community obligations or activities would get in the way.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
you would need to put more effort into organizing your time.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Where do you get most of information on nutrition during your recent pregnancy? (check all that apply)

- ☐ Books
- ☐ Magazines
- ☐ Health care professionals
- ☐ Friends and family
- ☐ Social media and blogs
- ☐ Internet (.com websites)
- ☐ Internet (.gov, .org websites)
- ☐ WIC brochures and websites
- ☐ I don't look for information on nutrition during pregnancy

Please answer the following questions considering your most recent pregnancy. Indicate how strongly you agree with each item using the following scale:

	Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
There was at least one option at work where I had healthy selections to choose from.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There was a wide variety of fresh fruits and vegetables where I shopped.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The fruits and vegetables where I shopped were at good prices.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The fruits and vegetables where I shopped were good quality.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

This section will focus on the barriers to healthy nutrition. Think about the barriers you faced during your pregnancy and rate them based on your experiences during recent pregnancy.

	Not at all	Somewhat	Frequently
too tired	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
lack of sleep	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
low motivation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
lack of time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
do not enjoy eating healthy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
lack of knowledge about appropriate nutrition	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
lack of family support	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
lack of friends support	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
conflicting advice from others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
isolation from other people	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
season of the year	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
cravings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
food aversions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
nausea/vomiting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
lack of access to healthy foods	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
cost	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Was there anything else that frequently got in a way from eating healthy during pregnancy but was not mentioned above? If nothing else, please leave blank.

What would it take to get you to eat healthier during your recent pregnancy? Please rate the following factors based on your recent pregnancy. If you already ate healthy, what helped you to do this?

	Would not help	Help a little	Help a lot
having a healthy baby	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
more money	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
support from family	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
support from friends	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
support from other pregnant women	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
doctor's advice	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
better access to healthy foods	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
self-motivation or will-power	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
exercising	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
feeling more energized	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
not feeling sluggish	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
consistent food supply	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
having more energy to cook	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
having someone cook for me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Was there anything else that would help you eat healthier during pregnancy but was not mentioned above? If nothing else, please leave blank.

Thank you for completing the survey. We appreciate your responses and would like to compensate you for your time. Please provide the mailing address so we could send you a \$20 gift card. This information will be kept confidential and used only to send you the gift card.

Name

Address

City State

Postal Code

Would you be interested in completing an additional survey? It would take additional 30-40 minutes and you would receive an additional \$10 gift card. The additional questionnaire will ask you about the foods you ate during your pregnancy. If you click "yes", a link to the survey will be sent to you in a separate email within the next 2-3 days.

☐ Yes

☐ No

## APPENDIX F: IRB Approval

### MICHIGAN STATE UNIVERSITY

### Initial IRB Application Approval

June 19, 2015

To: Lanay Mudd  
IM Sports Circle  
308 W Circle Drive Room 27 S  
East Lansing, MI 48824

Re: IRB# 15-613 Category: EXPEDITED 7  
Approval Date: June 18, 2015  
Expiration Date: June 17, 2016

Title: The Correlates of Physical Activity and Diet Quality in Low-Income Pregnant Women

The Institutional Review Board has completed their review of your project. I am pleased to advise you that **your project has been approved**.

**This letter also notes approval for the use of ResearchMatch.**

The committee has found that your research project is appropriate in design, protects the rights and welfare of human subjects, and meets the requirements of MSU's Federal Wide Assurance and the Federal Guidelines (45 CFR 46 and 21 CFR Part 50). The protection of human subjects in research is a partnership between the IRB and the investigators. We look forward to working with you as we both fulfill our responsibilities.

**Renewals:** IRB approval is valid until the expiration date listed above. If you are continuing your project, you must submit an *Application for Renewal* application at least one month before expiration. If the project is completed, please submit an *Application for Permanent Closure*.

**Revisions:** The IRB must review any changes in the project, prior to initiation of the change. Please submit an *Application for Revision* to have your changes reviewed. If changes are made at the time of renewal, please include an *Application for Revision* with the renewal application.

**Problems:** If issues should arise during the conduct of the research, such as unanticipated problems, adverse events, or any problem that may increase the risk to the human subjects, notify the IRB office promptly. Forms are available to report these issues.

Please use the IRB number listed above on any forms submitted which relate to this project, or on any correspondence with the IRB office.

Good luck in your research. If we can be of further assistance, please contact us at 517-355-2180 or via email at [IRB@msu.edu](mailto:IRB@msu.edu). Thank you for your cooperation.

Sincerely,



Ashir Kumar, M.D.  
BIRB Chair

cc: Alicja Stannard, James Pivarnik, Jean Kerver, Lorraine Weatherspoon



Office of Regulatory Affairs  
Human Research  
Protection Programs

Biomedical & Health  
Institutional Review Board  
(BIRB)

Community Research  
Institutional Review Board  
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Social Science  
Behavioral/Education  
Institutional Review Board  
(SIRB)

Olds Hall  
408 West Circle Drive, #207  
East Lansing, MI 48824  
(517) 355-2180  
Fax: (517) 432-4503  
Email: [irb@msu.edu](mailto:irb@msu.edu)  
[www.humanresearch.msu.edu](http://www.humanresearch.msu.edu)

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## REFERENCES

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## CHAPTER 4

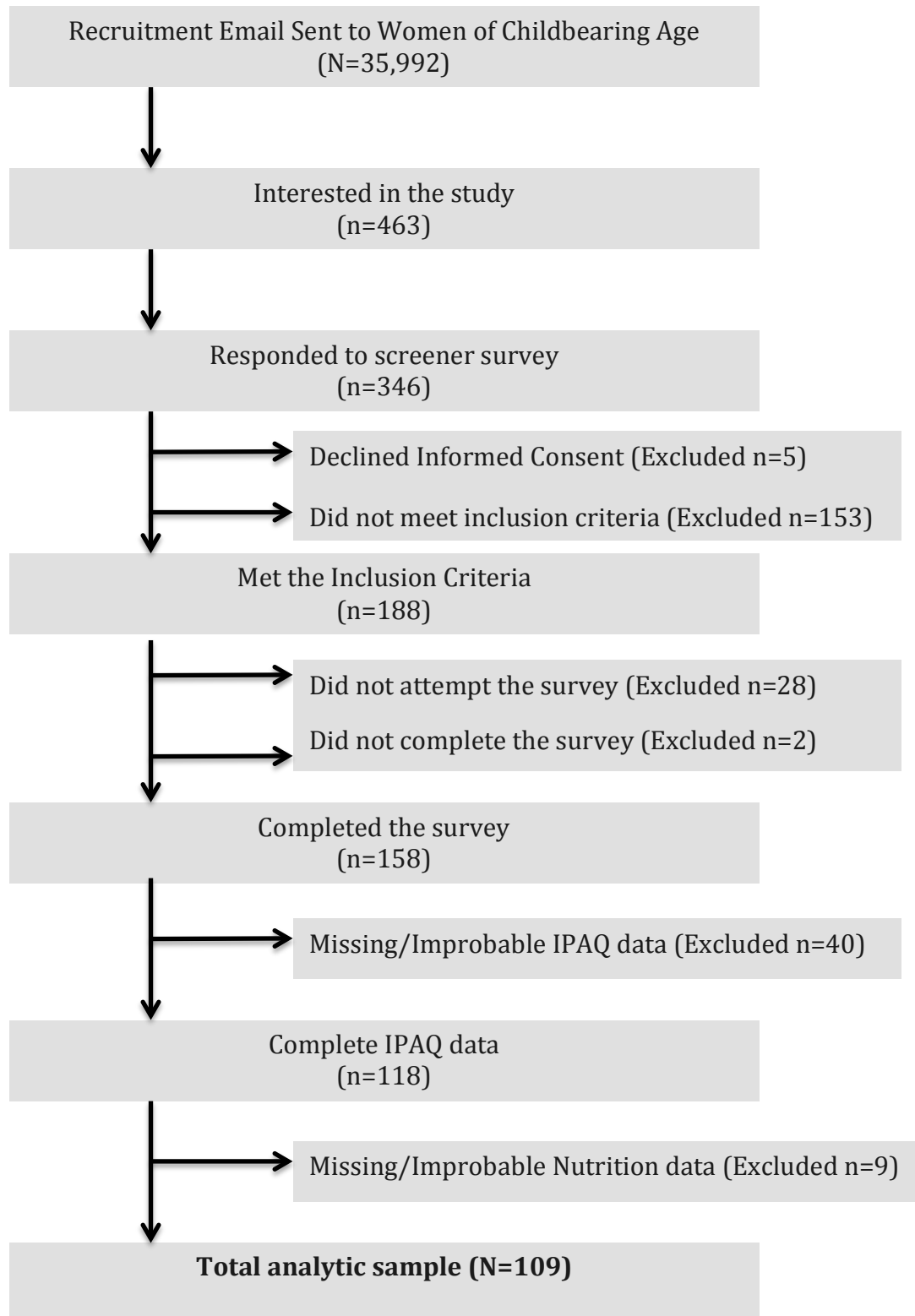
### RESULTS

#### **Description of Participants**

The study aimed to recruit 150 pregnant and postpartum women who met the participant inclusion criteria (18-45 years of age, WIC eligible or low-income, fluent in English, pregnant or <1year postpartum). In June, July, and August of 2015, recruitment emails were sent to the total of 35,992 females 18-45 years of age via the Research Match platform. Of those individuals, 463 (1.6%) expressed interest in the study. Of those potential participants, 346 (74.7%) responded to the screener survey, and of those women, 188 (54.3%) met the participant inclusion criteria and consented to the study. Although 158 women completed the study (84% of enrolled participants), 40 (25.3%) provided incomplete or improbable PA data, and 9 (5.1%) provided insufficient or improbable information to calculate Fruit and Vegetable intake. As a result, the total analytic sample for this investigation was 109 participants, as shown in Figure 4.1.

This dissertation has four aims focused on evaluating four Ecological Models for: 1) HPA, 2) JPA, 3) LTPA, and 4) DQ. Guided by these purposes, the results are organized into the following sections: (a) participant characteristics and correlates of PA and DQ according to Intrapersonal, Interpersonal, and Environmental factors, (b) barriers and facilitators to PA and DQ, (c) PA and DQ behaviors during pregnancy, and (d) study aims and evaluation of the Ecological models via confirmatory factor analysis and structural equation modeling.

**Figure 4.1. Participant flowchart for the total sample.**



## **Correlates of Physical Activity and Diet Quality**

Participant demographics for the total analytic sample are displayed in Table 4.1 as part of Intrapersonal correlates for PA and DQ. The majority of the analytic sample were postpartum women (62.4%, n=68). The median postpartum period was 6.25 months (range: 0.25-12 months) and most women reported having full-term delivery (81.5%). The rest of the analytic sample consisted of pregnant women (37.6%, n=41) who were evenly split across the three trimesters. Distributions and frequencies of all reported variables were compared between pregnant and postpartum women using Mann-Whitney U and chi-square analyses. A significantly larger number of postpartum women (n=25, 37%) reported having Pregnancy Related Health Problems (gestational diabetes, pregnancy induced hypertension, preeclampsia and/or bedrest) compared to currently pregnant women (n=4, 10%,  $p=0.002$ ). There were no other significant differences between groups, thus for all analyses in this dissertation, data from pregnant and postpartum women were combined.

Descriptive statistics for all examined correlates of PA and DQ are presented in Tables 4.1-4.6 and organized by the Intrapersonal, Interpersonal, and Environmental Factors relevant to PA and DQ. The mean age of the sample was 29.0 yrs (range 18-42) and the majority had at least some college education (88.9%), as displayed in Table 4.1. Only 3.7% of the analytic sample had pre pregnancy BMI classified as underweight while 43.9% were classified as normal, 21.5% as overweight, and 30.8% as obese. Underweight and normal BMI classifications were combined for further analysis. The majority of participants were multiparous (63.3%) with a reported median of two pregnancies (range 1-6). The participants identified themselves as being white (78%), African American (16.5%), Latino

or Hispanic (8.3%), Asian (4.6%), Native/American Indian (4.6%), and Hawaiian/Pacific (0.9%), which included 10% of individuals being multiracial. Further analysis classified the participants as white only (70.1%) vs. non-white (29.9%), as displayed in Table 4.1. Most women in the analytic sample were married (57.8%), lived in a household with at least two adults (92.7%), were employed (59.6%), and lived in the United States for their whole life (89.0%). We successfully recruited a low-income sample, as reflected by most women being on Medicaid (51.9%) and/or enrolled in the WIC program (56%). Most women perceived their health status as excellent or very good (56.0%), followed by 36.7% perceiving health status as good while only 7.3% of women reporting their health status as poor. Smoking (31.8%) and drinking alcohol (55.6%) were more prevalent pre-pregnancy than during pregnancy (10.2% and 5.5%, respectively). Overall, women rated lifestyle belief during pregnancy relatively high with a median score of 42 (21-50 range) indicating healthier lifestyle beliefs for pregnant women than midpoint score. On contrary, PA self-efficacy was below average with a median score of 2.6 on a 1-5 scale. Fruit and vegetable consumption self-efficacy score was above average with a median of 3.5 on a scale 1-5.

All demographic variables included in Tables 4.1 were examined for differences between the final analysis sample (n=109) and the sample of women with complete FV intake data (n=149) since n=40 participants (26.8%) were excluded from the analysis due to missing IPAQ data. All demographic variables differed by less than 5% with the exception of relationship status where the analytic sample had a higher percentage of married women than the full sample (data not shown).

**Table 4.1. PA and DQ Intrapersonal variables for the total sample (n=109).**

	n (%)
<b>Pregnancy Status</b>	
1 <sup>st</sup> trimester	14 (12.8)
2 <sup>nd</sup> trimester	13 (11.9)
3 <sup>rd</sup> trimester	14 (12.8)
Postpartum	68 (62.4)
<b>Pre Pregnancy BMI<sup>##</sup></b>	
Normal/Underweight	51 (47.7)
Overweight	23 (21.5)
Obese	33 (30.8)
<b>Race<sup>##</sup></b>	
White	75 (70.1)
Non-White	32 (29.9)
<b>Education<sup>#</sup></b>	
Some HS/HS/GED	12 (11.1)
Some College	40 (37.0)
College Grad	56 (51.9)
<b>Relationship Status</b>	
Married	63 (57.8)
Single with partner	35 (32.1)
Single without partner/ Divorced/Widowed	11 (10.1)
<b>Employment</b>	
Any	65 (59.6)
<b>Medicaid<sup>#</sup></b>	
Yes	56 (51.9)
<b>WIC Enrolled</b>	
Yes	62 (56.0)
No/I don't know	47 (41.3)
<b>Self-Perceived Health Status</b>	
Excellent/Very Good	61 (56.0)
Good	40 (36.7)
Poor/Fair	8 (7.3)
<b>Pregnancy Health Problems<sup>\$</sup></b>	
Yes	29 (26.6)
<b>Smoking</b>	
Prior Pregnancy <sup>##</sup>	34 (31.8)
During Pregnancy <sup>#</sup>	11 (10.2)
<b>Alcohol</b>	
Prior Pregnancy <sup>#</sup>	60 (55.6)
During Pregnancy	6 (5.5)

Table 4.1. (cont'd)

	median (range)
<b>Age</b>	29.0 (18-42)
<b>Times Pregnant</b>	2 (1-6)
<b>Lifestyle Beliefs Score<sup>a</sup> ##</b>	42 (21-50)
<b>PA Self- Efficacy Score<sup>b</sup> #</b>	2.6 (1-5)
<b>FV Consumption Self-Efficacy Score<sup>b</sup> ###</b>	3.5 (1-5)

*\$Reported at least one of the following Pregnancy Related Health Problems:  
Gestational diabetes, hypertension, preeclampsia, bedrest.*

*<sup>a</sup> scale 10-50, higher scores indicate healthier lifestyle beliefs*

*<sup>b</sup> scale 1-5, higher scores indicate higher self-efficacy*

*#n=108, ##n=107, ###n= 106*

Interpersonal correlates of PA demonstrated moderate social support from family members (median score 24 on scale of 10-50) and rather low social support from friends (median score 17 on scale of 10-50). Overall, perceptions of women who exercised during pregnancy were favorable (median score 3.4 on scale of 1-4) while the social roles strain median score of 3.0 (on scale of 1-4) indicated low social strain. The main sources women used for information on PA during pregnancy were Internet .com websites (n=65, 59.6%) and advice from a healthcare provider (n=59, 54.1%) while 17% of women reported not looking for information on PA. Only these three variables depicting sources of information on PA were used in evaluation of study aims.

**Table 4.2. PA Interpersonal variables for the total sample (n=109).**

	n (%)	median (range)
<b>PA Social Support Friends<sup>a#</sup></b>		17 (10-47)
<b>PA Social Support Family<sup>a ###</sup></b>		24 (10-46)
<b>Social Perceptions<sup>b #</sup></b>		3.4 (1.2-4)
<b>Social Roles Strain<sup>c #</sup></b>		3.0 (1-4)
<b>Sources of Information</b>		
<i>Internet .com</i>	<b>65 (59.6)</b>	
<i>Healthcare professionals</i>	<b>59 (54.1)</b>	
Friends/family	42 (38.5)	
Social media	40 (36.7)	
Internet .gov	37 (33.9)	
Books	34 (31.2)	
Magazines	33 (30.3)	
WIC	26 (23.9)	
<b>Don't look</b>	<b>18 (16.5)</b>	

<sup>a</sup> scale 10-50, higher scores indicate higher social support

<sup>b</sup> scale 1-4, higher scores indicate more favorable ratings of women who exercise

<sup>c</sup> scale 1-4, higher scores indicate lower social role strain

#n=108, ##n=107, ###n=91

For Environmental correlates of PA (Table 4.3), the majority of women (82.2%) rated the neighborhood they live in as safe (82.6%) but indicated limited access to facilities to engage in PA (66.7%). The median score for the sense of community was 1.7 (scale 1-4) indicating a favorable rating of the community women lived in. Community engagement was relatively low with a minority of women reporting attending community events (22.0%) or religious services (42.2%) and only 41.3% reporting socializing with pregnant women.

**Table 4.3. PA Environmental variables for the total sample (n=109).**

	n (%)	median (range)
<b>Sense of community score<sup>a</sup></b>		1.7 (1-4)
<b>Feel safe</b>	90 (82.6)	
<b>Limited access to facilities<sup>#</sup></b>	72 (66.1)	
<b>Attend community events</b>	24 (22.0)	
<b>Attend religious services</b>	46 (42.2)	
<b>Socialize with pregnant women</b>	45 (41.3)	

<sup>#</sup>n=108

<sup>a</sup>scale 1-4, higher score indicated lower sense of community

Examination of Interpersonal correlates for DQ showed average social support for healthy eating with a median score of 3.0 on a scale 1-5, as shown in Table 4.4. The validated social support scale for healthy eating did not allow for identifying friend vs. family social support as reported for PA. Social perceptions were average with a median score of 2.5 (on a 1-4 scale) while social role strains score was above average (median=3.6 on a 1-4 scale) indicating lower social strain. Similar to PA sources of information, most women obtained information on nutrition during pregnancy from Internet.com websites (59.6%) and healthcare providers (51.4%) while 12.8% reported not looking for information on nutrition during pregnancy. These three variables on sources of information were used in evaluation of study aims.

**Table 4.4. DQ Interpersonal variables for the total sample (n=109).**

	n (%)	median score (range)
<b>Social Support</b> <sup>a #</sup>		3.0 (1.67-5)
<b>Social Perceptions</b> <sup>b ##</sup>		2.5 (1-4)
<b>Social Roles Strain</b> <sup>c ###</sup>		3.6 (1.1-4)
<b>Sources of Information</b>		
<i>Internet .com</i>	<b>65 (59.6)</b>	
<i>Healthcare professionals</i>	<b>56 (51.4)</b>	
WIC	45 (41.3)	
Books	40 (36.7)	
Magazines	40 (36.7)	
Internet .gov	41 (37.6)	
Friends/Family	36 (33.0)	
Social Media	35 (32.1)	
<i>Don't look</i>	<b>14 (12.8)</b>	

#n=106

##n=108

###n=105

<sup>a</sup> scale 1-5, higher score indicates higher social support

<sup>b</sup> scale 1-4, lower score indicates more favorable rating of women who eat healthy

<sup>c</sup> scale 1-4, lower scores indicate higher social role strain

Overall, women rated their environment as favorable to healthy eating (median score 3.75 on a scale 1-5) as shown in Table 4.5. More specifically, within the healthy eating survey, 35.5% of women reporting having access to healthy food selections at work while 31.5% indicated not having such option. The majority of women reported having access to a variety of fruits and vegetables when shopping (86.6%), most reported the cost of fruits and vegetables being good (57.2%), and having access to quality of fruits and vegetables when shopping (66.1%). Other DQ Environmental variables such as: the sense of community, attending community events, attending religious events, and socializing with pregnant women were the same as reported previously for PA Environmental variables.

**Table 4.5. DQ Environmental variables for the total sample (n=109).**

	n (%)	median score (range)
<b>Healthy Eating Physical Environment</b> <sup>a</sup> #		3.8 (1-5)
<b>Sense of community score</b> <sup>b</sup> #		1.7 (1-4)
<b>Attend community events</b>	24 (22.0)	
<b>Attend religious services</b>	46 (42.2)	
<b>Socialize with pregnant women</b>	45 (41.3)	
<sup>a</sup> scale 1-5, higher score indicated higher healthy eating environment		
<sup>b</sup> scale 1-4, higher score indicated lower sense of community		
#n=106		

**Barriers and Facilitators**

Pregnancy specific barriers to PA are displayed in Table 4.6. The most frequently endorsed Intrapersonal barriers to PA during pregnancy were being too tired (55.0%) and having low motivation (43.5%). On the other hand, the lack of knowledge about PA, harm to the baby, and concern with pregnancy complications were endorsed as not being obstacles to PA by 77.1%, 68.8%, and 49.1% women respectively. The highest endorsed frequent Interpersonal barrier to PA was lack of childcare selected by only 25.7% of responders. Among the Environmental barriers to PA, season of the year was the most frequently endorsed barrier by 31.8%.

**Table 4.6. Reported barriers to PA organized according to the Intrapersonal, Interpersonal, and Environmental factors of the Ecological Model and ordered from the most frequently to least frequently endorsed (n=109).**

	Not at all <i>n (%)</i>	Somewhat <i>n (%)</i>	Frequently <i>n (%)</i>
<i><u>Intrapersonal</u></i>			
Too tired	5 (4.6)	44 (40.4)	60 (55.0)
Low motivation <sup>#</sup>	26 (24.1)	35 (32.4)	47 (43.5)
Lack of sleep <sup>#</sup>	14 (13.0)	53 (49.1)	41 (38.0)
Lack of time	25 (22.9)	44 (40.4)	40 (36.7)
Joint Pain <sup>#</sup>	29 (26.9)	45 (41.7)	34 (31.5)
Nausea/Vomiting	40 (36.7)	38 (34.9)	31 (28.4)
Concern with pregnancy complications <sup>#</sup>	53 (49.1)	29 (26.9)	26 (24.1)
Shortness of breath	47 (43.1)	36 (33.0)	26 (23.9)
Cost of being physically active	56 (51.4)	29 (26.6)	24 (22.0)
Do not enjoy being physically active	49 (45.0)	37 (33.9)	23 (21.1)
Harm to the baby	75 (68.8)	24 (22.0)	10 (9.2)
Lack of knowledge about appropriate PA	84 (77.1)	21 (19.3)	4 (3.7)
Other:			
Pregnancy Related Health Problems			3 (2.7)
Non Pregnancy Related Health			3 (2.7)
<i><u>Interpersonal</u></i>			
Lack of childcare	58 (53.2)	23 (21.1)	28 (25.7)
Lack of friends support	68 (62.4)	29 (26.6)	12 (11.0)
Isolation from other people	71 (65.1)	27 (24.8)	11 (10.1)
Lack of family support	69 (63.3)	30 (27.5)	10 (9.2)
Overly protective family members	80 (73.4)	21 (19.3)	8 (7.3)
Conflicting advice from others	84 (77.1)	19 (17.4)	6 (5.5)
<i><u>Environmental</u></i>			
Season of the year <sup>##</sup>	40 (37.4)	33 (30.8)	34 (31.8)
Weather	41 (37.6)	42 (38.5)	26 (23.9)
Lack of indoor spaces	62 (56.9)	24 (22.0)	23 (21.1)
Lack of outdoor spaces <sup>#</sup>	75 (69.4)	20 (18.5)	13 (12.0)

<sup>#</sup>*n*=108

<sup>##</sup>*n*=107

The most frequently endorsed Intrapersonal facilitators to PA were having more self-motivation or will-power (72.5%), being engaged in fun PA activities (61.5%), and having a healthier diet (51.4%), as shown in Table 4.8. Among Interpersonal facilitators,

having support from other pregnant women was most frequently endorsed (47.7%) followed by having childcare (43.1%), support from family (42.2%), and support from a friend (40.4%). For the Environmental facilitators to PA, good weather and access to facilities were considered the most frequent facilitators (59.6% and 44.0% respectively).

**Table 4.7. Reported facilitators to PA organized according to the Intrapersonal, Interpersonal, and Environmental factors of the Ecological Model and ordered from the most frequently to least frequently endorsed (n=109).**

	Would not help <i>n (%)</i>	Help a little <i>n (%)</i>	Help a lot <i>n (%)</i>
<i><u>Intrapersonal</u></i>			
Self-motivation or will-power	11 (10.1)	19 (17.4)	79 (72.5)
Fun Activities	9 (8.3)	33 (30.3)	67 (61.5)
Healthier diet	23 (21.1)	30 (27.5)	56 (51.4)
More time <sup>#</sup>	13 (11.9)	43 (39.4)	52 (48.1)
More money	26 (23.9)	32 (29.4)	51 (46.8)
Knowing it leads to easier labor	57 (52.3)	26 (23.9)	26 (23.9)
Other:			
Less Pain			1 (0.9)
Being active prior pregnancy			1 (0.9)
More energy			1 (0.9)
Less weight gain			1 (0.9)
<i><u>Interpersonal</u></i>			
Support from preg. women	21 (19.3)	36 (33.0)	52 (47.7)
Childcare	42 (38.5)	20 (18.3)	47 (43.1)
Support from family	21 (19.3)	42 (38.5)	46 (42.2)
Support from a friend <sup>#</sup>	20 (18.3)	45 (41.3)	44 (40.4)
Doctor's advice	38 (34.9)	44 (40.4)	27 (24.8)
<i><u>Environmental</u></i>			
Good weather	14 (12.8)	30 (27.5)	65 (59.6)
Access to facilities	19 (17.4)	42 (38.5)	48 (44.0)
Transportation <sup>#</sup>	66 (61.0)	18 (16.7)	24 (22.2)

<sup>#</sup>*n*=108

The most frequently endorsed Intrapersonal barrier to healthy eating was pregnancy related cravings (46.8%), as shown in Table 4.9. Women appeared to be knowledgeable about nutrition and enjoyed eating healthy as these two barriers were the least frequently endorsed by surveyed women (3.6% and 7.3% respectively). Over 70% of women considered Interpersonal barriers not to be relevant obstacles to healthy eating. Similarly, most women did not endorse Environmental barriers to healthy eating.

**Table 4.8. Reported barriers to healthy eating organized according to the Intrapersonal, Interpersonal, and Environmental factors of the Ecological Model and ordered from the most frequently to least frequently endorsed (n=109).**

	Not at all <i>n (%)</i>	Somewhat <i>n (%)</i>	Frequently <i>n (%)</i>
<i><u>Intrapersonal</u></i>			
Cravings	16 (14.7)	42 (38.5)	51 (46.8)
Too tired <sup>#</sup>	21 (19.4)	46 (42.6)	41 (38.0)
Cost <sup>##</sup>	25 (23.4)	46 (43.0)	36 (33.6)
Low motivation <sup>#</sup>	26 (24.1)	44 (40.7)	38 (35.2)
Food aversions <sup>#</sup>	43 (39.4)	33 (30.6)	32 (29.6)
Lack of sleep	31 (28.4)	46 (42.2)	32 (29.4)
Nausea/Vomiting <sup>#</sup>	39 (36.1)	42 (38.9)	27 (25.0)
Lack of time <sup>#</sup>	31 (28.7)	52 (48.1)	25 (23.1)
Do not enjoy eating healthy	76 (69.7)	25 (22.9)	8 (7.3)
Lack of knowledge about nutrition	87 (79.8)	18 (16.5)	4 (3.7)
Other:			
Vegan Diet	1 (0.9)		
Diet limited due to health problems			1 (0.9)
Pelvic Pain while shopping			1 (0.9)
<i><u>Interpersonal</u></i>			
Isolation from other people	84 (77.1)	12 (11.0)	13 (11.9)
Lack of family support	79 (72.5)	21 (19.3)	9 (8.3)
Lack of friends support	81 (74.3)	20 (18.3)	8 (7.3)
Conflicting advice from others	83 (76.1)	19 (17.4)	7 (6.4)
<i><u>Environmental</u></i>			
Season of the year	66 (60.6)	30 (27.5)	13 (11.9)
Lack of access to healthy foods	80 (73.4)	21 (19.3)	8 (7.3)
<sup>#</sup> <i>n</i> =108			
<sup>##</sup> <i>n</i> =107			

The majority of women considered all Intrapersonal facilitators as important to healthy eating (Table 4.10). The highest two were having a healthy baby (83.0%) and having more energy to cook (78.0%). For the Intrapersonal facilitators, the most frequently selected were support from family (48.6%), doctor's advice (45.9%), and

support from friends (44.4%). All Environmental Facilitators were highly rated by women with consistent food supply being helpful to 63.3% women and better access to healthy foods being helpful for 61.1% of women.

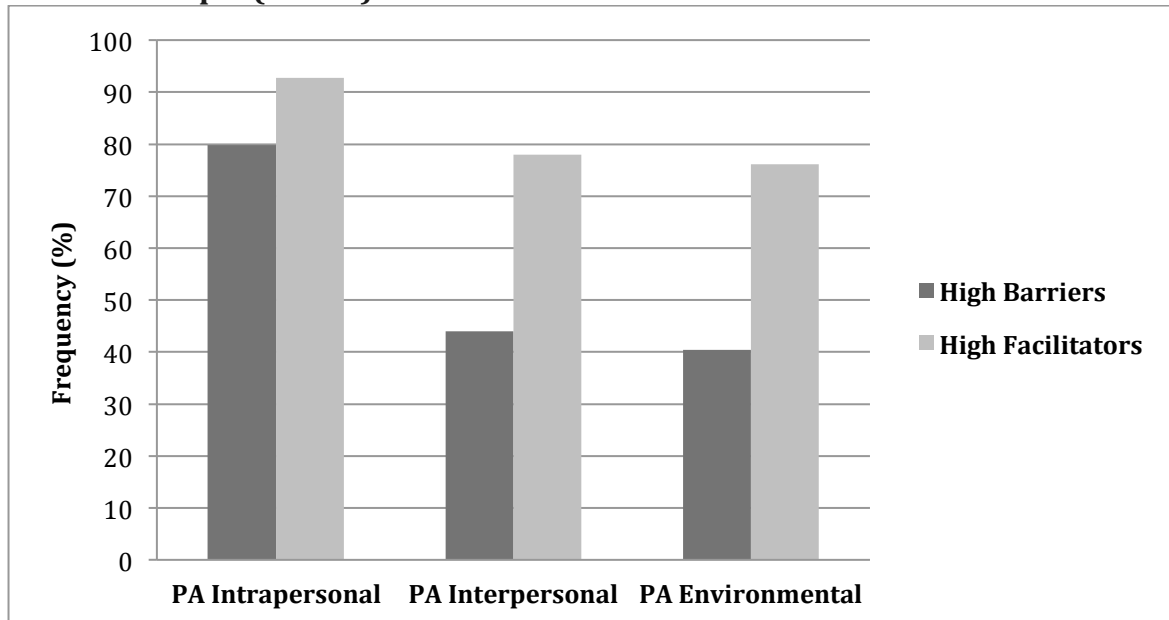
**Table 4.9. Reported facilitators to healthy eating organized according to the Intrapersonal, Interpersonal, and Environmental factors of the Ecological Model and ordered from the most frequently to least frequently endorsed (n=109).**

	Would not help <i>n (%)</i>	Help a little <i>n (%)</i>	Help a lot <i>n (%)</i>
<i><u>Intrapersonal</u></i>			
Having a healthy baby <sup>#</sup>	3 (2.7)	16 (14.3)	93 (83.0)
Having more energy to cook	4 (3.7)	20 (18.3)	85 (78.0)
Not feeling sluggish	5 (4.6)	22 (20.2)	82 (75.2)
Having someone cook for me	9 (8.3)	19 (17.4)	81 (74.3)
Feeling more energized	6 (5.5)	23 (21.1)	80 (73.4)
Self-motivation or will-power <sup>#</sup>	9 (8.3)	20 (18.3)	79 (73.1)
More money	8 (7.3)	25 (22.9)	76 (69.7)
Exercising	13 (11.9)	37 (33.9)	59 (54.1)
Other: Eating Healthy Prior Pregnancy			1 (0.9)
<i><u>Interpersonal</u></i>			
Support from family	16 (14.7)	40 (36.7)	53 (48.6)
Doctor's advice	22 (20.1)	37 (33.9)	50 (45.9)
Support from friends <sup>#</sup>	20 (18.3)	40 (37.0)	48 (44.4)
Support from other pregnant women	23 (21.1)	44 (40.4)	42 (38.5)
<i><u>Environmental</u></i>			
Consistent food supply	20 (18.3)	20 (18.3)	69 (63.3)
Better access to healthy foods <sup>#</sup>	14 (12.8)	28 (25.9)	66 (61.1)
Other: Farmers Markets			1 (0.9)

<sup>#</sup>*n*=108

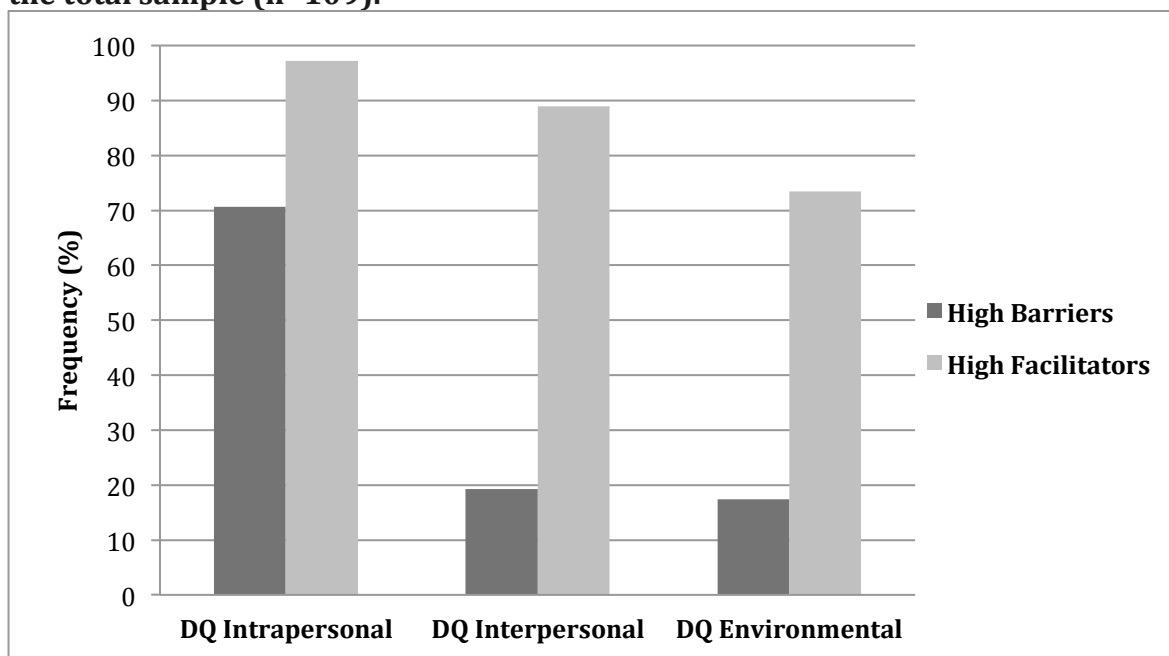
For further analyses, women were categorized as endorsing at least one barrier as “frequent” (High Barrier) or not, and as endorsing at least one facilitator as “helping a lot” (High Facilitator) or not for Intrapersonal, Interpersonal and Environmental levels. These data are displayed in Figures 4.2 and 4.3 for PA and DQ, respectively. Almost 80% of women reported at least one of the Intrapersonal Barriers to be a frequent obstacle to being physically active, while about half as many indicated at least one Interpersonal barrier (44%) or Environmental barrier (40%) as frequent. The majority of women indicated at least one facilitator to be helpful in being physically active in every category: 93% Intrapersonal, 78% Interpersonal, and 76% Environmental. Having at least one frequent barrier to DQ was less common than for PA, but followed the same pattern. Over 70% of women rated at least one Intrapersonal barrier as frequent to healthy eating while only 19% indicated at least one Interpersonal barrier as frequent and 17% indicated at least one Environmental barrier as frequent. A large majority of women indicated at least one facilitator to be very helpful in eating healthy: 97.2% for Intrapersonal, 89% for Interpersonal, and 73.4% for Environmental facilitators.

**Figure 4.2. Frequency of endorsing at least one frequent PA barrier and facilitator in the total sample (n=109).**



*High barrier indicates a participant rated at least one of the reported PA barriers a frequent barrier. High facilitator indicates a participant rated at least one of the reported facilitators as very helpful in being more physically active.*

**Figure 4.3. Frequency of endorsing at least one frequent DQ barrier and facilitator in the total sample (n=109).**



*High barrier indicates a participant rated at least one of the reported DQ barriers a frequent barrier. High facilitator indicates a participant rated at least one of the reported facilitators as very helpful in eating healthier.*

To further describe the load of barriers and facilitators, we created total “frequent barriers” and “frequent facilitators” scores for each ecological level by summing the total number of barriers rated as “frequent” and total number of facilitators rated as “helps a lot”. Using this method, the median “frequent barriers” scores for PA were 3 (range of 0-10) for Intrapersonal barriers, 0 (range 0-6) for Interpersonal barriers, and 1 (range 0-3) for Environmental barriers. The median “frequent facilitators” scores for PA were 3 (range 0-6) for Intrapersonal facilitators, 1 (range 0-4) for Interpersonal facilitators, and 1 (range 0-5) for Environmental facilitators.

The same scoring method was used for barriers and facilitators to healthy eating. The median “frequent barriers” scores for healthy eating were 2 (range 0-10) for the Interpersonal barriers, 0 (range 0-4) for the Interpersonal barriers, and 0 (range 0-2) for the Environmental barriers. The median “frequent facilitators” scores for healthy eating were 6 (range 0-7) for Intrapersonal facilitators, 2 (range 0-5) for Interpersonal facilitators, and 2 (range 0-2) for Environmental facilitators.

### **PA and DQ Behaviors During Pregnancy**

PA and DQ characteristics are summarized in Table 4.10. Median HPA was 28.0 MET-hr/wk with a wide range of 0.0 to 354.0 MET-hr/wk. Although more than half of the analytic sample reported some JPA during pregnancy (n=65, 59.6%), reported median JPA was only 0.2 MET-hr/wk (0.0-367.3). Median LTPA was 6.0 MET-hr/wk with a range of 0.0 to 107.5 MET-hr/wk. In total, 76.1% (n=86) of women in the analytic sample engaged in some LTPA, while 43.4% (n=49) met LTPA recommendations, as shown in Figure 4.4. Median total PA was 80.5 MET-hr/wk, which included HPA, JPA, LTPA and Transportation

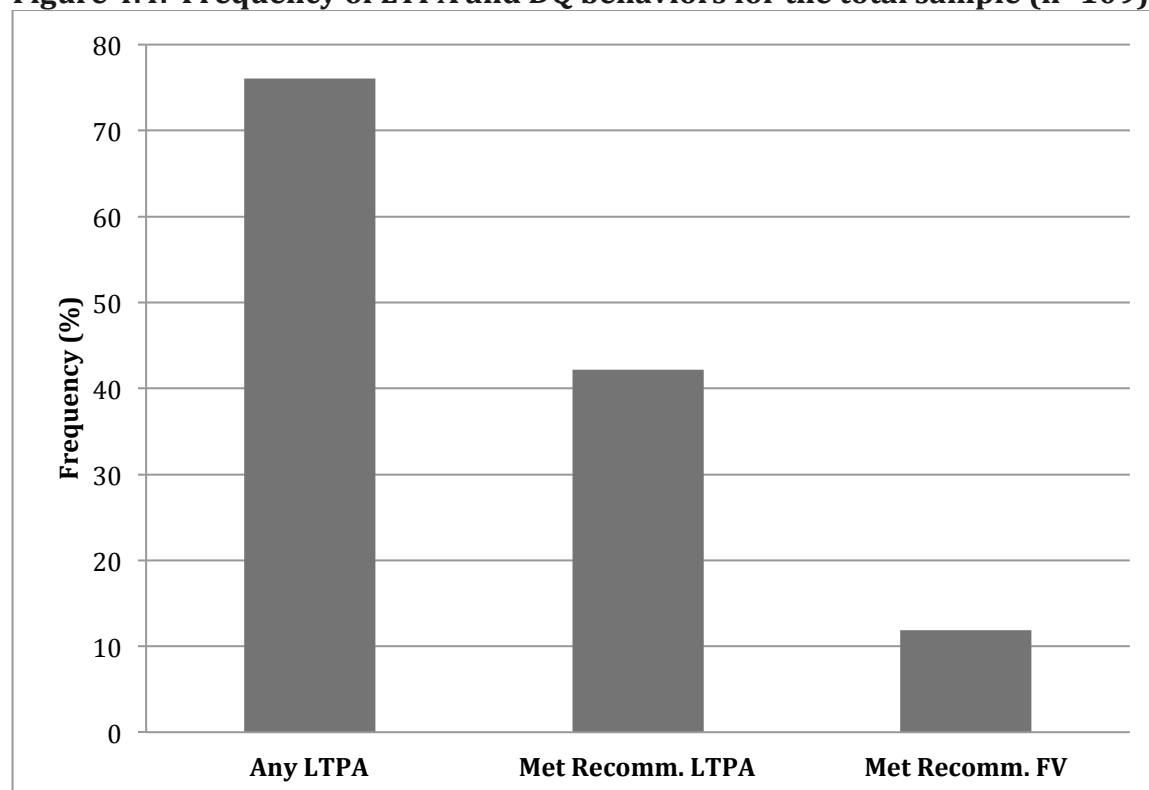
PA.

The median FV intakes with and without including fries were similar at 1.75 (range: 0.4-16.2) and 1.6 (range: 0.4-13.5) cups per week, respectively. Thus, DQ was predicted by using FV intake including fries for future analyses. FV recommendations were met by only 11.9% (n=13) of women, as shown in Figure 4.4. The percent of participants meeting FV recommendations did not differ when comparing the intake with and without fries.

**Table 4.10. PA and DQ habits during pregnancy for the total sample (n=109).**

	Median (range)
<b>PA Variables</b>	
<b>HPA</b> (MET-hr/wk)	28.0 (0.0-354.0)
<b>JPA</b> (MET-hr/wk)	0.2 (0.0-367.3)
<b>LTPA</b> (MET-hr/wk)	6.0 (0.0-107.5)
<b>Transportation</b> (MET-hr/wk)	3.9 (0.0-49.8)
<b>Total PA</b> (MET-hr/wk)	80.5 (0.0-435.0)
<b>DQ Variable</b>	
<b>FV Cups w/Fries per day</b>	1.75 (0.4-16.2)

**Figure 4.4. Frequency of LTPA and DQ behaviors for the total sample (n=109).**



*LTPA recommendation equals to 495 MET-min /wk. FV recommendation equals to 5 cups of fruits and vegetables per day.*

### **Evaluation of the Ecological Models**

**Specific Aim 1.** To construct an Ecological Model predicting HPA from Intrapersonal, Interpersonal, and Environmental factors by identifying the latent variables loading on the factors.

Aim 1 was accomplished by performing the CFA separately for Intrapersonal, Interpersonal, and Environmental correlates of PA. Correlation matrices for all Intrapersonal variables indicated ten variables to be significantly correlated with at least 2 other variables and these were selected to enter into the CFA. Moreover, race was also added to the model based on a theoretical concept suggesting it to be relevant to HPA behaviors even though it did not meet the initial inclusion criteria. Specific variables

meeting these criteria and included in the initial CFA model are listed in Table 4.11. Three other variables were highly correlated with included variables and were not included in the CFA due to concerns about multicollinearity. Parity was eliminated from the analysis as it highly correlated with Times Pregnant variable ( $r=0.45$ ). Smoking during pregnancy was eliminated from the analysis as all current smokers smoked prior pregnancy and the two variables were correlated at  $r=0.49$ . Lastly, JPA was highly correlated with Any Job ( $r=0.830$ ) and removed from the analysis. For the Interpersonal and Environmental correlates, all variables were selected for the initial CFA as each correlated with at least one other variable.

**Table 4.11. Variables examined in the confirmatory factor analyses for HPA organized by initially selected and final variables included in the analyses.**

Intrapersonal Factors		Interpersonal Factors		Environmental Factors	
All variables meeting selection criteria	Final variables used in the model	All variables meeting selection criteria	Final variables used in the model	All variables meeting selection criteria	Final variables used in the model
<ul style="list-style-type: none"> <li>• Education</li> <li>• Age</li> <li>• Pre preg BMI</li> <li>• Race</li> <li>• Relationship status</li> <li>• Health Status</li> <li>• Smoking past</li> <li>• Drinking past</li> <li>• Times Preg</li> <li>• Any job</li> <li>• Total PA</li> </ul>	<ul style="list-style-type: none"> <li>• Education</li> <li>• Age</li> <li>• Relationship status</li> <li>• Health Status</li> <li>• Smoking past</li> <li>• Total PA</li> </ul>	<ul style="list-style-type: none"> <li>• Family Social Support</li> <li>• Friends Social Support</li> <li>• Social Roles</li> <li>• Social Perceptions</li> <li>• Healthcare provider PA source</li> <li>• Internet.com PA source</li> <li>• Don't look for PA info</li> </ul>	<ul style="list-style-type: none"> <li>• Family Social Support</li> <li>• Friends Social Support</li> <li>• Social Roles</li> <li>• Social Perceptions</li> <li>• Healthcare provider PA source</li> <li>• Internet.com PA source</li> </ul>	<ul style="list-style-type: none"> <li>• Sense of community</li> <li>• Safety</li> <li>• Attend community events</li> <li>• Attend religious events</li> <li>• Socialize with pregnant women</li> </ul>	<ul style="list-style-type: none"> <li>• Sense of community</li> <li>• Attend community events</li> <li>• Attend religious events</li> <li>• Socialize with pregnant women</li> </ul>

Results of the CFA analyses for the Intrapersonal, Interpersonal, and Environmental factors are displayed in Table 4.12. Model fit determinations were based primarily on CFI, RMSEA and WRMR due to the relatively small sample size. There was a poor fit for the

initial model for the Intrapersonal latent variable: CFI=0.674, RMSEA= 0.105 (90% CI=0.075 to 0.135); WRMR= 1.1130 as displayed in Model 1.1, Table 4.12. Item factor loadings were significant for all but three correlates: pre pregnancy BMI, Race, and Any Job with  $p=0.74$ ,  $r^2=0.002$ ;  $p=0.989$ ,  $r^2=0.000$ ,  $p=0.770$ ,  $r^2=0.002$  respectively. All three correlates were removed from the analysis. The re-specification model (Model 1.2 in Table 4.12) improved the model fit slightly, but not to an acceptable level: CFI=0.782, RMSEA 0.112 (90% CI= 0.070 to 0.115); and WRMR= 1.051. Times Pregnant and Drinking Alcohol prior Pregnancy correlates did not fit the model based on the fit indices and were removed from the analysis. This model re-specification resulted in a good model fit: CFI=0.968, RMSEA 0.057 (90% CI= 0.000 to 0.131); and WRMR=0.680. As displayed in Table 4.11, correlates retained in the CFA model for the Intrapersonal latent factor were: Education, Age, Relationship Status, Self-Perceived Health Status, Smoking prior Pregnancy, and Total PA with all variables having significant ( $p<0.05$ ) associations with the latent Intrapersonal factor.

Interpersonal CFA analyses for HPA are displayed in Table 4.12. Initial CFA model showed poor fit: CFI=0.665, RMSEA 0.168 (0.118-0.221), and WRMR=1.317 and resulted in negative variances for Don't Look for Sources of Information on PA correlate. Removal of this variable resulted in an excellent model fit: CFI=1.000, RMSEA= 0.000 (90%CI= 0.000 to 0.113), and WRMR= 0.626. The final variables retained in the model were: Social Support from Family, Social Support from Friends, Social Perceptions, Social Role Strain, Sources of PA Information from Healthcare Provider and Sources of PA Information from .com websites, as displayed in Table 4.11.

Results of the Environmental CFA analyses for HPA are displayed in Table 4.12. The initial model fit was poor: CFI= 0.895, RMSEA 0.159 (90% CI=0.086 to 0.239), WRMR=1.078. However, after removal of the Safety variable, Model 3.2 showed a good fit: CFI=1.000, RMSEA 0.000 (90% CI=0.000 to .181), WRMR=0.408. Correlates retained in the model were: the Sense of Community, Attending Community Events, Attending Religious Events, and Socializing with Pregnant Women as displayed in Table 4.11.

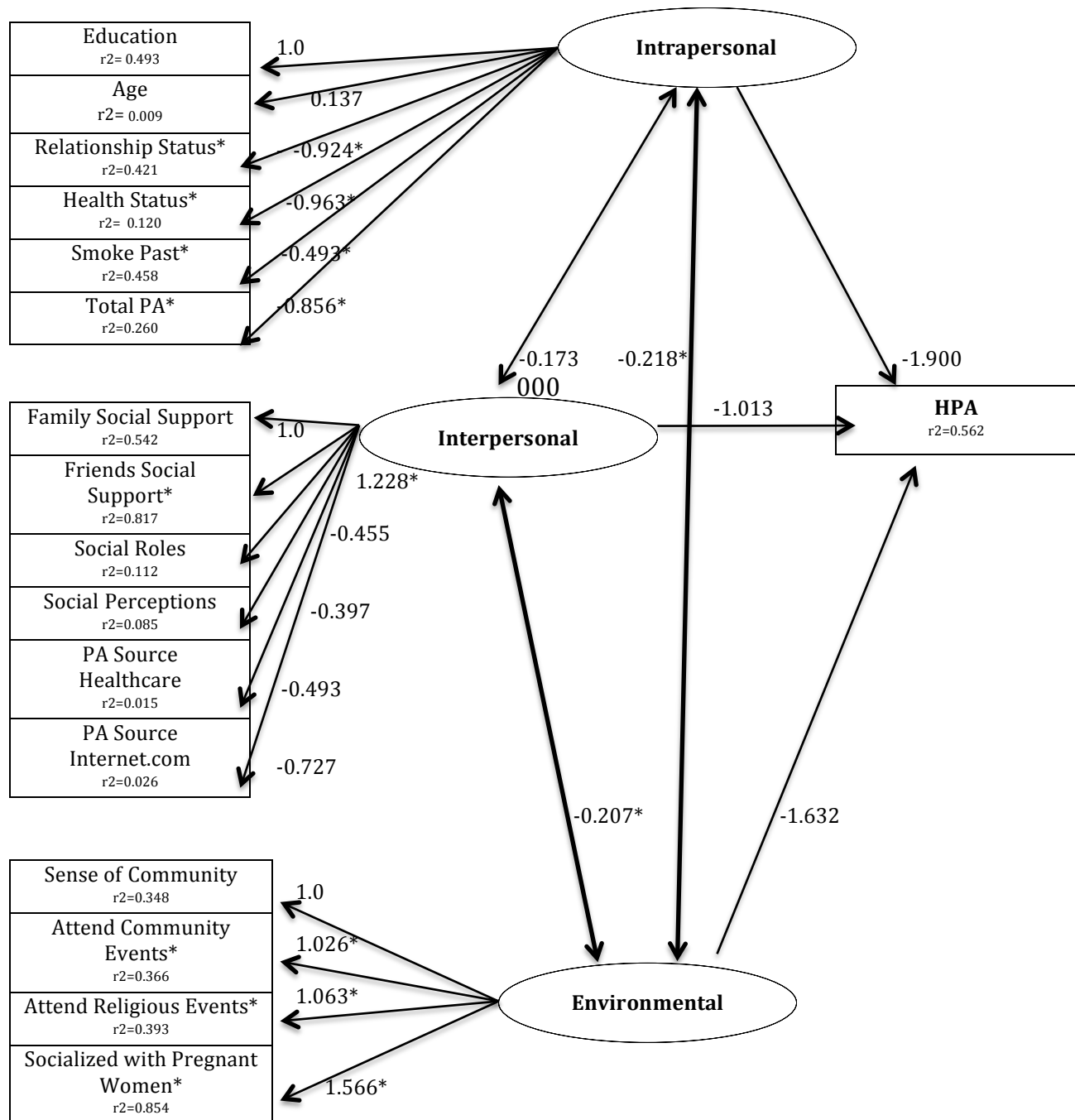
**Table 4.12. Results of confirmatory factor analysis of Intrapersonal, Interpersonal, and Environmental factors for HPA.**

<b>Model Type</b>	<b>Model Name</b>	<b>X<sup>2</sup> (df), <i>p</i></b>	<b>CFI</b>	<b>TLI</b>	<b>RMSEA (90% CI), <i>p<sub>close</sub></i></b>	<b>WRMR</b>
<b>Intrapersonal</b>	Model 1.1	$X^2=93.133(44)$ , $p=0.000$	0.674	0.508	0.105 (0.075-0.135), $p_{close}=0.002$	1.130
	Model 1.2	$X^2=46.410(20)$ , $p=0.001$	0.782	0.695	0.112 (0.070-0.115), $p_{close}=0.011$	1.051
	Model 1.3	$X^2=12.025(9)$ , $p=0.212$	0.968	0.947	0.057 (0.000-0.131), $p_{close}=0.392$	0.680
<b>Interpersonal</b>	Model 2.1	$X^2=48.532(14)$ , $p=0.000$	0.655	0.483	0.168 (0.118-0.221), $p_{close}=0.000$	1.317
	Model 2.2	$X^2=8.218(9)$ , $p=0.512$	1.000	1.036	0.000 (0.000-0.113), $p_{close}=0.668$	0.626
<b>Environmental</b>	Model 3.1	$X^2=18.577(5)$ , $p=0.002$	0.895	0.790	0.159 (0.086-0.239), $p_{close}=0.010$	1.078
	Model 3.2	$X^2=1.633(2)$ , $p=0.435$	1.000	1.015	0.000 (0.000-0.181), $p_{close}=0.526$	0.408

*CFI= comparative fit index, TLI= Tucker-Lewis Index, RMSEA= root mean square error of approximation, WRMR= weighted root mean square residual*

**Structural Equation Modeling.** Despite good fit criteria for the individual CFA models, the SEM fit the data poorly:  $\chi^2 = 146.268(114)$ ,  $p = 0.022$ , CFI=0.879, TLI=0.855, RMSEA=0.058 (90% CI=0.023 to 0.083),  $p_{close} = 0.316$ , and WRMR= 0.962. None of the latent variables was significant in predicting HPA as displayed in Figure 4.5. However, two significant relationships were found: (1) between Intrapersonal and Environmental latent variables as well as (2) between Interpersonal and Environmental latent variables with factor loadings of -0.218 and -0.207 respectively ( $p < 0.05$ ).

**Figure 4.5. Structural Equation Modeling for HPA based on the Ecological Model.**



\* indicate significant loadings ( $p < 0.05$ ).  $R^2$  values and loading factors displayed.

**Specific Aim 2.** To construct an Ecological Model predicting JPA from the Intrapersonal, Interpersonal, and Environmental factors by identifying the latent variables loading on the factors.

Aim 2 was accomplished in a similar manner as Aim 1. Variables meeting inclusion criteria are displayed in Table 4.13 and include the same correlates as HPA with an exception of Any Job as it was highly correlated with JPA ( $r=0.830$ ). CFA for the Intrapersonal, Interpersonal and Environmental factors yielded the same results in terms of model evaluation and final model fit as displayed in Tables 4.13 and 4.15.

**Table 4.13. Variables examined in the confirmatory factor analyses for JPA organized by initially selected and final variables included in the analyses.**

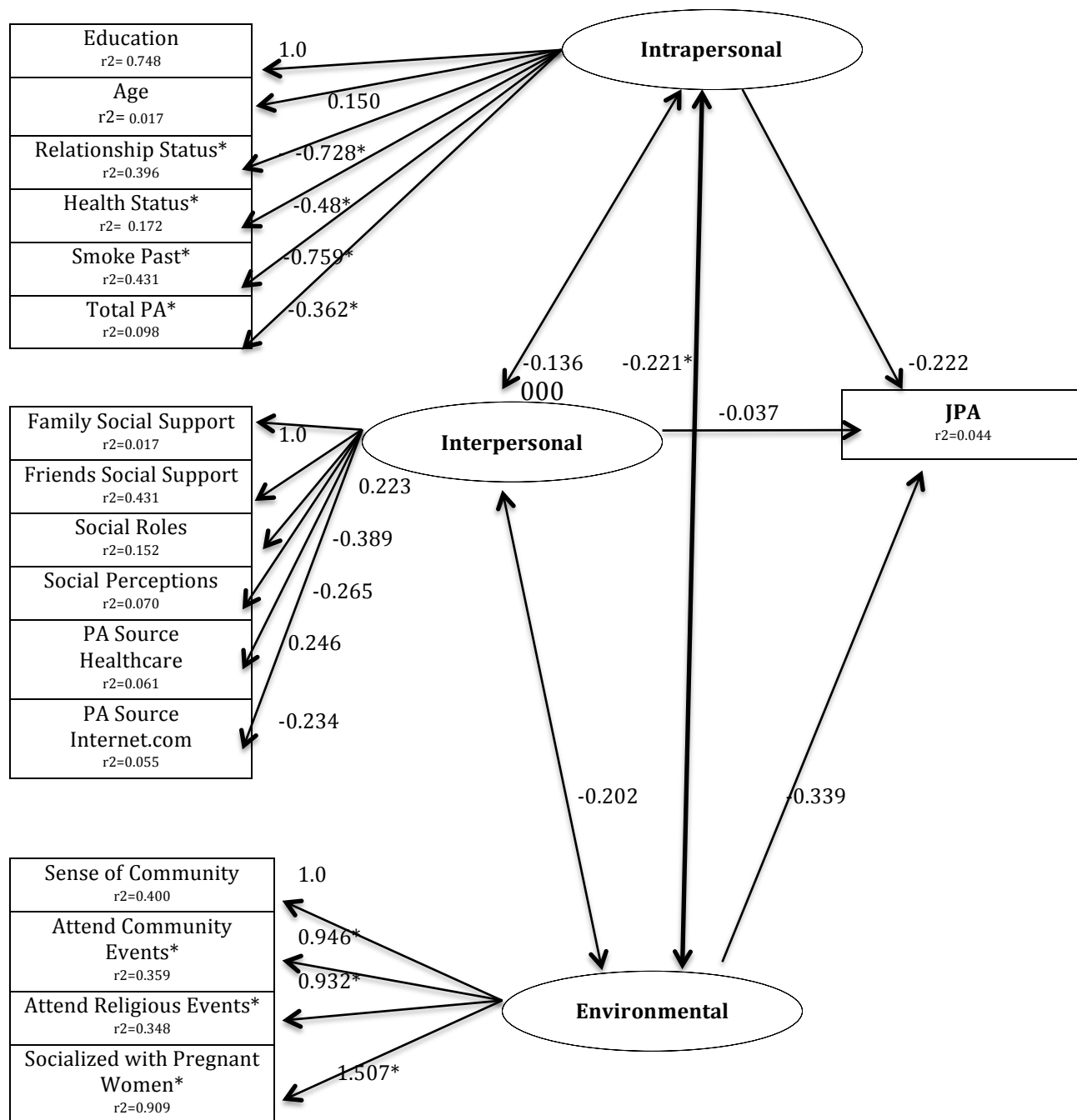
Intrapersonal Factors		Interpersonal Factors		Environmental Factors	
All variables meeting selection criteria	Final variables used in the model	All variables meeting selection criteria	Final variables used in the model	All variables meeting selection criteria	Final variables used in the model
<ul style="list-style-type: none"> <li>• Education</li> <li>• Age</li> <li>• Pre preg BMI</li> <li>• Race</li> <li>• Relationship status</li> <li>• Health Status</li> <li>• Smoking past</li> <li>• Drinking past</li> <li>• Times Preg</li> <li>• Total PA</li> </ul>	<ul style="list-style-type: none"> <li>• Education</li> <li>• Age</li> <li>• Relationship status</li> <li>• Health Status</li> <li>• Smoking past</li> <li>• Total PA</li> </ul>	<ul style="list-style-type: none"> <li>• Family Social Support</li> <li>• Friends Social Support</li> <li>• Social Roles</li> <li>• Social Perceptions</li> <li>• Healthcare provider PA source</li> <li>• Internet.com PA source</li> <li>• Don't look for PA info</li> </ul>	<ul style="list-style-type: none"> <li>• Family Social Support</li> <li>• Friends Social Support</li> <li>• Social Roles</li> <li>• Social Perceptions</li> <li>• Healthcare provider PA source</li> <li>• Internet.com PA source</li> </ul>	<ul style="list-style-type: none"> <li>• Sense of community</li> <li>• Safety</li> <li>• Attend community events</li> <li>• Attend religious events</li> <li>• Socialize with pregnant women</li> </ul>	<ul style="list-style-type: none"> <li>• Sense of community</li> <li>• Attend community events</li> <li>• Attend religious events</li> <li>• Socialize with pregnant women</li> </ul>

**Table 4.14. Results of confirmatory factor analysis of Intrapersonal, Interpersonal, and Environmental factors for JPA.**

<b>Model Type</b>	<b>Model Name</b>	<b>X<sup>2</sup> (df), <i>p</i></b>	<b>CFI</b>	<b>TLI</b>	<b>RMSEA (90% CI), <i>p<sub>close</sub></i></b>	<b>WRMR</b>
<b>Intrapersonal</b>	Model 1.1	$X^2=76.554(35)$ , $p=0.000$	0.712	0.629	0.108 (0.075-0.142), $p_{close}=0.003$	1.111
	Model 1.2	$X^2=93.133(44)$ , $p=0.000$	0.674	0.508	0.105 (0.075-0.135), $p_{close}=0.002$	1.130
	Model 1.3	$X^2=46.410(20)$ , $p=0.001$	0.782	0.695	0.112 (0.070-0.115), $p_{close}=0.011$	1.051
	Model 1.4	$X^2=12.025(9)$ , $p=0.212$	0.968	0.947	0.057 (0.000-0.131), $p_{close}=0.392$	0.680
<b>Interpersonal</b>	Model 2.1	Model did not converge				
	Model 2.2	$X^2=8.218(9)$ , $p=0.512$	1.000	1.036	0.000 (0.000-0.113), $p_{close}=0.668$	0.626
<b>Environmental</b>	Model 3.1	$X^2=18.577(5)$ , $p=0.002$	0.895	0.790	0.159 (0.086-0.239), $p_{close}=0.010$	1.078
	Model 3.2	$X^2=1.633(2)$ , $p=0.435$	1.000	1.015	0.000 (0.000-0.181), $p_{close}=0.526$	0.408

**Structural Equation Modeling.** In contrary to SEM results for HPA, SEM for JPA fit data well:  $X^2=102.072(99)$ ,  $p=0.396$ , CFI=0.980, TLI=0.976, RMSEA=0.019 (90% CI=0.000 to 0.060),  $p_{close}=0.8666$ , and WRMR= 0.851. Although none of the latent factors were significant in predicting JPA, covariance between Intrapersonal and Environmental latent factors was found to be significant with a loading of -0.221 (Figure 4.6). Covariance between Interpersonal and Environmental factors did not reach significance at  $p=0.58$  and loading factor -0.202.

**Figure 4.6. Structural Equation Modeling for JPA based on the Ecological Model.**



\* indicates significant loadings ( $p < 0.05$ ).  $R^2$  values and loading factors displayed.

**Specific Aim 3.** To construct an Ecological Model predicting LTPA from the Intrapersonal, Interpersonal, and Environmental factors by identifying the latent variables loading on the factors.

Specific Aim 3 was accomplished in a similar manner as Aim 1 and 2. Despite entering into the correlation matrices correlates relevant only to LTPA (i.e. High Barriers for PA, High Facilitators to PA, access to PA facilities), variables meeting selection criteria for the Intrapersonal factors were identical to those used in HPA analysis, which resulted in same CFA analysis and model fit. However, Intrapersonal and Environmental CFA models included LTPA specific variables as displayed in Table 4.15.

Interpersonal CFA analyses for LTPA are displayed in Table 4.16. Initial CFA model did not converge, however, after removing Facilitators to PA, the model showed poor fit: CFI=0.650, RMSEA 0.143 (0.099-0.189), and WRMR=1.244. Negative variances were also present in this model. Therefore, Don't Look for Sources of Information on PA correlate was removed from the analysis as it displayed negative variances. The subsequent model showed a good fit: CFI=1.000, RMSEA= 0.000 (90%CI= 0.000 to 0.095), and WRMR= 0.671. Even though the model fit very well, only Social Support of Family was significantly associated with the Interpersonal latent factor ( $p=0.014$ ). The final variables retained in the model were: Social Support from Family, Social Support from Friends, Social Perceptions, Social Role Strain, Sources of PA Information from Healthcare Provider, Sources of PA Information from .com websites and High Barriers to PA, as displayed in Table 4.15.

Results of the Environmental CFA analyses for LTPA are displayed in Table 4.16. The initial model did not converge and Safety was removed from the initial set of variables.

This resulted in a model with poor fit: CFI= 0.845, RMSEA 0.153 (90% CI=0.107 to 0.200), WRMR=1.322. Despite all variables being significant in the model and  $r^2$  values being at least 0.163, examination of fit indices resulted in removal of Socializing with Pregnant Women variable. This resulted in improving model fit: CFI=0.947, RMSEA= 0.100 (90 % CI= 0.031 to 0.164), WRMR=0.941; however, RMSEA and WRMR criteria were still not satisfactory. Attending Community Events variable was dropped from the model, which improved model fit to very good: CFI=0.999, RMSEA= 0.018 (90% CI= 0.000 to 0.137), WRMR=0.587. Correlates retained in the model were: the Sense of Community, Attending Religious Events, High Barriers, High Facilitators, and Access to Facilities, as displayed in Table 4.15.

**Table 4.15. Variables examined in the confirmatory factor analyses for LTPA organized by initially selected and final variables included in the analyses.**

Intrapersonal Factors		Interpersonal Factors		Environmental Factors	
All variables meeting selection criteria	Final variables used in the model	All variables meeting selection criteria	Final variables used in the model	All variables meeting selection criteria	Final variables used in the model
<ul style="list-style-type: none"> <li>• Education</li> <li>• Age</li> <li>• Pre preg BMI</li> <li>• Race</li> <li>• Relationship status</li> <li>• Health Status</li> <li>• Smoking past</li> <li>• Drinking past</li> <li>• Times Preg</li> <li>• AnyJob</li> <li>• Total PA</li> </ul>	<ul style="list-style-type: none"> <li>• Education</li> <li>• Age</li> <li>• Relationship status</li> <li>• Health Status</li> <li>• Smoking past</li> <li>• Total PA</li> </ul>	<ul style="list-style-type: none"> <li>• Family Social Support</li> <li>• Friends Social Support</li> <li>• Social Roles</li> <li>• Social Perceptions</li> <li>• Healthcare provider PA source</li> <li>• Internet.com PA source</li> <li>• Don't look for PA info</li> <li>• High Barriers</li> <li>• High Facilitators</li> </ul>	<ul style="list-style-type: none"> <li>• Family Social Support</li> <li>• Friends Social Support</li> <li>• Social Roles</li> <li>• Social Perceptions</li> <li>• Healthcare provider PA source</li> <li>• Internet.com PA source</li> <li>• High Barriers</li> </ul>	<ul style="list-style-type: none"> <li>• Sense of community</li> <li>• Safety</li> <li>• Access to facilities</li> <li>• Attend community events</li> <li>• Attend religious events</li> <li>• Socialize with pregnant women</li> <li>• High Barriers</li> <li>• High Facilitators</li> </ul>	<ul style="list-style-type: none"> <li>• Sense of community</li> <li>• Access to facilities</li> <li>• Attend religious events</li> <li>• High Barriers</li> <li>• High Facilitators</li> </ul>

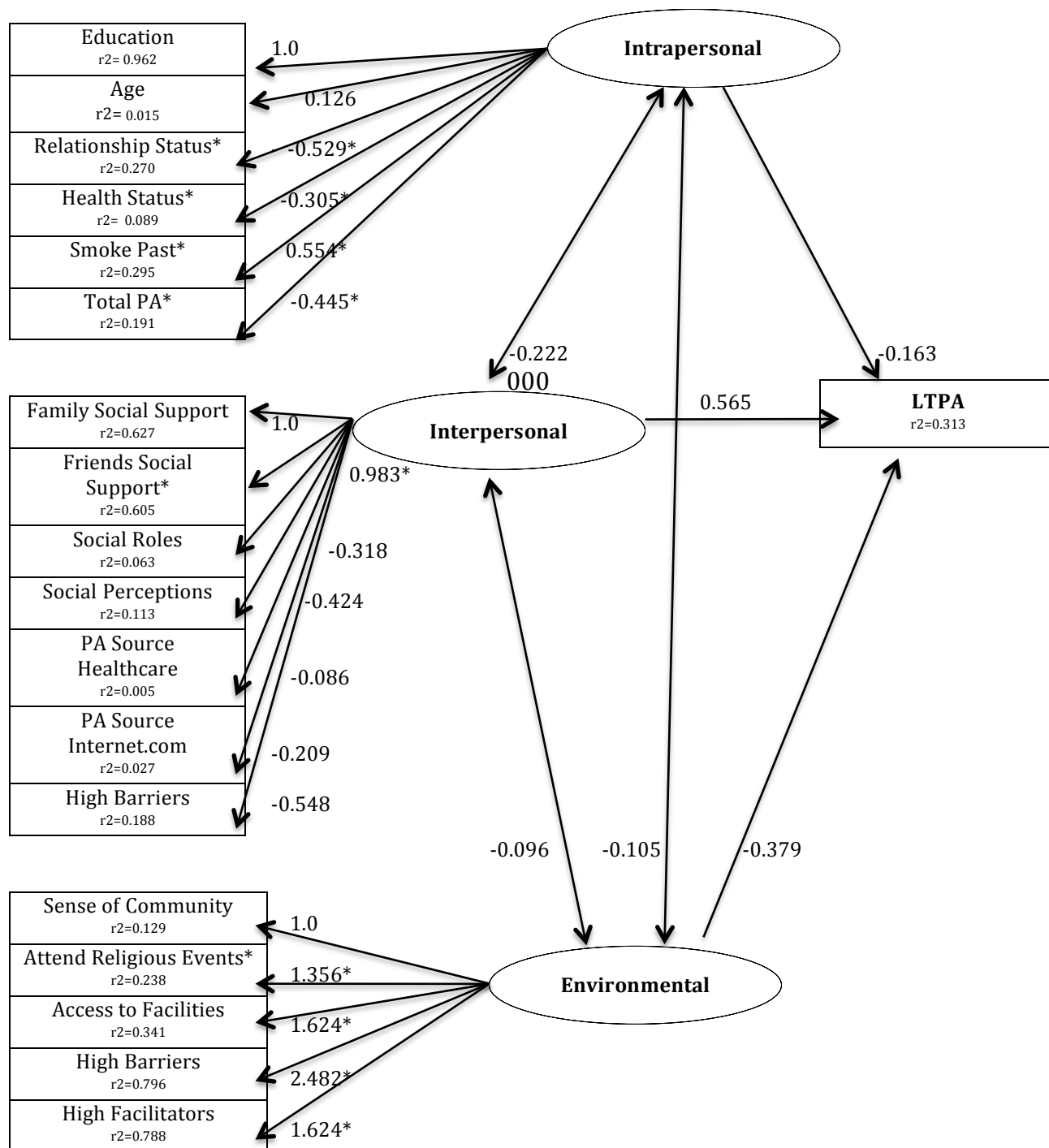
**Table 4.16. Results of confirmatory factor analysis of Intrapersonal, Interpersonal, and Environmental factors for LTPA.**

Model Type	Model Name	X <sup>2</sup> (df), <i>p</i>	CFI	TLI	RMSEA (90% CI), <i>p<sub>close</sub></i>	WRMR
Intrapersonal	Model 1.1	X <sup>2</sup> = 93.133(44), <i>p</i> =0.000	0.674	0.508	0.105 (0.075-0.135), <i>p<sub>close</sub></i> =0.002	1.130
	Model 1.2	X <sup>2</sup> = 46.410(20), <i>p</i> =0.001	0.782	0.695	0.112 (0.070-0.115), <i>p<sub>close</sub></i> =0.011	1.051
	Model 1.3	X <sup>2</sup> = 12.025(9), <i>p</i> =0.212	0.968	0.947	0.057 (0.000-0.131), <i>p<sub>close</sub></i> =0.392	0.680
Interpersonal	Model 2.1	Model did not converge				
	Model 2.2	X <sup>2</sup> = 55.739 (20), <i>p</i> =0.000	0.650	0.510	0.143 (0.099-0.189), <i>p<sub>close</sub></i> =0.001	1.244
	Model 2.3	X <sup>2</sup> = 12.619 (14), <i>p</i> =0.557	1.000	1.053	0.000 (0.000-0.095), <i>p<sub>close</sub></i> =0.740	0.671
Environmental	Model 3.1	Model did not converge				
	Model 3.2	X <sup>2</sup> = 48.899(14), <i>p</i> =0.000	0.845	0.768	0.153 (0.107-0.200), <i>p<sub>close</sub></i> =0.000	1.322
	Model 3.2	X <sup>2</sup> = 18.582(9), <i>p</i> =0.029	0.947	0.911	0.100 (0.031-0.164), <i>p<sub>close</sub></i> =0.097	0.941
	Model 3.4	X <sup>2</sup> = 5.175(5), <i>p</i> =0.395	0.999	0.998	0.018 (0.000-0.137), <i>p<sub>close</sub></i> =0.543	0.587

*CFI*= comparative fit index, *TLI*= Tucker-Lewis Index, *RMSEA*= root mean square error of approximation, *WRMR*= weighted root mean square residual

**Structural Equation Modeling.** The SEM for LTPA fit data satisfactory: X<sup>2</sup>= 170.711(147), *p*=0.088, CFI=0.920, TLI=0.907, RMSEA=0.044 (90% CI=0.000 to 0.070), *p<sub>close</sub>*=0.625, and WRMR= 0.936. Latent factors were not significant in predicting LTPA as displayed in Figure 4.7, however, Interpersonal latent factor approached significance at *p*=0.065 and loading factor of 0.565.

**Figure 4.7. Structural Equation Modeling for LTPA based on the Ecological Model.**



\* indicates significant loadings ( $p < 0.05$ ).  $R^2$  values and loading factors displayed.

**Specific Aim 4.** To construct an Ecological Model predicting DQ from the Intrapersonal, Interpersonal, and Environmental factors by identifying the latent variables loading on the factors.

Nutrition specific variables were examined in the correlation matrices and same criteria as in Aim 1-3 were used for selection of the variables for further analysis. Intrapersonal factors selected for the CFA were the same as for HPA and LTPA analyses, as Fruit and Vegetable Self-Efficacy did not correlate with any variables. Other variables meeting the selection criteria for the CFA are displayed in Table 4.17.

Interpersonal CFA analyses for DQ did not result in model conversion or displayed negative variances that could not be retained in the model, regardless of trying different combinations of Interpersonal variables. This resulted in no CFA being produced for future analysis.

On the contrary, the results of the Environmental CFA analyses for DQ resulted in creating a good model for the Environmental latent factor, as displayed in Table 4.18. Although the initial model, showed poor fit: CFI= 0.928, RMSEA 0.078 (90% CI=0.000 to 0.147), WRMR=0.837, model fit was improved by the removal of Healthy Eating Environment correlate due to low  $r^2=0.003$  and high p value=0.793. The subsequent model showed an excellent fit: CFI=1.000, RMSEA= 0.000 (90 % CI= 0.000 to 0.104), WRMR=0.459. Correlates retained in the final model were: the Sense of Community, Attending Community Events, Attending Religious Events, and High Barriers as displayed in Table 4.17.

**Table 4.17. Variables examined in the confirmatory factor analyses for DQ organized by initially selected and final variables included in the analyses.**

Intrapersonal Factors		Interpersonal Factors		Environmental Factors	
All variables meeting selection criteria	Final variables used in the model	All variables meeting selection criteria	Final variables used in the model	All variables meeting selection criteria	Final variables used in the model
<ul style="list-style-type: none"> <li>• Education</li> <li>• Age</li> <li>• Pre preg BMI</li> <li>• Race</li> <li>• Relationship status</li> <li>• Health Status</li> <li>• Smoking past</li> <li>• Drinking past</li> <li>• Times Preg</li> <li>• Any job</li> <li>• Total PA</li> </ul>	<ul style="list-style-type: none"> <li>• Education</li> <li>• Age</li> <li>• Relationship status</li> <li>• Health Status</li> <li>• Smoking past</li> <li>• Total PA</li> </ul>	<ul style="list-style-type: none"> <li>• Social Support</li> <li>• Social Roles</li> <li>• Social Perceptions</li> <li>• Healthcare provider PA source</li> <li>• Internet.com PA source</li> <li>• Don't look for PA info</li> <li>• High Barriers</li> <li>• High Facilitators</li> </ul>	<ul style="list-style-type: none"> <li>• None</li> </ul>	<ul style="list-style-type: none"> <li>• Sense of community</li> <li>• Healthy eating environment</li> <li>• Attend community events</li> <li>• Attend religious events</li> <li>• Socialize with pregnant women</li> <li>• High Barriers</li> <li>• High Facilitators</li> </ul>	<ul style="list-style-type: none"> <li>• Sense of community</li> <li>• Attend community events</li> <li>• Attend religious events</li> <li>• Socialize with pregnant women</li> <li>• High Barriers</li> </ul>

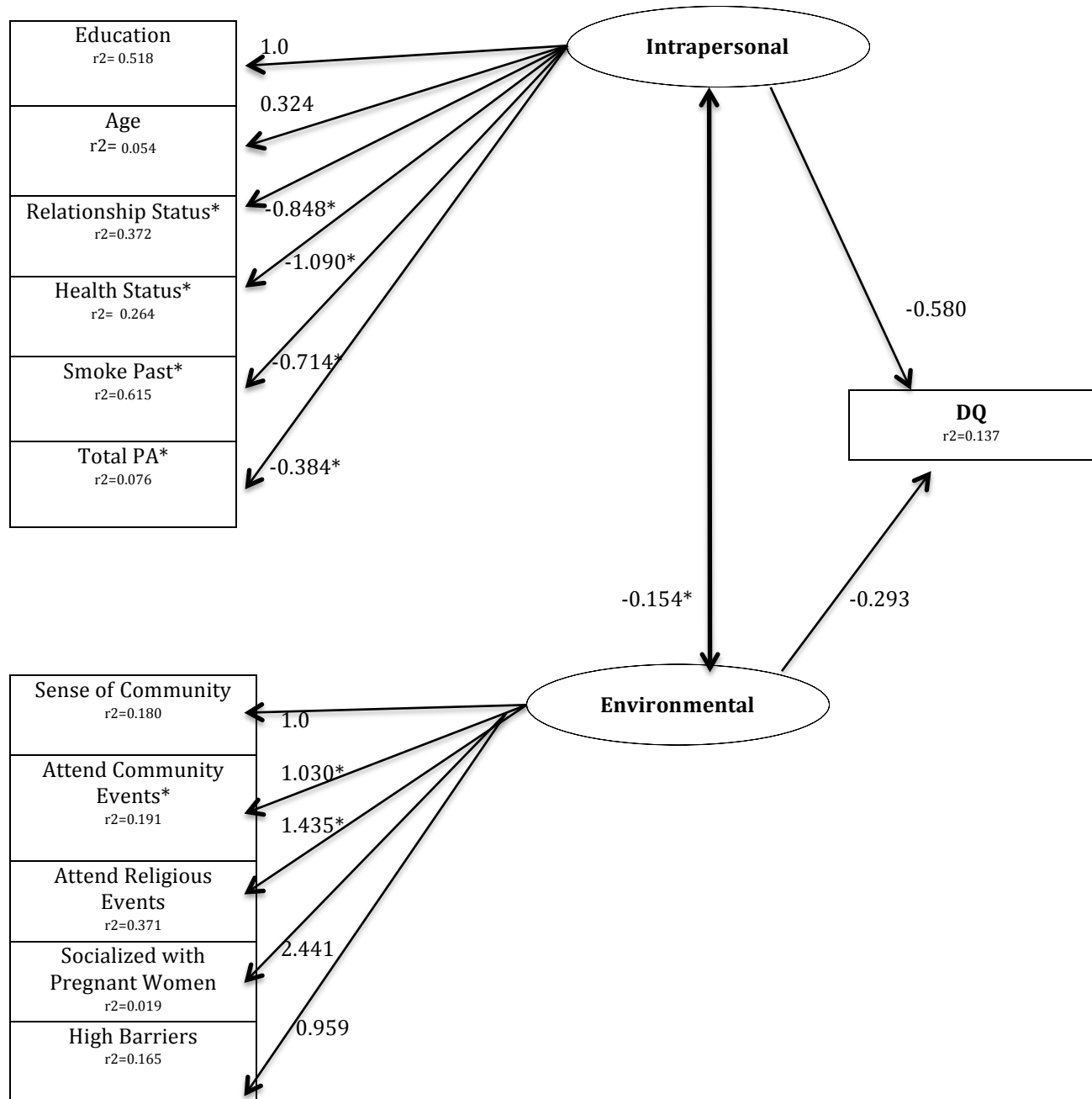
**Table 4.18. Results of confirmatory factor analysis of Intrapersonal, Interpersonal, and Environmental factors for FV.**

Model Type	Model Name	X <sup>2</sup> (df), <i>p</i>	CFI	TLI	RMSEA (90% CI), <i>p<sub>close</sub></i>	WRMR
<b>Intrapersonal</b>	Same model as for HPA and JPA					
<b>Interpersonal</b>	Model 1.1-1.7 did not converge or displayed negative variances					
<b>Environmental</b>	Model 2.1	X <sup>2</sup> = 14.719(9), <i>p</i> =0.099	0.928	0.880	0.078 (0.000-0.147), <i>p<sub>close</sub></i> =0.232	0.837
	Model 2.2	X <sup>2</sup> = 3.157(5), <i>p</i> =0.676	1.000	1.055	0.000 (0.000-0.104), <i>p<sub>close</sub></i> =0.785	0.459

*CFI= comparative fit index, TLI= Tucker-Lewis Index, RMSEA= root mean square error of approximation, WRMR= weighted root mean square residual*

**Structural Equation Modeling.** Despite the Interpersonal CFA model not converging, SEM was performed using Intrapersonal and Environmental latent variables. The SEM for DQ fit data well:  $\chi^2 = 65.892(52)$ ,  $p = 0.093$ , CFI=0.936, TLI=0.919, RMSEA=0.050 (90% CI=0.000 to 0.084),  $p_{\text{close}} = 0.468$ , and WRMR= 0.891. Although none of the latent factors were significant in predicting DQ as displayed in Figure 4.7, the Intrapersonal latent factor approached significance at  $p$  value=0.088 and loading factor of -0.580. Additionally, a covariance between the Interpersonal and Environmental latent variables was significant ( $p < 0.05$ ) and loading factor of -0.154.

**Figure 4.8. Structural Equation Modeling for DQ based on the Ecological Model.**



*\* indicated significant loading ( $p < 0.05$ ).  $R^2$  values and loading factors displayed.*

## CHAPTER 5

### DISCUSSION

The overall purpose of this dissertation was to examine factors impacting PA and DQ in low-income pregnant women based on the Ecological Model framework. Specifically, this study assessed the Intrapersonal, Interpersonal, and Environmental factors that may impact levels of HPA, JPA, LTPA, and DQ. This was accomplished by assessing correlates to PA and DQ in a comprehensive framework rather than individually as previously presented in literature. Overall, it was predicted that the Intrapersonal, Interpersonal, and Environmental latent factors would predict HPA, JPA, LTPA, and DQ. However, the results of this study did not support the hypotheses.

#### **Sample Characteristics**

The analytic sample examined in this dissertation did not reflect a typical low-income pregnant population. The prevalence of women meeting PA recommendations in this study was higher (42.2%) compared to the national averages previously reported for pregnant women (15.8%[1] and 22.9%[2]). One possible explanation for this phenomenon was the fact that women participating in this study were highly educated and less ethnically diverse than expected for low-income populations. For example, the majority of states participating in the WIC program in 2012 (n=47) reported women having a median education level of 12<sup>th</sup> grade (completed high school), while most of our sample (52%) were college graduates [3]. Additionally, the 2012 WIC report indicated that close to 40% of women enrolled in the program were non-white or multiracial, compared to less than 30% in our study [3]. A population based study by Evenson and Wen using data from the National Health and Nutrition Examination Survey from 1999-2006 (n=944) found non-

Hispanic white pregnant women to be more active compared to other ethnic groups (OR=3.36, 95% CI=1.74-5.58)[2]. Although that study found no significant differences in meeting PA recommendations between education levels, another study by Evenson et al [1] using the Behavioral Risk Factor Surveillance System (BRFSS) found women (n=1979) with higher education to be more likely to meet PA recommendation compared to those with less than high school education: high school (OR= 4.6 (95% CI= 1.9-11.1), some college (OR= 3.3 (95% CI= 1.3-8.4), and college education (OR= 4.8 (95% CI= 1.9-12.2)[1]. These findings suggest potential reasons for education level and race distribution to result in a higher prevalence of meeting PA recommendations in our analytic sample compared to national prevalence rates. Prevalence data for HPA and JPA are unknown, thus comparison to national trends could not be made.

Twelve percent of the analytic sample examined in this dissertation reported meeting recommendations for daily FV intake. Although no population based studies have specifically provided prevalence of FV intake in low-income pregnant women, it is known that women from low-income families are less likely to meet recommendations of consuming at least 5 cups of FV per day compared to higher income populations [4]. One population based study by Zhao et al., using the BRFSS data (n=2,295) from 2001-2009, showed 30-40% of pregnant women met daily FV recommendations of at least 5 cups [5]. However, household income was not associated with increased odds of meeting FV daily recommendations among middle income (OR=1.2, 95% CI=0.6-2.3) and higher income (OR=1.5, 95% CI=0.7-3.1) compared to household income of <\$15,000. It is important to note that income classifications used by Zhao et al.[5] were different from low-income criteria used in this dissertation, which was <185% of US poverty level. A review of

literature discussing the correlates to FV intake in non-pregnant adults found higher income, higher education level, and increased age to be associated with higher vegetable consumption [6]. Given this evidence, the prevalence of FV intake in the analytic sample examined in this dissertation appears to be relatively low.

The somewhat unique characteristics of the analytic sample, compared to a typical low-income population, possibly influenced other descriptive variables and correlates of PA and DQ. Higher education was likely related to a relatively low prevalence of smoking during pregnancy in our sample (10%). This association between higher education and lower prevalence of smoking is supported by findings of the Zhao et al who also showed that higher education was significantly associated with higher odds of not smoking during pregnancy [5]. Additionally, higher education level might also be reflected in higher Lifestyle Beliefs scores (median 42, scale 10-50) as women in our sample may have been more knowledgeable about healthy lifestyle behaviors. Although PA Self-Efficacy scores (median 2.6, scale 1-5) matched well with LTPA level (42% meeting recommendations), FV Self-Efficacy appeared to be high (score 3.5, scale 1-5) compared to only 12% of women meeting daily FV recommendations. This large discrepancy between the perceived and actual behaviors, however, is supported by research in Australian pregnant women (n=857) which showed that while most (62%) perceived their diets to be healthy, only 10% met recommendations for daily FV intakes [7].

Among the Interpersonal characteristics, PA Social Support from family was higher than friends (24 and 17 respectively, scales 10-50), as expected; however both were relatively low. Overall, DQ Social Support was average (score 3, scale 1-5) and similar to a sample of 401 non-pregnant women examined for the survey validation (mean 3.37,

SD=0.87) [8]. Women reported favorable Social Perceptions of PA (median 3.4, scale 1-4) and fairly low Social Roles Strain for PA (median 3.0, scale 1-4). These favorable social perceptions may be related to higher education as well. However, compared to PA, scores for both Social Perceptions and Social Roles Strain for DQ were less favorable (median 2.5, scale 1-4 and median 3.6, scale 1-4, respectively) and possibly were reflected in low prevalence of meeting FV intake recommendations. The main sources of information for PA and DQ were the same with Internet.com websites being the top choice (59.6% for both) followed by the advice from healthcare professionals (54.1 and 51.4% respectively).

Among our results for Environmental variables, the Sense of Community score was low (median 1.7, scale 1-4) compared to values reported by Ainsworth et al in a group of 917 non-pregnant African American women (mean  $3.13 \pm 0.51$ ) [9]. This indicates that most women in our study were not engaged in their community; however, they felt safe in the community in which they lived (92.6%).

### **HPA Model**

The Aim 1 of this study hypothesized that the Intrapersonal and Interpersonal factors would be significant for HPA level. The results of this study did not support this hypothesis. Neither Intrapersonal nor Interpersonal factors predicted HPA. Despite good fit criteria for the individual CFA models for each of the Intrapersonal, Interpersonal, and Environmental factors, the SEM fit the data poorly.

The findings of this study are surprising. It is possible that the criteria used for selecting the variables for the analysis impacted the results. Only variables correlated with at least two other Intrapersonal variables were entered into the CFA model and considered in subsequent analyses. It is possible that variables significantly correlated with only one

factor such as Medicaid status or Lifestyle Beliefs could have influenced the Intrapersonal latent factor and consequently resulted in the Intrapersonal factor predicting HPA level better; however, we were constrained by sample size to select a maximum of 11 variables for the CFA analyses.

In this dissertation, evaluation of the Ecological Model relied on the CFA as the main analysis prior to evaluation of the entire Ecological Model in SEM. We chose CFA, rather than Exploratory Factor Analysis (EFA) because we theorized that three latent factors (Intrapersonal, Interpersonal and Environmental) would fit the data well and explain a high amount of the variability in our outcome variables. It is possible that the use of EFA would have yielded more significant findings. Although the models evaluated in this study were structured based on the existing body of literature on pregnant women, some correlates, such as Social Roles Strain and Social Perceptions, were adapted from non-pregnant populations. This potentially led to some of the correlates not being most suitable for hypothesis testing and forcing the variables into the model. CFA modeling resulted in many model re-specifications with a number of variables being dropped from the analysis due to poor model fit. CFA requires strong empirical evidence or conceptual foundation to guide the specification and evaluation of the factor model. Thus, EFA could be used earlier in the process of scale development and validation of constructs used in this dissertation. Performing EFA beforehand could result in elimination of the irrelevant variables and finding a model that best fits data. However, we had strong empirical evidence and theoretical construct to examine the data in the Ecological Model framework. Additionally, the use of EFA may have resulted in the formation of latent variables that

would have not been easily interpretable or relevant to the Ecological Model that we sought to test.

When examining the SEM model for HPA, the only difference between this model and other SEM models examined in this dissertation was variance ( $r^2$  value) for individual correlates making up the latent Intrapersonal factor. In the SEM model for HPA, similar to other SEM models constructed for this dissertation, the Intrapersonal correlates significantly associated with the Intrapersonal latent factor were: Relationship Status, Self-Perceived Health Status, Smoking status prior Pregnancy and Total PA. Relationship status and Smoking status prior pregnancy explained most of the variance for the Intrapersonal latent factor: 42.0% and 45.8% respectively. Although these two variables can be associated with PA level [10], it is likely that many variables relevant to HPA such as Any Job or Medicaid could be directly associated with HPA but were not captured by the way the Intrapersonal latent factor was structured.

For the Interpersonal latent factors, only Social Support from friends was significant with 81.7% of variance being explained by this correlate. This was a surprising finding, as it was not expected for the PA Social Support from friends, rather than family, to be such a significant contributor to the latent Interpersonal factor. Social Roles Strain and Social Perceptions were expected to contribute to the latent Interpersonal factor as well, but did not. Although these two correlates were examined previously in the context of LTPA [9], we theorized that they would also be associated with HPA and JPA. For example, questions examining the Social Roles Strain asked women to rate various household, childcare, and job-related tasks that would interfere with their LTPA. Therefore, indirectly, the Social Roles Strain variable was relevant to the Interpersonal construct for HPA and JPA. Similar

reasoning was used when selecting Social Perceptions to be included in the HPA and JPA models. However, the Interpersonal latent factor was not significantly associated with HPA. Even though there is no literature examining HPA in the context of the Ecological Model, it appears that the social component of the model would not necessarily be associated with HPA, particularly since the Interpersonal correlates examined in this dissertation were relevant more to LTPA rather than specifically HPA.

In the SEM model for HPA, the Environmental correlates significantly associated with the latent Environmental factor were: Attending Community Events, Attending Religious events, and socializing with pregnant women. Socializing with pregnant women explained most of the variance in the Environmental latent factor (85%), followed by attending religious events (39%) and attending community events (36.6%). The magnitudes of these associations are quite large but not surprising in establishing the Environmental latent construct [9, 11].

Despite none of the latent factors being significantly associated with HPA, SEM revealed covariance between: (1) between the Intrapersonal and Environmental latent factors and (2) between the Interpersonal and Environmental latent factors. This suggests a small degree of overlap between the Environmental latent factors and both Intrapersonal and Interpersonal latent factors (-0.218 and -0.207 respectively). This was not unexpected as the environment an individual lives in can be influenced by personal and social factors especially if the intrapersonal factors are predominantly relying on Social Support of friends. However, it is surprising that covariance between the Intrapersonal and Intrapersonal latent factors did not exist as these two constructs show a greater degree of overlap. It is possible, however, that this association might be relevant more to LTPA

rather than HPA. Furthermore, examining additional household-related correlates such as: the use of daycare and the number of young children living at home could result in structuring better latent variables for the HPA model.

In summary, Intrapersonal, Interpersonal, and Environmental latent factors did not predict HPA. It is possible that the model did not include all relevant correlates for HPA and did not perform well due to small sample size. Additionally, since HPA has not been examined in the context of Ecological Model, using a different statistical approach that included EFA of the parameters could have yielded different results. Based on data analyzed in this dissertation, it appears the HPA is not predicted by the Ecological Model as proposed, however, further examination of the correlates of HPA could lead to a finding a more suitable model for the data.

### **JPA Model**

The Aim 2 of this study hypothesized that the Intrapersonal, Interpersonal, and Environmental factors would be significant for JPA level; however, the Intrapersonal factors would be more significant than the Interpersonal and Environmental in predicting JPA level. The results of this study did not support this hypothesis, as none of the factors were significant predictors of JPA. However, SEM for JPA fit the data well.

The findings of this study are surprising. However, the explanation of SEM results for the HPA model applies to the JPA model. The lack of significant association among JPA and the Intrapersonal, Interpersonal, and Environmental latent factors is likely related to: (1) selection criteria used for determining relevant variables for the analysis of Intrapersonal factors, and (2) the fact that the EFA was possibly a better approach for

model building since the latent factors were not confirmed by previous analyses but only theoretically based concepts.

When examining the SEM model for JPA, similarly to the SEM model for HPA, the Intrapersonal correlates significantly associated with the Intrapersonal latent factor were: Relationship Status, Self-Perceived Health status, Smoking status prior Pregnancy and Total PA. Relationship status and Smoking status prior pregnancy explained most of the variance for the Intrapersonal latent factor: 40% and 43% respectively. For the Interpersonal latent factors, no correlates were significant, which was somewhat surprising. The lack of association between the Interpersonal latent factor and JPA may suggest that the social component is not related to occupation specific PA.

The Environmental correlates significantly associated with the latent Environmental factor in the SEM model for JPA were the same as in the HPA model. Attending Community Events explained 36% of variance for the Environmental latent factor while Attending Religious events explained 35% of the variance and socializing with pregnant women 90% of the variance. The magnitude of these associations is quite large but not surprising in establishing the Environmental latent construct [9]. Since the Environmental latent variable did not include any additional environmental job-specific correlates, compared to HPA Environmental latent variable, it was reasonable for the latent variable not to be significant when examining it in the context of employment related activity. Inclusion of job-specific correlates, such as type of work, work shift schedule and occupational demands may have led to better specification of an Environmental latent factor with greater predictive ability for JPA.

Although none of the latent factors were significantly associated with JPA, SEM revealed one covariance between the Intrapersonal and Environmental latent factors. This suggests a small degree of overlap (loading of -0.221) between the individual characteristics of individual and environment. The finding was not unexpected as a pregnant woman's living environment can be associated with her individual characteristics in the context of JPA. However, it is important to note that the variance explained by the Intrapersonal, Interpersonal, and Environmental factors is only 4.4% of JPA. This suggests the latent constructs developed for the purpose of this dissertation did not capture appropriate variables for evaluating JPA. JPA has been shown to have an inverse relationship with LTPA particularly in blue-collar workers [12]. However, in this dissertation study Total PA rather than LTPA met the inclusion criteria for the model. Also, examining JPA specific variables such as psychosocial work demands could result in structuring more job-related latent factors.

In summary, the JPA Ecological Model performed similarly to the HPA model as it did not predict PA well. All future modifications discussed within the context of HPA model apply also to JPA model, particularly incorporating more correlates specific to JPA. Inclusion of psychosocial work demands correlates could result in structuring more job-specific latent factors. The Ecological Model can still be a good model to examine in the context of JPA, however, further evaluation of the model is needed with a larger sample size and job-specific correlates.

### **LTPA Model**

The Aim 3 of this study hypothesized that the Intrapersonal, Interpersonal, and Environmental factors would be significant for LTPA level. However, it was also

hypothesized that Intrapersonal and Interpersonal factors would be more significant than the Environmental factors for the LTPA level. The results of this study did not support this hypothesis as none of the latent constructs predicted LTPA. The SEM for LTPA fit the data satisfactory.

Although the findings of this study were not expected, the explanation of SEM results for previously discussed HPA and JPA models apply to the LTPA model as well. The lack for significant association among LTPA and the Intrapersonal, Interpersonal, and Environmental latent factors is likely related to: (1) selection criteria used for determining relevant variables for the analysis of Intrapersonal factors, and (2) possibly the use of CFA over EFA to examine proposed theoretical framework. The unique demographic characteristics of the sample and limited statistical power may have also contributed to the lack of significant findings.

When examining the SEM model for LTPA, the same Intrapersonal correlates as in HPA and JPA models made up the Intrapersonal latent factor. However, Relationship status explained 27% of the variance and Smoking status Prior to Pregnancy explained almost 30% of the variance for the Intrapersonal latent factor. Research has shown that Intrapersonal barriers to PA, especially being tired and lack of motivation are significantly associated with LTPA during pregnancy [13, 14]. However, the High Barriers and High Facilitators variable created in this dissertation did not correlate with a sufficient number of other variables. Thus, they were not entered into the CFA analysis and subsequently were not considered in the SEM model. Similarly, the evidence suggests that PA self-efficacy is positively associated with LTPA [9, 15]. Since it was not associated with any other intrapersonal correlates, PA self-efficacy was not entered into the model. The way

latent constructs were created did not allow certain variables to be considered in the SEM if they were not associated with other correlates, which may have led to poor specification of latent factors.

For the Interpersonal latent factors, only social support from friends was significant with 60.5% of variance being explained by this correlate. This was a not a surprising finding, however it was expected for the other correlates to be significantly associated with the latent Interpersonal factor in the context of SEM for LTPA. Strong evidence suggests a direct association between social support from both family and friends with LTPA [16, 17]. Also, lower social roles strain was previously shown to be associated higher odds of meeting LTPA recommendations in low-income women (OR=1.49, 95% CI 1.06-2.10) [9] but was not significant in the model. The Environmental correlates significantly associated with the latent Environmental factor were: Attending Community Events, Attending Religious events, Environmental Barriers and Environmental Facilitators to PA. The most variance was explained by the High Barriers (79.6%) and High Facilitators (78.8%).

In this dissertation, Barriers and Facilitators to LTPA were analyzed in a simplified method by categorizing Intrapersonal, Interpersonal, and Environmental Barriers/Facilitators as High vs Low Barrier/Facilitator. Although consistent with the classification of Barriers according to the Ecological model [18], this method possibly oversimplified the complexity of Barriers and Facilitators as well as resulted in a lack of significant associations between these correlates and latent constructs. Most research examining Barriers to LTPA relies on qualitative analysis [18] over quantitative studies. It is possible that Barriers and Facilitators might not work well in modeling when analyzed in

a comprehensive way due to oversimplification of obtained data. For this reason a second scoring method was used in this study as previously described by Genkinger et al [19]. In this method scored high frequency Barriers and Facilitators were scored as continuous variables and a median split was used for categorization. However, the scoring did not perform well enough to be used in the models as some median splits were zero. A larger sample could possibly allow specific Barriers/Facilitators, such as being tired or not having time, to be individually selected for the analysis and could perform better in modeling.

In summary, the LTPA model did not fit data well. Although the theoretical construct used for this model was based on evidence supported by previous studies, none of the latent factors predicted LTPA. Since most of the literature on PA examines specifically LTPA, it was surprising that this model did not perform as expected. In particular, previous reviews of literature using the Ecological Model to summarize relationships between individual correlates and LTPA during pregnancy provided strong theoretical support for the conception of this study and the use of SEM to directly evaluate the Ecological Model in relation to PA among our sample of low-income pregnant women [9, 10]. However, as previously discussed, a number of factors such as larger sample size and validated pregnancy specific scales could lead to structuring a better fitting LTPA Ecological Model for low-income pregnant women.

### **Nutrition Model**

The Aim 4 of this study hypothesized that the Intrapersonal, Interpersonal, and Environmental factors would be significant for DQ; however, the Intrapersonal and Interpersonal factors would be more significant than Environmental factors for DQ. The results of this study did not support this hypothesis as none of the latent constructs

predicted DQ. While the CFA model for intrapersonal factors did not converge, the Intrapersonal and Environmental factors did not predict DQ. The SEM fit the data satisfactory.

The DQ findings of this study are surprising especially regarding the lack of convergence for an Interpersonal latent factor in the model. However, Robinson [6], in the only literature review addressing FV intake in the context of the Socio-Ecological Model among low-income African American women, identified Individual and Environmental factors as the most effective aspects to target for behavior change. This would support the Interpersonal latent factor not being a contributor in predicting DQ, in the context of Ecological model.

As in previously discussed SEM analyses, explanation for the lack of significant associations between the latent factors and DQ apply to the nutrition specific model as well. Intrapersonal factors in the DQ model were the same as in other SEM analyses. Intrapersonal correlates significantly associated with the Intrapersonal latent factor were: Relationship Status, Self-Perceived Health Status, Smoking Status Prior Pregnancy and Total PA. Relationship Status and Smoking Status Prior Pregnancy explained most of the variance for the Intrapersonal latent factor: 37% and 61.5% respectively. Previous studies have shown FV self-efficacy to be positively associated with FV intake in pregnant women [6, 20]; however, in this dissertation study, FV self-efficacy was not correlated with any other Intrapersonal variables and, therefore, was not considered in further analysis. Additionally, the knowledge of dietary recommendations during pregnancy was not examined in this research. Even though previous research by Thornton et al. [21] on pregnant and postpartum Latino women found no association between the knowledge of

nutrition recommendation and higher DQ, it is possible that using the knowledge of nutrition during pregnancy as a covariate could potentially help to specify the model.

Although nutrition specific correlates were examined in this study, they did not work well in the model. This was evident when examining the Interpersonal correlates, as the CFA model did not converge and resulted in no Interpersonal latent factor being created. It is possible that the Interpersonal correlates examined in this study did not fully capture the essence of nutrition specific Interpersonal variables. Social Roles Strain and Social Perceptions correlates were adapted from the PA specific questions and possibly did not translate well into nutrition specific correlates. Additional Interpersonal nutrition specific correlates not addressed in this dissertation could include: social and cultural traditions, role expectations impacting eating practices, and patterns within friends and family[6]. Using a wider range of nutrition specific correlates could allow for creation of Interpersonal latent factor making the DQ model more comprehensive.

The Environmental correlates significantly associated with the latent Environmental factor were: Attending Community Events, Attending Religious events, and Environmental Barriers to healthy nutrition. Most variance was explained by attending religious events (37%) with only 19% for attending community events. These results are supported by previous studies suggesting that engagement in religious activities and community events contribute to health-related issues in the community especially in African Americans [6]. Since the analytical sample was predominantly White, it is possible that the impact of the community was not as influential in this sample as it could be in a more diverse group of women.

Additionally, the evidence suggests that low-income mothers in the later stages of pregnancy begin to increase their FV intake as they become more aware of the health benefits [22]. This suggests that FV intake changes as pregnancy progresses together with women's perceptions on healthy eating as well as FV intake self-efficacy [6]. As nutrition specific variables are likely to change as pregnancy progresses, assessment of DQ in this dissertation possibly did not allow this study to specifically capture this process. Since our study examined pregnant women in all three trimesters, as well as postpartum women recalling to mid-pregnancy, the nutrition specific correlates and the outcome variables were likely different for these four groups of women. This partially provides support for the lack of significant findings in DQ model in this dissertation. This same argument could also be applied to the lack of findings for LTPA, since participation in LTPA is known to decrease from the first to third trimester. Trends in HPA and JPA across pregnancy have not been published [23].

### **Summary of all SEM Models**

Four SEM models were created and evaluated for predicting HPA, JPA, LTPA, and DQ. Each model examined the correlates of PA and DQ classified by the Intrapersonal, Interpersonal, and Environmental categories represented by comprehensive latent factors. None of the latent factors in any of the models predicted any of the outcome variables. It is possible that creation of latent variables did not represent well the correlates associated directly with the outcome variables. The variables entered into and retained in the models were significantly related to each other, not necessarily the outcome. A larger sample size would allow for examination of a larger number of variables in the model without eliminating some of the Intrapersonal correlates. Also, as discussed previously, some of the

Intrapersonal, Interpersonal, and Environmental factors could include additional survey items to represent each latent factor more specifically.

Previous literature discussing the Ecological Model in pregnant and non-pregnant women has relied on literature reviews of the existing studies. However, one study by Ainsworth et al. examined personal (i.e., intrapersonal), social (i.e., interpersonal), and physical (i.e., environmental) correlates to LTPA among 917 African-American women in South Carolina[9] within the Ecological Model framework. Data analysis in this study relied on the use of logistic regressions to examine each individual correlate with LTPA. Ainsworth et al. found significant associations between LTPA and several correlates on each of the examined levels of the Ecological Model. In that study, odds of meeting LTPA recommendations were significantly higher for: excellent/very good self-perceived health status compared to fair/poor (Intrapersonal factor: OR=1.55, 95% CI=1.04-2.31), high self-efficacy compared to average/low (Intrapersonal factor: OR=2.04, 95% CI=1.50-2.78), lower social roles strain compared to higher social roles strain (Interpersonal factor: OR=1.49, 95% CI=1.06-2.10), and seeing people exercise in neighborhood (Environmental factor: OR=1.57, 95% CI=1.16-2.12). The results of this study, although not specific to a pregnant population, provided support for the use of the Ecological Model in this dissertation. Future analysis of the data obtained from this dissertation could also be examined as regressions for comparison. It may be that individual correlates will show stronger relationships with our outcome variables than did the latent variables we constructed.

Although the aim of this research was to examine PA and DQ based on the latent constructs of the Ecological Model, an alternative method of cluster analysis could provide

different results. Clustering analysis would allow the grouping of participants based on similar scores and characteristics rather than predetermined SEM path analysis. Hierarchical cluster analysis would allow us to determine the number of clusters represented in the data. By using the cluster analysis, created clusters would then be compared to the outcome variables [24]. The use of this method would determine associations among variables from different Intrapersonal, Interpersonal and Environmental constructs rather than use three separate latent factors. The use of cluster analysis has been applied in examining socio-ecological system models in social sciences when representing human behavior and its various characteristics [25]. Such analysis would provide interesting perspectives on PA and DQ behaviors and attitudes among pregnant low-income women and will be pursued in subsequent analyses.

### **Outcome Measurement Tools**

All PA outcome variables were assessed by the IPAQ. The use of the IPAQ for assessment of PA level among a pregnant population might be considered problematic as, to date, it has not been validated in a pregnant population. However, the use of this PA assessment was chosen over the Pregnancy Physical Activity Questionnaire (PPAQ) for a number of reasons. First, the PPAQ assessing PA in pregnant women did not show as strong reliability and validity data as the IPAQ in terms of the variables of interest such as HPA, JPA, and LTPA [26]. The PPAQ showed poor criterion validity for activity types when compared against the CSA actigraph with Spearman correlation coefficients ranging between -0.12- 0.14 for HPA, and between -0.10- 0.42 for JPA depending on actigraph cut points [26]. The IPAQ, on the other hand, showed good test-retest reliability with coefficients of 0.74 for JPA and 0.79 for HPA (90% CI 0.79-0.82) and good validity against

log book ( $r=0.64$  for JPA,  $r=0.47$  for HPA, and  $r=0.58$  for LTPA) in healthy adults [27]. In addition, although both the IPAQ and PPAQ use MET equivalents to calculate metabolic expenditure, neither assessment relies on pregnancy specific MET values. Third, by using the IPAQ, PA data could be analyzed as a continuous variable, which was the original intention of researcher. Even though the PPAQ allow the calculation of continuous data as well, the actual data obtained from the questionnaire is nominal with PPAQ answers as: (1) none, (2) less than  $\frac{1}{2}$  hour per week, (3)  $\frac{1}{2}$  to almost 1 hour per week, (4) 1 to almost 2 hours per week, (5) 2 to almost 3 hours per week, (6) 3 or more hours per week. This categorization of answers may result in classifying women performing twice as much activity per week (30 min vs almost 60 minutes) into the same activity duration category. Thus, for all these reasons, we felt the IPAQ would provide more accurate PA data than the PPAQ.

PA guidelines have been commonly interpreted as LTPA not PA, which influences the categorization and subsequently proportion of individuals meeting/not meeting recommendation. PA recommendations issued by the DHHS in 2008 advise healthy pregnant and postpartum women to engage in at least 150 minutes of moderate intensity aerobic activity per week [28]. Although various types of PA are associated with decreased risk for chronic diseases in adults, it is cardiorespiratory fitness level that is associated better health outcomes [29]. Thus, even though the DHHS PA guidelines refer to physical activity and not specifically exercise or LTPA, research studies commonly interpret these recommendations as 150 minutes of moderate exercise or LTPA when categorizing participants as meeting/not meeting recommendations [2, 9]. This dissertation study also used this common categorization as time spent on LTPA. However, if time spent on JPA and

HPA was also considered towards meeting recommendations, our sample would have 93.6% classified as meeting recommendations, rather than the 42% reported in our current results. However, recently published new ACOG PA guidelines for pregnant and postpartum women, clearly indicate the importance of exercise during pregnancy and suggest women should aim for 20-30 minutes of moderate-intensity exercise program on most or all days of the week [30]. Based on the new ACOG PA guidelines, however, performing 80 minutes of moderate-intensity exercise per week (e.g., 20 minutes x 4 days) would be sufficient for meeting recommendations compared to 150 minutes of moderate PA highlighted in DHHS guidelines. This discrepancy creates a need in the scientific community to clearly specify the guidelines and cutpoints used to classify participants as meeting/not meeting guidelines since health benefits and scientific results associated with 80 min/wk of PA may vary widely from results associated with 150 min/wk of PA. Additionally, the new ACOG guidelines attempted to provide restrictions for occupational PA; however, insufficient evidence exists in order to clearly implement such recommendations and no validated PA pregnancy questionnaire would be able to address this parameter [30]. In the absence of any clear guidelines for household or occupational activity levels, this dissertation used median score cutpoints to categorize both household related and occupational PA.

Although the use of a detailed nutrition questionnaire would provide a more accurate assessment of DQ during pregnancy, the investigators decided to use a screener FV survey to assess DQ to reduce subject burden. Literature shows that a FV screener is the best single marker of DQ [6]. The Five Factor FV survey used in this dissertation was selected because it included only nine questions, demonstrated good validity, and was

designed to be taken on a computer [31]. The survey only asked women to report frequency of food consumption, however, it was not validated specifically in pregnant women. For this reason, it is possible that the portion sizes estimated for a pregnant population could be larger than calculated (depending on pregnancy trimester). This possibly resulted in underestimation of portion sizes and subsequently underestimation of prevalence for meeting daily FV consumption during pregnancy. However, a shorter survey was purposefully selected for this study as it was assumed a longer DQ survey would result in a higher number of incomplete DQ data. Additionally, since our sample included postpartum women who recalled mid-pregnancy behaviors, it was more likely for women to accurately recall FV intake rather than details of complete daily nutrition intake and provide reliable data for semiquantitative questionnaires.

In addition to nutrition data gathered and described in this dissertation, a subsample of women (n=69) also completed the Block Food Frequency Questionnaire (2005). Although FV data could not be directly compared due to different classification of FV intakes (fruit intake with vs without juice), median HEI-2010 scores for this subset was 61.2 with ranges between 27.8-90.1 (on a scale from 0-100). Only 3% of the subset had a HEI-2010 score of at least 80, which is similarly low compared to our prevalence of only 12% of the total sample meeting FV guidelines. Nash et al. examined a cohort of 2,282 pregnant women from the Prenatal Health Project and similarly found lower prevalence of scoring 80 on dietary index over meeting recommended FV intakes (2.5% vs. 8% respectively)[32]. It is important to note the similarities in sample characteristics between Nash et al. and this dissertation study including very high education level (72% of women being college graduates) [32].

## Study Limitations

Although this dissertation provides a novel perspective with respect to examining the correlates of PA and DQ in low-income pregnant women, the study had a number of limitations. First, the sample size of 109 presented restrictions in terms of statistical analyses given a large number of variables examined in this study. After creating correlation matrices for the Intrapersonal correlates to PA and DQ and eliminating highly correlated variables ( $r \geq 0.8$ ), the number of variables entered into the CFA had to be restricted to no more than 11 in order to maintain statistical power. This resulted in elimination of at least four variables such as: Medicaid, Lifestyle Beliefs, FV intake, and LTPA, that were not considered in further analysis but were significantly correlated ( $p < 0.05$ ) with at least one other variable in the data set. This method of elimination of variables meeting initial inclusion criteria for the model only applied to the Intrapersonal correlates. It is possible that a larger sample size would allow for the creation of better latent factors by including more variables. All Interpersonal and Environmental correlates were entered into the models as they met selection criteria for the CFAs and there was sufficient statistical power for further analysis.

Second, all correlates of PA and DQ used in this study as well as all outcome variables (HPA, JPA, LTPA, and DQ) were categorized, which decreased the sensitivity of detecting statistical significance. The reason for categorization of all correlates and outcome variables was primarily related to the non-parametric distribution of continuous data such as age, BMI, and many subscales scores. This type of distribution was especially true for the outcome variables as all four variables were highly skewed to the right with the medians being lower than the means. Additionally, classification of barriers and facilitators

as overall High/Low Barrier or Facilitator variable simplified the data analysis, but allowed the use of these variables in the CFA and SEM modeling, whereas including each barrier/facilitator individually would not have been possible due to power restrictions. Also, it is possible that different criteria for categorizing variables would slightly influence the CFA and SEM modeling. In this study, it was necessary for most correlates to be dichotomized due to variable distribution and small sample size.

Third, this dissertation examined PA and DQ behaviors in pregnant and postpartum women combined, which potentially impacted the results of the study. Although it has been demonstrated in previous studies that PA level decreases [2] and FV intake [6] increases as pregnancy progresses, this study did not examine trimester specific PA and DQ behaviors. Additionally, by analyzing data from all trimesters combined potentially influenced a number of other PA and DQ correlates such as: self-efficacy [6, 13], social support, as well as barriers and facilitators [14]. It is likely that the results of the study would be different if sample size was larger and allowed us to examine Ecological models by trimester.

Fourth, data for this study was collected on a convenience sample, which resulted in obtaining results not generalizable to a typical low-income pregnant population. This analytic sample was fairly well educated and predominantly White. Most likely, the use of Research Match as a recruitment tool was the reason for having a relatively high level of college education [2] compared to a more nationally representative low-income population. Since potential Research Match study participants are voluntarily enrolled into a database that is centered around universities and research centers, it is possible that these participants might be associated with universities and have a higher education status

overall compared to traditional low-income populations. This also potentially influenced the distribution of other variables, including race, social support, and environmental variables, as well as barriers and facilitators.

Fifth, despite best efforts being made to use only validated scales, not all scales used in this study were validated. In the absence of pregnancy specific scales, PA Social Roles Strain and PA Social Perceptions scales were modified to a pregnant population but were not validated on this sample. However, the original scales were assessed in a diverse group of 344 women (14.5% white, 23% Latina, 53.5% African American, and 8.7% Native American; 63% at least some college degree)[33]. Additionally, Nutrition Social Roles Strain and Nutrition Social Perceptions questions were adapted and modified from the PA equivalent questions. However, face validity of these Nutrition related questions was established by two nutrition experts. Lastly, to unify wording across all questionnaires used in this study and make it less confusing for the participants, a word “exercise” was replaced by “physical activity”, which potentially slightly altered the meaning of some questions. However, the researchers believe it did not impact the results of this study in a great extent, as the general population might not be aware of the subtle difference between these two terms.

Our data were obtained via an online survey. Even though some scales used in this study, such as FV intake screener, were designed to be taken online [31], most of the scales used in this study were validated in lab conditions with researchers’ supervision. Even though our study participants were provided with researcher’s phone number and email contact information in case they had any questions while completing the survey, it is possible that having an on-site assistance would be more convenient for participants to

have their questions answered. As the data were self-reported, recall bias is possible, especially among the postpartum participants.

Lastly, postpartum women reported a higher incidence of pregnancy-related health problems compared to pregnant women participating in the study (37% and 10% respectively). It is likely that pregnant women completing the survey did not experience pregnancy-related health problems as those typically occur later in pregnancy. For this reason, the data for pregnant and postpartum women were combined in the analysis. However, it is also possible that postpartum women who experienced pregnancy-related health complications were more likely to participate in a study on pregnancy, which would result in a population bias. Since study participants were recruited using the Research Match platform, which is centered around university settings and often recruits for various clinical trials, it is possible that women with a history of health problems were overrepresented in the sample compared to a typical population of pregnant women.

### **Study Strengths**

Despite a number of limitations, this study had several strengths. First, this research was based on a theoretical concept that allowed examining an individual within a broader social and environmental context. The assessment of Intrapersonal, Interpersonal, and Environmental factors simultaneously in the same population of low-income pregnant women, has not been done previously. Studies discussing the correlates of PA in women are limited to literature views evaluating each correlate separately in the context of LTPA, which results in equivocal conclusions depending on the studied sample and which correlates were considered [10]. This dissertation examined latent factors for

Intrapersonal, Interpersonal, and Environmental correlates in the context of PA and DQ behaviors.

This dissertation also addresses different types of PA. Most studies on PA among pregnant women focus primarily on LTPA while HPA and JPA are not taken into consideration. Since low-income women are less likely to engage in LTPA compared to mid- high-income populations [12], considering influences on HPA and JPA may be more important in this population. Additionally, assessment of pregnancy related behaviors would be incomplete without examining also DQ. Studies tend to focus on either PA or DQ behaviors separately, even though both should be considered when examining pregnancy behaviors.

The concepts of Social Roles Strain and Social Perceptions have rarely been considered in PA behaviors and have not been examined in the context of dietary behaviors. In order to create similar correlates for DQ as PA, these two variables were adapted for dietary behaviors. This added valuable descriptive data for this sample of pregnant women even though the Intrapersonal factor model did not converge.

Finally, this study used a comprehensive list of pregnancy related barriers and facilitators for PA and DQ, which provided a valuable look at these correlates. Even though, for the purpose of this dissertation, the analysis of barriers and facilitators was simplified by categorizing these correlates, this provides rich descriptive data for future study.

### **Future Research Directions**

Findings from this dissertation present a number of future directions in regards to correlates of PA and DQ. Since none of the latent Intrapersonal, Interpersonal, and

Environmental factors significantly predicted PA or DQ, it is possible that the Ecological model as evaluated in this dissertation, might not be the best approach to examine these behaviors. However, a larger sample of low-income pregnant women more representative of a typical low-income population may allow more comprehensive data analysis that may provide more support for the Ecological Model. Alternatively, similar to the strategy employed by Ainsworth et al [9] the model could be examined as regressions for each of the Intrapersonal, Interpersonal, and Environmental correlates, bypassing the latent variables. This would allow us to determine whether any of the raw variables in each of the Ecological levels were associated with our outcomes, and may suggest ways of refining future investigations. Also, keeping the data as continuous with a larger sample could increase sensitivity to yield significant results.

Although this dissertation study attempted to examine a low-income population, the analytic sample was more educated than expected providing a valuable look at behaviors of an educated low-income population. Despite 89% of women having at least some college education, only 12% met daily FV intake recommendation, while median FV consumption self-efficacy score was above average at 3.5 (range 1-5). This discrepancy between the actual FV consumption and FV self-efficacy should be further examined as DQ is an essential aspect of healthy progression of pregnancy and potentially birth outcomes. Moreover, examination of low-income pregnant women within a broader social and environmental context is still needed since this population is less likely to meet recommendations for PA and DQ, which can have an impact on the health of the mother and the baby.

## **Conclusions**

This dissertation found no significant associations among latent Intrapersonal, Interpersonal, and Environmental factors for HPA, JPA, LTPA, and DQ behaviors. However, this analysis was the first attempt to examine the Ecological model when using such latent factors in a pregnant population. Our findings suggest the Ecological Model as analyzed in this dissertation might not capture the essence and the complexity of PA and DQ behaviors in the most accurate way. Future studies, examining larger samples and a more traditional low-income population of pregnant women could provide more support for the Ecological Model in reference to PA and DQ behaviors during pregnancy.

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