Racial/Ethnic and Income Disparities for Family Meals in a Population-Based Cohort of Two-Year Old Children

By

Adiba M. Ali

A THESIS

Presented to the Department of Public Health and Preventative Medicine
and the Oregon Health & Science University
School of Medicine
in partial fulfillment of
the requirements for the degree of

Master of Public Health

May 2013

Certification of Approval

Table of Contents

Table of Figures

List of Abbreviations

AI/AN	American Indian / Alaska Native
CI	Confidence Interval
CSHCN	Children with Special Health Care Needs
FPL	Federal Poverty Level
GOF	Goodness-of-Fit
NH	Non-Hispanic
OR	Odds Ratio
PI	Pacific Islander
WIC	Special Supplementary Nutrition Program for Women, Infants, and Children

Abstract

Background: Sharing family meals together is an important component of the family environment that can influence early childhood development and protect against negative health outcomes such as obesity, depression, and substance abuse. Routinely shared mealtime can improve life-style related health behaviors and enhance family cohesion. Previous research on family meals has primarily been limited to Caucasian families with adolescents. While socioeconomic disparities have been shown for adverse health outcomes, there is little research exploring the demographic characteristics associated with sharing family meals. This study estimates the prevalence of sharing family meals among Oregon families with two-year old children, and tests the hypothesis that race/ethnicity and poverty status are associated with family meal frequency.

Methods: The Oregon Pregnancy Risk Assessment Monitoring System (PRAMS) is a population-based survey on experiences before, during and after pregnancy; PRAMS-2 is a follow-up survey conducted when the child reaches 2 years of age. This study analyzes the PRAMS-2 survey responses of women who had live births in 2004 and 2005. The PRAMS-2 survey asked, "Does your family eat meals together?" Mothers who reported "always" or "usually" having family meals were compared with those who reported "sometimes" or "never." A multivariate logistic regression model was developed using weighted survey techniques to evaluate the associations between those who reported "always or usually" having family meals and multiple independent variables.

Results: Of the 1,911 respondents to the 2007-2008 PRAMS-2 survey, 87.8% reported always or usually having family meals together. In a multivariate model, race/ethnicity, poverty status, and birth order were significantly associated with family meal frequency, after adjusting for

marital status, maternal age, and maternal employment. Compared to Non-Hispanic (NH) Whites, NH Blacks (adjusted odds ratio (ORa): 0.46; 95% confidence interval (CI): 0.27, 0.81), Hispanics (ORa: 0.42; 95% CI: 0.26, 0.70), and NH Asians (ORa: 0.50; 95% CI: 0.31, 0.81) were less likely to report always or usually having family meals. Mothers with a household income at or above 100% of the Federal Poverty Level (OR_a: 1.80; 95% CI: 1.02, 3.15), and more than one child (OR_a: 1.60; 95% CI: 1.02, 2.52) were more likely to report always or usually having family meals together.

Discussion & Conclusions: Racial/ethnic and income disparities are highlighted among families reporting eating meals together. Employment and marital status were not significant in the final model but trends of increasing family meals were observed with having full-time employment and being married. These findings may reflect socioeconomic patterns of financial stress and unstable home environments since racial/ethnic minorities may share similar economic constraints. The stratified sampling design is a major strength of this study, allowing for population-based estimates. However, the analysis is limited due to the lack of precision in the PRAMS-2 survey question measuring family meal frequency, potentially contributing residual confounding. This study explores the demographics characteristics of families with two-year old children who share meals together, and identifies disparities during early childhood that may eventually influence adolescent health. These findings can guide public health policy and family-based interventions to help maintain a healthy family environment. Educational campaigns to encourage family meals and address barriers may be targeted to high-risk populations. Future research is needed to quantify family meals frequency with precision, and further identify risk factors and consequences of family routines.

Introduction

Sharing a meal together with one's family is an activity that has been cited for its numerous benefits on a family's development, health, and well being. Family meals have been linked with outcomes such as reduced risk of obesity, depression, substance abuse. Studies have also linked family meals with enhanced language development skills and academic achievement. Family mealtime routines are increasingly attracting attention for its role as a protective factor for diverse health-related outcomes, ranging from the level of an individual child's physical and psychosocial well-being, to the healthy functioning of a family [1].

Early Childhood Development

Families are social systems, and represent a key component in the social environment and material setting for child development [2]. The practice of family feeding can be considered a routine social practice, since eating is embedded in social relations, and is an activity central to family life. The routine family meal not only influences the development of eating patterns and food preferences during early childhood, but as a component of the family environment, it plays a vital role in a child's physical and cognitive development. The early years of life are a critical time to develop lifestyle, family and food preferences [3]. Mealtime offers a natural opportunity for parental influence [4]. Routinely established shared family meals can provide repeated exposure to proper mealtime behavior and healthy eating habits [3]. Having a regular amount of time dedicated to family meals can help children develop specific habits such as regular healthful meal, or limited television viewing time. [5]

Family Cohesion and Psychosocial Health

The family mealtime uniquely offers a regular window of focused time in which members of a family can gather together. The benefits of the shared family meal, as reported in a survey by parents of 10 year old children, include time for conversation, feeling of togetherness, shared nutrition, and ceremony [6]. In the same survey, parents also described challenges to family meals such as meal planning, food preparation, and clean-up. The combination of these benefits and challenges provides an opportunity for family members to connect with each other, as well as share responsibilities.

The protective effects of family meals on psychosocial and behavioral health have been described to be mediated by family cohesion and communication [7]. Recent studies have emphasized that the extent of parental engagement with their children influences the effects of family dinners [4]. Learning is vital in the development of a child's eating behavior, and parents can serve as important role models in this process [8]. Higher family functioning, as measured by communication, closeness, problem solving ability, and behavioral control, was found to be associated with more frequent family meals [9]. Communication and cohesion within the family, as well as the quality of the family meal environment, as determined by the presence of competing activities and distractions, together can have an influence the protective effects of shared mealtime.

Behavioral and Mental Health

Many studies have shown that family meals are associated with better family cohesion, as well as a reduction of behavioral problems. Among adolescents, additional mental health benefits of family meals have been demonstrated, such as decreased depression and substance abuse [10]. Adolescents who reported being happy or being able to communicate with family have been

linked with lower risk of substance abuse [11]. A combination of family connectedness, positive family relationships, psychological health, and regular family meals have been shown to be protective against eating disorders among adolescents [12].

Obesity

In addition to psychosocial health effects, family meals have also been shown to be protective against obesity and weight-related health, and disordered eating patterns [13]. Family meals are associated with beneficial effects on nutritional intake, and inversely related to childhood obesity rates. Youth who eat with their families have reported more healthful diets [10]. Family functioning was shown to be associated with weight, dietary intake, and less sedentary behavior, as well as being protective for adolescent weight and weight-related health behaviors [9]. Family meals have been shown to improve children's life-style related health behaviors. Such behaviors include healthier dietary habits, with less consumption of soft drinks and more fruit consumption.

Comment [DP1]: do you want to specify the direction of the relationship s? you do say that family function ing (good functioning) is protective for adolescent weight (what does this mean—not being overweight or obese?) and weight-related health behaviors. What about dietary intake—what is the direction—intake of healthful foods more likely with good functioning? Good functioning more likely with lower weight?...

Routine household activities may be promising behavioral targets for counseling. Studies have shown that regular practices such as decreased screen time and increased sleep duration are associated with more frequent family meals [14]. These three household routines – family meals, sleep, & screen time – together have been associated with a 40% reduction in obesity among pre-school aged children [15].

It is important to note that it is not simply the activity itself that promotes health at the dinner table, but the family environment as well. The emotional climate created by the family during meals can influence how young children become overweight [16]. These aspects of the family environment are of utmost concern, especially since early childhood obesity is a strong predictor of adult obesity risk [8].

Barriers to family meals

Qualitative studies have identified several barriers that families face in conducting family meals. Such barriers include child behavioral issues, developmental challenges, scheduling, and support from the father/husband figure [17]. Many families experience added strains in juggling shift jobs and added transportation time between home and work. A focus group study highlighted some of the major challenges that single mothers encounter in maintaining family routines. Child behavior and mother's fatigue were major barriers to maintaining activities such as bedtimes and mealtimes at the same time everyday [18].

Comment [DP2]: What kind of behavior?

Socioeconomic Disparities

Most of the research on family meals in the current literature has been limited to Caucasian populations [10]. Few studies have examined racial/ethnic disparities and family meals [19]. There is substantial evidence demonstrating racial disparities in obesity rates. The relationship between family food behavior and adolescent obesity may be affected by cultural / socioeconomic differences [20]. Such disparities have been demonstrated among pre-school aged children [21]. Studies have also shown that low socioeconomic status, low education, and single-parent-headed households are associated with substance misuse among school children [11]. Racial/ethnic disparities in health and health care are being investigated, however, studies of disparities in children are rare, and less is known about racial/ethnic disparities among younger children [22].

Significance

The role of family meals on early childhood development, and its protective effects against adverse health outcomes, highlights the importance of protective factors during early childhood.

Family based intervention efforts early in life, such as routine family meals, have been recommended by the surgeon general and the institute of medicine [2321]. Family meals have been associated with healthy psychosocial development, good nutritional habits, early childhood, lower obesity rates, and reduced behavioral and mental health disorders. Assessing potential disparities and barriers associated with maintaining routine family meals is critical in order to implement effective interventions strategies to promote family meals. There is evidence of racial/ethnic and income disparities in childhood obesity, as well as youth mental and behavioral health outcomes. However, there is little evidence-based research exploring the risk factors for infrequent family meals. This study seeks to evaluate the associations between family meal frequency and socioeconomic factors such as race/ethnicity, poverty status, and a range of maternal characteristics, from a population-based cohort of Oregon mothers with two-year old children. Specifically, the PRAMS-2 survey will be used to assess the prevalence of family meal frequency in Oregon, and evaluate the associations between family meal frequency and socioeconomic factors. The specific aims of this study are:

Comment [DP3]: ?

1. Estimate the prevalence of frequent family meals among families with two-year olds in Oregon.
2. Evaluate the association between family meal frequency and race/ethnicity, poverty status, and additional maternal demographic characteristics.
3. Develop a multivariate model to test the hypothesis that race/ethnicity and poverty status are associated with family meal frequency.

Methods

Overview of PRAMS

The Pregnancy Risk Assessment Monitoring System (PRAMS) is a population based surveillance system designed to monitor selected maternal behaviors and experiences. The Centers for Disease Control and Prevention (CDC) have run the PRAMS program since 1987, and Oregon PRAMS began surveying in 1998. The Office of Family Health of the Oregon Department of Human Services uses the data collection and analysis to support program development, program evaluation, and policy-making. Eligible PRAMS participants include Oregon resident women who recently gave birth. PRAMS data are linked with the birth certificate registry, providing additional demographic data. Beginning in 2004, cohorts of women were re-interviewed when their child was 2 years old in the follow-up PRAMS-2 survey. This study will analyze PRAMS-2 responses of women who had live births in 2004 and 2005, and were re-interviewed for the PRAMS-2 survey in 2006 and 2007. Detailed methodology of PRAMS has been previously described [24]. The sampling design and weighting schemes will be briefly described here.

The PRAMS surveillance system selects subjects every month from a sampling frame of eligible birth certificates. The sampling frame includes Oregon women who gave birth within 2 to 6 months of the selection date, and a stratified random sample of women are selected for interviewing. Women of racial/ethnic minorities (Hispanic, American Indian/Alaska Native, Asian/Pacific Islander, and African American) are oversampled in order to obtain a sufficient sample size for meaningful analysis of health issues related to race/ethnicity. Sampling rates are based on derived population proportions. The survey is mailed to the selected subjects, and

those who don't respond receive a second mailed survey and telephone calls to complete an interview.

The survey responses are weighted before analysis in order to make the sample representative of the population of Oregon women. Three weighting factors are applied to the survey analysis: over-sampling, non-response, and non-coverage. The over-sampling adjustment accounts for the design, and is the reciprocal of the sampling proportion. The non-response adjustment accounts for any potential selection bias among respondents. A regression analysis is performed to determine which demographic characteristics are associated with non-respondents. The non-response weight assumes that those who did not respond would have provided answers that are similar to those respondents who shared their demographic characteristics. Finally, the non-coverage adjustment accounts for the possible exclusion of eligible birth certificates or inclusion of ineligible birth certificates from the sampling frame. The total list of birth certificates issued that year is compared with those that were included in the sampling frame. The final weight is the product of these three weights, and is applied to the entire dataset for all analyses.

Human Subjects Protection

This study is a secondary data analysis using de-identified data. A data-use request was granted by the Oregon Public Health Division, Center for Health Statistics Researchers' Review Committee. Permission to access PRAMS 2004-2005 and corresponding PRAMS-2 datasets was granted. The Oregon PRAMS database confidentiality guidelines were assessed and the PRAMS data sharing agreement was signed. The study protocol was submitted to the OHSU Institutional Review Board for determination (IRB00007704). The IRB determined that the

proposed activity is not human subject research because it "does not meet the definition of human subject per 45 CFR 46.102(f)."

Data Management

Oregon Public Health Division maintains responsibility for data collection, cleaning, and management. Upon submission of the PRAMS data sharing agreement, the complete database containing merged and de-identified data was obtained, along with the corresponding data dictionaries and original surveys. The database comprises three merged datasets in STATA format, including the 2004-2005 PRAMS survey responses, the corresponding data from the Oregon Birth Certificate files, and the subsequent 2006-2007 PRAMS-2 survey responses. Identifiable data, including names, dates, addresses, county of residence, and actual birth weights, were removed from the file. The final weights for analysis were already computed and included in the provided database.

Variable Coding

The variables analyzed for this study were derived from the PRAMS-2 dataset and the birth certificate registry. The outcome variable of interest, the primary predictors, and additional covariates considered for the analysis are described in detail below.

Outcome Variable

The outcome variable of interest is "Family Meals Frequency", as measured by the question in PRAMS-2, "Does your family eat meals together?" There were four possible responses including "always," "usually," "sometimes," or "never." A literature review on family meal frequency was performed to determine the optimal categorization of the PRAMS-2 family meal variable. Most studies found associations between diverse health outcomes and sharing meals at least 4 times per week. Other studies restricted analyses to sharing meals 5 to 7 days per week. Some studies

asked about the number of meals per week, and analyzed the number of meals as a continuous variable in a multiple linear regression model. Since most studies in the literature did not restrict analysis to "every day" or "always", the decision was made to dichotomize the PRAMS-2 family meals responses into "always or usually" and "sometimes or never." There were 1,911 completed PRAMS-2 surveys, and 36 respondents answered either "don't know" or did not answer the question. The remaining 1875 respondents were included for analysis.

Predictor Variables

This study evaluates family meal frequency with two primary predictors: race/ethnicity and poverty status. Race/ethnicity data is collected from the birth certificate files, and is analyzed as five categories: Non-Hispanic (NH) White, Hispanic, NH Black, NH American Indian/Alaska Native (AI/AN), NH Asian/Pacific Islander (PI). Poverty status is derived from responses to the annual household income question in the PRAMS-2 survey and the poverty guidelines issued in the annual Federal Register by the Department of Health and Human Services [25-27]. In this analysis, poverty status is reported as a percentage of the federal poverty level (FPL), as computed using the 2006-2007 poverty guidelines.

Several additional predictor variables were considered in the analysis of family meal frequency. These variables include maternal age, education, marital status, employment status, nativity, household size, birth order, county type, having childcare arrangements, having a special needs child, and whether the child has ever been enrolled in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC). These characteristics were selected based on scientific relevance in the literature, and were derived from either the 2006-2007 PRAMS-2 survey or the birth certificate files. Each of these variables is described in detail in Table 1.

Table 1. Variable coding for outcome, primary predictors, and additional covariates, as derived from 2006-2007 PRAMS-2 or birth certificate files.

Characteristic	Possible Responses	Coding for Analysis
Family Meals Frequency (PRAMS-2)	Always Usually Sometimes Never	1 = Always or Usually 2 = Sometimes or Never
Maternal Race/Ethnicity (Birth Certificate)	Race: White, Black, Indian, Chinese, Japanese, Hawaiian, Filipino, Other Asian or Pacific Islander Ethnicity: Non-Hispanic, Mexican, Puerto Rican, Cuban, Central or South American, Other Hispanic	1 = Non-Hispanic (NH) White 2 = Hispanic 3 = NH Black 4 = NH American Indian / Alaska Native 5 = NH Asian / Pacific Islander
Poverty Status (PRAMS-2)	Less than $10,000 $10,000 to $14,999 $15,000 to $19,999 $20,000 to $24,999 $25,000 to $29,999 $30,000 to $34,999 $35,000 to $49,999 $50,000 or more	1 = Less than 100% FPL 2 = 100% FPL or higher
Maternal Age (PRAMS-2)	Date of birth	1 = younger than 25 years 2 = 25 to 34 years 3 = older than 34 years
Maternal Education (PRAMS-2)	Less than 12th grade 12th grade or GED More than 12th grade	1 = Less than 12 grade 2 = 12th grade 3 = More than 12th grade
Marital Status (PRAMS-2)	Never Married Married Widowed Divorced Separated	1 = Married 2 = Not Married
Birth Order (Birth Certificate)	Number of live births living	1 = one 2 = more than one
Maternal Employment Status (PRAMS-2)	Yes, full time Yes, Part time No, but I am looking for work No, I am not looking for work	1 = Full time or part time 2 = Unemployed

Table 1 (Continued). Variable coding for additional covariates, as derived from 2006-2007 PRAMS-2 or birth certificate files.

Characteristic	Possible Responses	Coding for Analysis
Household Size (PRAMS-2)	Total income dependents	1 = Three or less 2 = More than three
Child on WIC (PRAMS-2)	No Yes, on WIC now Yes, but no longer on WIC	1 = No 2 = Yes, on WIC now
CSHCN (PRAMS-2) An ongoing need (lasting 6 months or more) for: Specialty Health Care, Behavioral or mental health services, Physical Therapy, Occupational Therapy, Speech Services, Medication, Home health services, Special diet, Use of assistive devices, Durable medical equipment	No Yes	1 = None 2 = One or more ongoing need
Childcare arrangements (PRAMS-2)	No Yes	1 = No 2 = Yes
Maternal Nativity (Birth Certificate)	Mother's country of birth	1 = US born 2 = Foreign born
County Type (Birth Certificate)	All Oregon counties	1 = Rural 2 = Urban

Post-hoc Power Analysis

A crude post-hoc power analysis was performed in order to determine the smallest odds ratio that can be detected in order to achieve a power of 0.80 at an alpha level of 0.05. The power analysis software, G*Power 3.1 was used for this calculation [28]. Assuming normal distribution of the predictor variables, a sample of 1,875 family meal responses has 80% power to detect a minimum odds ratio of 1.23.

Comment [DP4]: What do you mean by post-hoc here?

Comment [DP5]: Most if not all of your predictors are categorical not continuous—so it doesn't make sense to assume normality. We should do another (simpler) calculation based on the main categorical predictors.

Statistical Analysis

The objectives of this study are to estimate the prevalence of frequent family meals and test the hypotheses that race/ethnicity and poverty status are associated with family meal frequency. Data from the 2006 & 2007 PRAMS-2 cohort are combined and used for this analysis. All analyses are weighted for over-sampling, non-response, and non-coverage using STATA 11.1.

Descriptive Statistics

Descriptive statistics were computed for each variable considered for analysis, including the outcome variable, primary predictors, and additional covariates. The prevalence estimate of family meals frequency in Oregon was computed using the weighted percentages of "always or usually" having family meals. The frequency distribution of each variable was examined in each of the possible responses described in Table 1. One-way tabulations were used to examine the number of unweighted observations and weighted percentages for each category of the variables. Based on these distributions, and evidence cited in the literature, the variable coding most appropriate for this analysis was determined.

Comment [DP6]: Not sure what this sentence means.

Univariate Analysis

The relationship between family meal frequency and each of the primary predictors and covariates considered in this study was examined using weighted two-way tabulations. The unweighted number of observations in each cell was reviewed to verify that cell counts were sufficient for further analysis. The weighted percentage of always or usually having family meals was computed for each level of the predictor variables, and the chi-squared test statistics were evaluated for each pair. Simple logistic regression models were built to further characterize the univariate associations between the dichotomous family meal frequency variable and each predictor variable. The weighted bivariate odds ratio for each predictor was computed for each simple model. The strength of the statistical association of each univariate model, combined with the clinical importance of each characteristic, was carefully assessed for inclusion into a multivariate logistic regression model. Covariates with no independent associations with family meal frequency, and weak evidence of what? cited in the literature, were excluded from consideration of the multivariate model.

Comment [DP7]: Just checking that you meant 'and' here not 'or'?

Confounding Assessment

The primary predictors for family meal frequency evaluated in this study are race/ethnicity and poverty status. In order to identify confounding factors of the relationship between family meal frequency and each of the primary predictors, the associations between each potential confounder and primary predictor were examined in detail. Covariates were considered for confounding assessment if they were independently associated with family meal frequency in the simple logistic regression model, and significantly associated with either of the two primary predictors as demonstrated by the strength of chi-squared test statistics. Covariates that lie on the causal pathway between the primary predictor and family meal frequency were excluded

from the assessment. Each potential confounder was added separately to the simple logistic regression models of either race/ethnicity on family meals or poverty status on family meals. The point estimates of each simple model were compared with the model including the potential confounder. Covariates that affected any of the levels of the primary relationships by more than 10% were considered confounders.

Multivariate Analysis

The multivariate model developed for this study tested the hypothesis that race/ethnicity and poverty status are significantly associated with family meal frequency. The model building procedure was manually implemented, since the automated step-wise STATA functions are not applicable to weighted survey data. A backwards stepwise regression approach was adopted to ensure that potentially important characteristics are not prematurely excluded from the model. Variables incorporated into the initial multivariable modeling step were selected based on scientific relevance, and results of the univariate and confounding analyses. Subsequently, variables were eliminated from the model in an iterative process.

Decisions to add or remove variables from the model were based on several criteria, including the significance of each variable, as well as the overall model. In addition, model assessment tools were employed to evaluate the overall fit of each iterative model. For this study, the Goodness-of-Fit (GOF) test served as the primary model assessment tool. A non-significant GOF statistic indicated that the model prediction does not significantly differ from the observed [29]. There are several other assessment tools that are not applicable to this study, such as the pseudo-R-squared, and the AIC/BIC (Akaike/Bayesian information criterion). These criteria are based on maximum likelihood estimation, which assumes that observations are

independently and identically distributed. This assumption is not met in the case of weighted survey data since sampling weights and strata are specified with survey estimators.

Comment [DP8]: Maximum likelihood does not assume observations are independent.. I do't know what the issues are with survey data,. Perhaps just delete tehse two sentecnes.

Multi-Collinearity

Multi-collinearity was evaluated with the variance inflation factor (VIF) for each predictor variable considered for the model to identify characteristics too strongly correlated with each other. Since the post-estimation command "estat vif" is not applicable for survey data, the VIF was computed manually as the inverse of the tolerance (1-R-squared) for each set of predictors. Linear regressions were run separately, with each predictor set as the "dependent" variable, and the remaining predictor variables set as the "independent" variable. The VIF values for each predictor were compared to determine the extent to which each predictor variable's effect was independent of the other predictors considered for the model. Variables that demonstrated relatively high multi-collinearity were subsequently removed from the model.

Interactions

Interactions between the two primary predictors, race/ethnicity and poverty status were tested in the multivariate model. This particular interaction test was selected because many studies in the literature examining the socioeconomic disparities of health outcomes related to individual behavior and family structure have cited statistical interactions between race/ethnicity and income [30-33]. The interaction was evaluated in the full model, and entered as a multiplicative term. The overall significance of the interaction term was tested at the 0.05 alpha level, and considered for inclusion into the final model.

The final multivariate model developed for this study includes carefully selected predictor variables that contribute to the overall fit and significance of the model, while offering a parsimonious yet meaningful interpretation of family meals.

Comment [DP9]: Somewhat vague, so want to make sure that the decisions are clearly described in results section.

Results

PRAMS-2 Response Rate

This study analyzed data from the 2004-2005 Oregon PRAMS birth year cohort. Over the course of two years, 5,620 mothers were sampled for the initial PRAMS survey, and 3,883 women responded back to PRAMS. This cohort was followed in time and re-sampled two years later for the PRAMS-2 survey. Of the original 2004-2005 birth cohort, 1,911 women responded in 2006-2007 to the PRAMS-2 survey. The PRAMS-2 weighted response rate is computed as the ratio between the weighted number of PRAMS-2 respondents and the total weighted number of women who were sampled in the original PRAMS survey, as outlined in Table 2 below. This yields a combined 2004-2005 PRAMS-2 response rate of 43.5%.

Table 2. Combined 2004 – 2005 PRAMS-2 response rates

Weighted Response Rates	2004 Birth Year Cohort	2005 Birth Year Cohort	Combined 2004 & 2005 Birth Year Cohort
Total PRAMS sample	2,814	2,806	5,620
Total PRAMS-2 sample (PRAMS participants)	1,968	1,915	3,883
PRAMS-2 Respondents	865	1,046	1,911
Weighted PRAMS denominator	43,641	43,815	87,456
Weighted PRAMS-2 respondents	17,131	20,888	38,019
Weighted Response	17,131/43,641 **→39.3%**	20,888/43,815 **→47.7%**	38,019/87,456 **→43.5%**

#

Family Meals Prevalence in Oregon

The frequency distribution of the outcome variable, family meal frequency is shown below in Table 3. Of the 1,911 women who responded to the 2006-2007 PRAMS-2 survey, 1,875 women answered the question "Does your family eat meals together?" Based on evidence available in the literature, the decision was made to dichotomize family meal frequency to compare the demographic characteristics of mothers who reported "always" or "usually" having family meals, versus "sometimes" or "never" having family meals. Among families with two-year old children in Oregon in 2006 and 2007, an estimated 87.8% of mothers reported always or usually having family meals together.

Table 3. Family Meals Categorizations and Frequency Distributions (PRAMS-2)

Category	n[a]	%[b]	Category	n[a]	%[b]
Always	852	45.1%			
Usually	744	41.5%	Always or Usually	1596	87.8%
Sometimes	272	11.6%			
Never	7	0.5%			
Don't Know	17	0.3%	Sometimes or Never	279	12.2%
Missing	19	1.1%			
Total	*1911*	*100.0%*	***Total***	1875	100.0%

[a] Unweighted number of respondents; [b] Weighted percentage

Univariate Analysis

The primary predictors, maternal race/ethnicity, and poverty status, were initially evaluated for their associations with family meals. In the univariate analysis, both maternal race/ethnicity ($p < 0.001$) and poverty status ($p = 0.002$) were significantly associated with always or usually having family meals. The maternal race/ethnicity analysis revealed that compared to Non-Hispanic Whites, Hispanics, NH Blacks, NH American Indian/Alaska Native, NH Asian/Pacific Islanders were significantly less likely to report always or usually having family meals together.

The frequency distribution for poverty status was assessed in order determined the most relevant and appropriate analysis levels. Initially, five levels of poverty status were considered: less than 50% FPL, 50-99% FPL, 100-199% FPL, 200-299% FPL, and 300% FPL or more. The family meals prevalence estimates and family meals univariate associations for each of these five levels were carefully examined. The observed prevalence estimates indicated a divergence of the outcome at 100% FPL. Therefore, the decision was made to collapse this variable into two categories: Less than 100% FPL versus 100% FPL or more. This classification scheme revealed that compared to families living below the federal poverty level, those living at or above 100% of the federal poverty level are significantly more likely to report always or usually having family meals together (Table 4).

Table 4. Poverty status classification

Poverty Status Classifications	n[a]	Always-Usually Family Meals[b]	Unadjusted OR (95 % CI)
Poverty Status (5 levels)			
Less than 50% FPL	253	81.8%	Referent
50 to 99% FPL	246	80.1%	0.90 (0.48, 1.68)
100 to 199% FPL	394	89.6%	**1.92 (1.02, 3.61)**
200 to 299% FPL	467	90.8%	**2.19 (1.18, 4.03)**
300% FPL or higher	368	92.1%	**2.58 (1.34, 4.95)**
Poverty Status (2 Levels)*			
Less than 100% FPL	504	81.2%	Referent
100% FPL or higher	1229	90.7%	**2.27 (1.50, 3.44)**

[a] Unweighted number of respondents;
[b] Weighted percentage of those reporting always or usually having family meals, excluding those who did not respond or responded that they did not know
*Categorization used in the multivariate model

Several additional characteristics were evaluated for their univariate associations with family meals. Covariates significantly associated with family meals at an alpha level of 0.05 include maternal education, marital status, birth order, currently being on WIC, and maternal nativity. The univariate association between maternal employment status and family meals was significant at an alpha level of 0.25. Covariates that were not associated with family meals include maternal age, household size, having a child with special health care needs, having childcare arrangements, and county type.

Comment [DP10]: Why pick 0.25? Could just report pvalue.

Table 5. Univariate analysis of family meal frequency by demographic characteristics

Characteristic	n[a]	Always-Usually Family Meals[b]	Unadjusted OR (95 % CI)
Total	1,875	87.8%	--
Maternal Race/Ethnicity			
Adjusted Wald Test	--	--	p = 0.0001
NH White	823	90.6%	Referent
Hispanic	359	79.7%	0.41 (0.27, 0.61)
NH Black	187	78.0%	**0.37 (0.23, 0.59)**
NH AI/AN	217	85.1%	**0.59 (0.36, 0.97)**
NH Asian/PI	283	83.7%	**0.53 (0.34, 0.84)**
Other/Missing	6	--	--
Poverty Status			
Adjusted Wald Test	--	--	p = 0.0001
Less than 100% FPL	504	81.2%	Referent
100% FPL or higher	1229	90.7%	**2.27 (1.50, 3.44)**
Don't Know/Missing	142	--	--
Maternal Age			
Adjusted Wald Test	--	--	p = 0.6491
Less than 25 years	349	85.7%	Referent
25 to 34 years	991	88.5%	1.26 (0.75, 2.11)
34 years or older	535	88.3%	1.25 (0.72, 2.21)
Maternal Education			
Adjusted Wald Test	--	--	p = 0.0007
Less than 12 grade	270	79.6%	Referent
12 grade	410	85.8%	1.56 (0.9, 2.68)
Higher than 12 grade	1187	90.4%	**2.4 (1.5, 3.8)**
Don't Know/Missing	8	--	--
Marital Status			
Adjusted Wald Test	--	--	p = 0.0102
Married	1387	89.4%	Referent
Not Married	482	82.9%	**0.58 (0.38, 0.88)**
missing	6	--	--
Maternal Employment Status			
Adjusted Wald Test	--	--	p = 0.1782
Full time or part time	1033	86.5%	Referent
Unemployed	830	89.3%	1.31 (0.88, 1.94)
Don't Know/Missing	12	--	--

Comment [DP11]: What do you mean by adjusted wald test in the table (have both adjusted and unadjusted analyses in various tables)?

Table 5 (continued). Univariate analysis of family meal frequency

Characteristic	n[a]	Always-Usually Family Meals[b]	Unadjusted OR (95 % CI)
Birth Order			
Adjusted Wald Test	--	--	p = 0.0430
First Child	843	85.4%	Referent
Second child or greater	1031	89.7%	**1.49 (1.01, 2.19)**
Missing	1	--	--
Household Size			
Adjusted Wald Test	--	--	p = 0.6462
≤ 3	666	87.6%	Referent
>3	1147	88.6%	1.1 (0.73, 1.65)
Don't Know/Missing	62	--	--
Child currently on WIC			
Adjusted Wald Test	--	--	p = 0.0006
No	1235	90.4%	Referent
Yes, on WIC now	637	82.6%	**0.50 (0.34, 0.75)**
Don't Know/Missing	3	--	--
CSHCN			
Adjusted Wald Test	--	--	p = 0.3364
None	1604	88.3%	Referent
1 or more ongoing need	253	85.2%	0.76 (0.44, 1.32)
Don't Know/Missing	18	--	--
Childcare arrangements			
Adjusted Wald Test	--	--	p = 0.4849
No	873	87.6%	Referent
Yes	960	87.9%	1.03 (0.70, 1.52)
Don't Know/Missing	42	--	--
Maternal Nativity			
Adjusted Wald Test	--	--	p = 0.0006
US born	1300	89.7%	Referent
Foreign born	575	82.1%	**0.53 (0.36, 0.76)**
Rural vs urban residence			
Adjusted Wald Test	--	--	p = 0.7531
Rural	408	88.4%	Referent
Urban	1467	87.6%	0.93 (0.57, 1.49)

[a] Unweighted number of respondents;

[b] Weighted percentage of those reporting always or usually having family meals, excluding those who did not respond or responded that they did not know

Confounding Assessment

Potential confounders of the relationship between family meal frequency and the primary predictors, race/ethnicity and poverty status, were assessed separately. Covariates included in the assessment were associated with both the outcome (family meals) and the primary predictor (either race/ethnicity or poverty status), and did not lie on the causal pathway. For each assessment, the univariate logistic regression model of family meals and each primary predictor was compared with the models including each additional covariate.

The univariate model of race/ethnicity on family meals was compared separately with five additional models including the covariates: maternal education, marital status, birth order, being on WIC, and maternal nativity. The associations of at least one race/ethnicity group and family meals changed by more than 10% when maternal education, marital status, or having a child on WIC was added to the univariate model.

The associations of one or more poverty level with family meals changed by 10% or more when maternal education, marital status, or maternal nativity were added to the univariate model. Birth order was not associated with poverty status; therefore it was not included in the analysis. Having a child currently on WIC was not evaluated as a confounder of poverty status as it is likely to lie on the causal pathway since these two variables are very closely related.

The results of the confounding assessment were incorporated into the multivariate model building process to account for any potential systematic error in the final predictive model. The changes observed with each potential confounder are summarized below in Table 6 (for race/ethnicity) and Table 7 (for poverty status).

Table 6. Confounding Assessment on Family Meals and Race/Ethnicity

Family Meals Model on Race/ Ethnicity + Potential Confounder	OR (95% CI)	p-value	% change OR
Simple Model: Race/Ethnicity			
NH White	Referent	--	--
Hispanic	0.41 (0.27, 0.61)	<0.001	Referent
NH Black	0.37 (0.23, 0.59)	<0.001	Referent
NH AI/AN	0.59 (0.36, 0.97)	0.038	Referent
NH Asian/PI	0.53 (0.34, 0.84)	0.007	Referent
Model 1: Race/Ethnicity + Education			
NH White	Referent	--	--
Hispanic	0.49 (0.31, 0.79)	0.003	**20%**
NH Black	0.38 (0.24, 0.62)	<0.001	3%
NH AI/AN	0.62 (0.37, 1.03)	0.064	5%
NH Asian/PI	0.52 (0.33, 0.83)	0.006	-2%
Model 2: Race/Ethnicity + Marital Status			
NH White	Referent	--	--
Hispanic	0.43 (0.29, 0.67)	<0.001	5%
NH Black	0.43 (0.26, 0.74)	0.002	**16%**
NH AI/AN	0.66 (0.39, 1.11)	0.114	**12%**
NH Asian/PI	0.51 (0.32, 0.81)	0.004	-4%
Model 3: Race/Ethnicity + Birth Order			
NH White	Referent	--	--
Hispanic	0.39 (0.26, 0.59)	<0.001	-5%
NH Black	0.36 (0.22, 0.59)	<0.001	-3%
NH AI/AN	0.59(0.36, 0.97)	0.037	0%
NH Asian/PI	0.52 (0.33, 0.83)	0.006	-2%
Model 4: Race/Ethnicity + Child on WIC			
NH White	Referent	--	--
Hispanic	0.50 (0.31, 0.80)	0.004	**22%**
NH Black	0.40 (0.24, 0.66)	<0.001	8%
NH AI/AN	0.63 (0.38, 1.06)	0.081	7%
NH Asian/PI	0.52 (0.33, 0.82)	0.005	-2%
Model 5: Race/Ethnicity + Maternal Nativity			
NH White	Referent	--	--
Hispanic	0.44 (0.28, 0.70)	0.001	7%
NH Black	0.37 (0.23, 0.60)	<0.001	0%
NH AI/AN	0.58 (0.35, 0.97)	0.036	-2%
NH Asian/PI	0.58 (0.35, 0.95)	0.03	9%

Table 7. Confounding Assessment on Family Meals and Poverty Status

Family Meals Model on Poverty Status + Potential Confounder	OR (95% CI)	p-value	% change OR
Simple Model: Poverty Status			
Less than 100% FPL	Referent	--	--
100% FPL or higher	2.27 (1.50, 3.44)	0.0001	Referent
Model 1: Poverty Status + Education			
Less than 100% FPL	Referent	--	--
100% FPL or higher	1.91 (1.15, 3.17)	0.0120	**-16%**
Model 2: Poverty Status + Marital Status			
Less than 100% FPL	Referent	--	--
100% FPL or higher	1.90 (1.17, 3.09)	0.0100	**-16%**
Model 3: Poverty Status + Maternal Nativity			
Less than 100% FPL	Referent	--	--
100% FPL or higher	2.01 (1.30, 3.09)	0.0016	**-11%**

#

Multivariate Analysis

A backwards model building approach was adopted during the initial stage of the multivariate analysis. All scientifically relevant variables described in Table 1 of the Methods section were considered as candidates for the full model. The primary predictors, race/ethnicity and poverty status, remained in the multivariate model regardless of the statistical criteria, since the specific aims of this study are to test these two particular associations. Of the additional covariates, household size, having a child with special health care needs, having childcare arrangements, and county type were excluded from further analysis since the univariate associations with family meals were not significant at an alpha level of 0.25. Although maternal age did not meet the 0.25 level of significance with family meals, it remained as a candidate for inclusion in the full model, since age is an important demographic variable routinely adjusted for in epidemiological research.

In the first iteration of the model building process, the primary predictors, race/ethnicity and poverty status, along with the remaining seven covariates, maternal age, education, marital status, birth order, employment status, maternal nativity, and whether the child was currently on WIC, were entered into the model. Although the overall model was significant, the goodness-of-fit test revealed a lack of fit. Each covariate was carefully re-examined for its adjusted association with family meals and potential multi-collinearity. Maternal nativity, education, and having a child on WIC demonstrated weak adjusted associations with family meals and had relatively high variation inflation factors (VIF). A sub-analysis of maternal nativity with race/ethnicity revealed a strong correlation, with over 90% of Whites being US born, and almost 80% of Hispanics and Asian/Pacific Islanders being foreign born. Similarly, maternal education and being on WIC was significantly associated with both race/ethnicity and poverty status, as expected. Based on these evaluations, the decision was made to remove the variables

education, nativity, and WIC from the model. The resulting multivariate model was characterized by an overall significance and a good model fit.

The full model was subsequently tested for an interaction between the two primary predictors, race/ethnicity and poverty status. The multiplicative term was entered into the multivariate model, however, the adjusted Wald test revealed that the overall term is not statistically significant at the 0.05 alpha level (p = 0.5721). Therefore, the interaction term was not considered for inclusion in the final model.

The final model developed for family meal frequency in this study includes race/ethnicity, poverty status, age, marital status, birth order, and maternal employment. Race/ethnicity remains the strongest demographic predictor of family meal frequency (p-value = 0.0044). Compared to NH Whites, Hispanics (adjusted OR (OR_a): 0.42; 95% Confidence interval (CI): 0.26, 0.70), NH Blacks (OR_a: 0.46; 95% CI: 0.27, 0.81), and NH Asians/Pacific Islanders (OR_a: 0.50; 95% CI: 0.31, 0.81), were about half as likely to report always or usually having family meals together. Poverty status is also significantly associated with family meals in the final model (p = 0.0415). That is, those living at 100% of the federal poverty level or higher more likely to report sharing family meals than those living below 100% of the federal poverty level (OR_a: 1.80; 95% CI: 1.02, 3.15).

Among the additional covariates included in the final model, only birth order remains significant (p = 0.0407). Mothers with more than one child were more likely to report always or usually having family meals (OR_a: 1.60; 95% CI: 1.02, 2.52). Maternal age, marital status, and maternal employment status were not significant in the final model, but were kept in the final model as they are often cited in literature as important characteristics related to family routines and health disparities. The results of the final model are presented below in Table 8.

Table 8. Multivariate analysis of family meal frequency by demographic characteristics

Characteristic	n[a]	Always-Usually Family Meals[b]	Unadjusted OR (95 % CI)	Adjusted OR (95% CI)
Total	1,875	87.8%	--	***F-test: p< 0.0001*** ***GOF: p = 0.9731***
Maternal Race/Ethnicity				
Adjusted Wald Test			p = 0.0001	p = 0.0044
NH White	823	90.6%	Referent	Referent
Hispanic	359	79.7%	**0.41 (0.27, 0.61)**	**0.42 (0.26, 0.70)**
NH Black	187	78.0%	**0.37 (0.23, 0.59)**	**0.46 (0.27, 0.81)**
NH AI/AN	217	85.1%	**0.59 (0.36, 0.97)**	0.62 (0.36, 1.08)
NH Asian/PI	283	83.7%	**0.53 (0.34, 0.84)**	**0.50 (0.31, 0.81)**
Poverty Status				
Adjusted Wald Test			p = 0.0001	p = 0.0415
Less than 100% FPL	504	81.2%	Referent	Referent
100% FPL or higher	1229	90.7%	**2.27 (1.50, 3.44)**	**1.80 (1.02, 3.15)**
Maternal Age				
Adjusted Wald Test			p = 0.6491	p = 0.4629
Less than 25 years	349	85.7%	Referent	Referent
25 to 34 years	991	88.5%	1.26 (0.75, 2.11)	0.77 (0.41, 1.45)
34 years or older	535	88.3%	1.25 (0.72, 2.21)	0.65 (0.32, 1.30)
Marital Status				
Adjusted Wald Test			0.0102	p = 0.2877
Married	1387	89.4%	Referent	Referent
Not Married	482	82.9%	**0.58 (0.38, 0.88)**	0.74 (0.42, 1.30)
Birth Order				
Adjusted Wald Test			p = 0.043	0.0407
First Child	843	85.4%	Referent	Referent
Second child or greater	1031	89.7%	**1.49 (1.01, 2.19)**	**1.60 (1.02, 2.52)**
Maternal Employment Status				
Adjusted Wald Test			p = 0.1782	p = 0.1256
Full time or part time	1033	86.5%	Referent	Referent
Unemployed	830	89.3%	1.31 (0.88, 1.94)	1.44 (0.90, 2.30)

[a] Unweighted number of respondents;
[b] Weighted percentage of those reporting always or usually having family meals, excluding those who did not respond or responded that they did not know

Sidebar: Selected Sub-analyses

A sub-analysis of selected variables in the final model was done in order to better understand the associations observed in the final multivariate model. Although maternal employment and marital status are important predictors of family routines as cited in the literature, these characteristics were not significant in final model presented in this study. In order to better understand the observed associations, and potentially identify forms of residual confounding, these variables were re-examined. These sub-analyses are described in detail below.

Maternal Employment

As described in the variable coding table above, maternal employment status was derived from the PRAMS-2 survey question, "Are you employed?" to which mothers responded with one of the following responses: "Yes, full time", "Yes, part time", "No, but I am looking for work", or "No, I am not looking for work." For the purposes of this study, the employment variable was dichotomized such that mothers who were unemployed were compared with those who were working either full time or part time. Although maternal employment status was not significant in the final model presented in this study, the categorizations were further explored to better understand how the constructs of employment status may influence family meal frequency.

When the maternal employment variable is analyzed with four categories as presented in the original survey, it is interesting to note the frequency distribution of always or usually having family meals. Mothers who are unemployed and are not looking for work most frequently reported having family meals (90.7%), while mothers who are not employed but looking for work have the lowest prevalence of always usually having family meals (84.8%). These trends may reflect the economic stability, financial stress, and the ability to maintain family routines.

Although the observed frequency distribution of the four maternal employment status categories with respect to family meal frequency appears informative, the full multivariate

model did not demonstrate a good fit upon model assessment. The categorizations were reconsidered and examined as three categories: (1) Employed full time or part time, (2) Not employed but looking for work, and (3) Not employed and not looking for work. The simple model of family meals with the three category design of maternal employment status revealed an unadjusted odds ratio close to significance, however, the multivariate model again revealed a lack of fit. Therefore, the simple dichotomized categorization of the maternal employment status variable was incorporated into the final multivariate model. These evaluations are summarized below in Table 9.

Table 9. Sub-analyses of Maternal Employment Status Categorizations

Maternal Employment Status (PRAMS-2)	n*	Always-Usually Family Meals	Unadjusted OR (95 % CI)	Adjusted OR (95% CI)
Total	1,875	87.8%	--	--
4 categories				
Adjusted Wald Test	--	--	p = 0.1839	p = 0.3470
Yes, full time	581	87.5%	Referent	Referent
Yes, part time	452	85.3%	0.83 (0.50, 1.38)	0.77 (0.44, 1.37)
No, but looking for work	215	84.8%	0.79 (0.43, 1.46)	1.17 (0.57, 2.40)
No, not looking for work	615	90.7%	1.39 (0.83, 2.33)	1.30 (0.70, 2.41)
Don't know/Missing	12	--	--	--
3 categories				
Adjusted Wald Test	--	--	p = 0.1158	p = 0.3109
Yes, full time or part time	1033	86.5%	Referent	Referent
No, but looking for work	215	84.8%	0.87 (0.50, 1.51)	1.33 (0.70, 2.54)
No, not looking for work	615	90.7%	1.52 (0.93, 2.40)	1.48 (0.87, 2.52)
Don't know/Missing	12	--	--	--
2 categories*				
Adjusted Wald Test	--	--	p = 0.1782	p = 0.1256
Yes, full time or part time	1033	86.5%	Referent	Referent
Not employed	830	89.3%	1.31 (0.88, 1.93)	1.44 (0.90, 2.30)
Don't know/Missing	12	--	--	--

[a] Unweighted number of respondents;
[b] Weighted percentage of those reporting always or usually having family meals, excluding those who did not respond or responded that they did not know
*Categorization used in the multivariate model

Marital Status

The marital status variable included in the final model for this study was derived from the PRAMS-2 survey, and was analyzed as a dichotomous variable. Although single parenthood and unstable home environments have been cited in the literature as important predictors of maintaining household routines and family meals, the marital status variable was not significant in the final multivariate model of this study. Marital status data was collected both in the PRAMS-2 survey and the birth certificate registry. The PRAMS-2 survey also inquired about the mothers' living situation by asking, "Are you living with….?" in which the mother could check all that apply among the following responses: "(1) Your spouse or partner, (2) Other adult (not spouse or partner), or (3) No other adults(s)". Each of these sources of partner-related data was assessed individually in an attempt to better understand the observed results and to examine alternative approaches to analyzing the relationship between marital status and family meal frequency (results summarized in Table 10 below).

The marital status data derived from the birth certificate registry may be analyzed in two different ways: either simply dichotomized as "Married" or "Not Married", or with further categorization of the "Not Married" group based on whether or not the father's name was entered into the birth certificate registry. The additional sub-group considering the father's presence during the birth of the child was incorporated for potential insight into the stability of the home and father's role in parenting. Compared to married mothers, those who are unmarried and have the father's name on the birth certificate were less likely to report always or usually having family meals. In contrast, unmarried mothers who did not have the father's name on the baby's birth certificate reported family meals frequency patterns similar to married couples (90.1%).

Analysis of the PRAMS-2 "Living with…" question also revealed interesting results with respect to family meal frequency. Mothers who reported living with a spouse or partner reported similar family meal frequency trends as those mothers not living with any other adult (88.4% and 87.2% reported always or usually having family meals, respectively). However, upon stratification by marital status, family meals are less frequently reported by unmarried mothers living with a partner (81.9%) or non-partner "other adult" (78.7%), compared with married mothers (89.4%). Interestingly, these results do not indicate that mothers living with "no other adult" (presumably single parents) necessarily report family meal frequencies that are different from married households (although contrary to findings in the literature).

These alternative analyses of marital status (summarized in Table 10 below) consistently reveal less frequent family meals among unmarried households in which the father may have a presence, and among unmarried mothers living with another adult who is not reported as a spouse or partner. Such households may comprise unstable relationships and struggle with managing the family environment. It is possible that an unmarried mother living with another adult not considered a spouse or partner may be challenged with social and financial distress, and face barriers in managing childcare and family routines.

Table 10. Alternate analyses of marital status, derived from the birth certificate & PRAMS-2

Characteristic	n[a]	Always-Usually Family Meals[b]	Unadjusted OR (95 % CI)	Adjusted OR (95% CI)
Total	1,875	87.8%	--	--
Marital Status (BC)				
Adjusted Wald Test	--	--	p = 0.001	p = 0.1182
Married	1350	90.1%	Referent	Referent
Not Married	525	82.4%	**0.51 (0.34, 0.77)**	0.70 (0.40, 1.11)
Marital Status (BC)				
Adjusted Wald Test	--	--	p = 0.0011	p = 0.0842
Married	1350	90.1%	Referent	Referent
Not married, Father's name on BC	402	80.1%	**0.44 (0.29, 0.68)**	0.60 (0.35, 1.01)
Not married, Father's name NOT on BC	123	90.1%	0.99 (0.49, 2.04)	1.22 (0.58, 2.60)
Marital Status (PRAMS-2)*				
Adjusted Wald Test	--	--	p = 0.010	p = 0.2877
Married	1387	89.4%	Referent	Referent
Not Married	482	82.9%	**0.58 (0.38, 0.88)**	0.74 (0.42, 1.30)
Missing	6	--	--	--
Living with…. (PRAMS-2)				
Adjusted Wald Test	--	--	p = 0.1244	p = 0.2735
Spouse or partner	1570	88.4%	Referent	Referent
Other adult	108	77.9%	**0.46 (0.22, 0.97)**	0.61 (0.25, 1.50)
No other adult	191	87.2%	0.89 (0.48, 1.68)	1.38 (0.67, 2.84)
Missing	6	--	--	--
Living with… & Marital Status (combined from PRAMS-2)				
Adjusted Wald Test			p = 0.0458	p = 0.3209
Married	1387	89.4%	Referent	Referent
Not Married & Lives with partner	203	81.9%	**0.54 (0.30, 0.95)**	0.64 (0.32, 1.31)
Not married & Lives with other adult	105	78.7%	**0.44 (0.20, 0.94)**	0.52 (0.21, 1.33)
Not married & Lives with no other adult	174	86.7%	0.77 (0.41, 1.48)	1.13 (0.53, 2.40)
Missing	6	--	--	--

[a] Unweighted number of respondents;

[b] Weighted percentage of those reporting always or usually having family meals, excluding those who did not respond or responded that they did not know

*Categorization used in the multivariate model

Family Meals in Married Households

Single parenthood has been well cited in the literature as a barrier to maintaining family routines, and the analysis of the various sources of marital status data in this study demonstrates similar trends. Although the multivariate regression model presented in this study indicates that race/ethnicity remains the strongest demographic predictor of always or usually having family meals, an alternative sub-analysis was considered to better understand how socioeconomic factors influence family routines among the sub-population of married households. The multivariate logistic regression model was re-visited to determine whether race/ethnicity or poverty status is a stronger predictor of family meals in the subset of mothers in the sample who reported being married.

The multivariate model run for the sub-population of married mothers shows that race/ethnicity remains a significant demographic predictor of family meals ($p = 0.0142$), however, this relationship is not as strong as the initial result observed in the full, unrestricted analysis (full model $p = 0.0044$; See Table 8). Poverty status demonstrates strong associative trends ($p = 0.0550$) among married mothers, with higher family meal frequency reported among those living at or above the federal poverty level.

Comment [DP12]: Could this be an issue of power-most OR's are similar.

Interestingly, maternal employment status is significantly associated with family meal frequency in the restricted analysis among married households ($p = 0.0367$), while the observed association in the full, unrestricted model was not statistically significant (full model $p = 0.1256$; See Table 7). Compared to married mothers who are working either full time or part time, unemployed married mothers are more likely to report always or usually having family meals together (OR_a: 1.87; 95% CI: 1.03, 3.40). This is likely because more than 80% of married mothers who are unemployed reported that they are not looking for work, possibly indicating financial stability. In contrast, more than half of unmarried mothers who are unemployed

reported that they are still looking for work. These results indicate that the combined influence of race/ethnicity, poverty status, maternal employment status, and marital status, plays an important role in family meal frequency, and, more generally, family organization and stability. The results of the model restricted to married households are summarized in Table 11 below.

Table 11. Family Meals Sub-analysis Restricted to Married Households

Characteristic	n[a]	Always-Usually Family Meals[b]	Unadjusted OR (95 % CI) (Married Only)	Adjusted OR (95% CI) (Married Only)
Total	1,387	89.4%	--	***F-test: p < 0.0008***
			--	***GOF: p = 0.0925***
Maternal Race/Ethnicity				
Adjusted Wald Test			p = 0.0010	p = 0.0142
NH White	662	91.5%	Referent	Referent
Hispanic	248	81.4%	**0.41 (0.25, 0.66)**	**0.43 (0.22, 0.84)**
NH Black	92	78.3%	**0.33 (0.18, 0.62)**	**0.34 (0.18, 0.66)**
NH AI/AN	120	88.8%	0.73 (0.36, 1.50)	0.68 (0.32, 1.45)
NH Asian/PI	259	85.7%	**0.55 (0.33, 0.93)**	**0.57 (0.34, 0.97)**
Missing	6	--	--	--
Poverty Status				
Adjusted Wald Test			p = 0.011	p = 0.0550
Less than 100% FPL	217	83.5%	Referent	Referent
100% FPL or higher	1082	91.2%	**2.05 (1.18, 3.58)**	2.03 (0.98, 4.20)
Don't Know/Missing	88	--	--	--
Maternal Age				
Adjusted Wald Test			p = 0.8256	p = 0.4258
Less than 25 years	148	90.7%	Referent	Referent
25 to 34 years	777	89.6%	0.87 (0.36, 2.10)	0.62 (0.20, 1.90)
34 years or older	462	88.4%	0.78 (0.32, 1.92)	0.49 (0.15, 1.59)
Missing	--	--	--	--
Birth Order				
Adjusted Wald Test			p = 0.1161	p = 0.1338
First Child	593	87.2%	Referent	Referent
Second child or greater	793	90.8%	1.46 (0.91, 2.33)	1.55 (0.87, 2.76)
Missing	1	--	--	**--**
Maternal Employment Status				
Adjusted Wald Test			p = 0.0609	p = 0.0367
Full time or part time	755	87.4%	Referent	Referent
Unemployed	622	91.7%	1.58 (0.98, 2.56)	**1.87 (1.03, 3.40)**
Missing	10	--	--	**--**

[a] Unweighted number of married respondents;
[b] Weighted percentage of married mothers reporting always or usually having family meals, excluding those who did not respond or responded that they did not know

Discussion

Summary of Findings

This study reports the prevalence of family meal frequency among families with two-year old children in Oregon, and investigates the role of race/ethnicity and poverty status, along with several other socioeconomic characteristics, on sharing family meals together. Among the cohort of women who had live births in 2004 and 2005, 87.5% of those mothers of two-year old children reported always or usually sharing family meals together. A multivariate analysis revealed significant associations between family meals and race/ethnicity, poverty status, and birth order. Further sub-analyses of employment status and marital status demonstrated weaker associations with family meals among those with unstable home environments and financial stress.

Comparison with Previous Findings

Family Meals Prevalence

In this study, 87.8% Oregon mothers reported "always or usually" having family meals together. Since this analysis is restricted to families with two-year old children, it was expected that the prevalence estimate would be relatively high. Although only a few studies have examined family meal frequency among children as young as two years of age, most studies report a decrease in family meal frequency with increasing age groups [34]. On average, more than half the families surveyed nationally report sharing meals 3 to 5 times a week [35]. The Child Trends analysis of the 2007 National Survey of Children's Health reported national and state data on frequency of family meals. Among Oregon families with young children from birth to 5 years of age, 66.1% shared meals 6-7 per week, 19.7% shared meals 4-5 days per week, while 14.2% shared meals 3 or fewer days per week [36]. In a cross-sectional study among 3 to 5 year old

Comment [DP13]: A lot more than ½? , little more than ½?

children, 57% of families reported eating together 7 days a week [37]. In another study examining the prevalence of household routines among 4 year old children from the Early Childhood Longitudinal Study, Birth Cohort, 56.6% of mothers reported having a family dinner 6 or 7 evenings per week [15].

Most other studies measuring family meals frequency are focused on families with adolescents, and generally report less frequent meals, as compared with families with younger children. Child Trends analyses report only 39.6% of adolescents sharing family meals 6-7 days per week, 29.7% sharing meals 4-5 days per week, and 30.7% sharing meals 3 or fewer days per week [34]. In a nationally representative survey, the Center on Addiction and Substance Abuse at Columbia University found that 58% of teens report having dinner with their families at least five times a week [38].

The 87.8% prevalence of family meal frequency reported in this study is higher than most other reports. Compared with other published studies on family meals, this study cohort represents families with children of the youngest age group. As younger children are dependent on the family for feeding, a higher rate of family meal frequency was expected. However, it is important to note that the prevalence estimates may not be comparable across all studies since there is variability in the definition of family meals and frequency measurement. Many studies have measured family meal frequency by specific number of days per week, while other studies are less defined. Since the survey question in this study asked whether families ate together "always, usually, sometimes, or never", it is possible that individual interpretation of this question varies widely across the study sample, representing potential information bias (See Strengths and Limitations).

Race/Ethnicity

In this analysis, non-Hispanic Blacks, Hispanics, and non-Hispanic Asians/Pacific Islanders were significantly less likely to report always or usually having family meals together, compared with non-Hispanic Whites. Several other studies have identified racial and ethnic disparities with respect to family meals. In a nationwide sample of parents of young children age 35 months to 4 years, NH Blacks (OR_a: 4.4; 95% CI: 1.9, 10.1) and Hispanics (OR_a: 3.4; 95% CI: 1.3, 8.9) had greater odds of never eating lunch or dinner with their family, compared to NH Whites [22]. In a study among 4 year old children, NH Blacks and Hispanics had lower odds of reporting eating dinner as a family more than 5 times per week, compared with NH Whites [15]. In a study examining trends in family meal frequency over a 10 year period, the mean number of family meal per week reported by Asian adolescents were shown to have significantly decreased [39].

Several other studies on family meal frequency have shown contrasting trends with respect to racial/ethnic disparities. A Child Trends analysis reports that Hispanic adolescents (49%) are more likely than NH White (36%) and NH Black (36%) adolescents to eat meals 6 to 7 days a week together with their families [34]. In a population based cross sectional study among adolescents, Asian American youth reported the highest mean frequency of family meals in a week (5.3) [40].

These contrasting trends are notable, since it is likely that these variations are attributable to the diverse acculturation experiences among different minority populations. For example, the Project EAT survey, based in the Minneapolis/St. Paul metropolitan area of Minnesota, sampled adolescents from diverse racial/ethnic and socioeconomic backgrounds [39]. Their analysis revealed decreasing family meal frequencies specifically among the Asian adolescents in the study sample. However, the authors caution against extrapolating these findings to other Asian populations, especially since a majority of the Asian adolescents in their study population were

of one particular Asian ethnic group (Hmong). Their study findings on the Asian population specifically reflect the experiences of the Hmong community, as it is likely that this subpopulation in this area share similar socioeconomic characteristics. As such, it is important to consider the specific backgrounds of the broadly categorized racial/ethnic groups across different geographic regions in order to gain a better understanding of the observed findings.

Comment [DP14]: Im not sure what you mean here-are you suggesting that the Asian population you studied is similar to the Hmong? If so, did you want to say—and it is likely (rather than as it is likely)? It is really the phrase beginning with 'as it is likely' that I'm having trouble understanding (perhaps just dense).

Nativity

In this study, differences in family meal frequency by maternal nativity were examined. In the univariate analysis, foreign born mothers had lower odds of always or usually having family meals, compared with U.S. born mothers (unadjusted OR: 0.53; 95% CI: 0.36, 0.76; see Table 5 above). Although maternal nativity was significant in the univariate analysis, it was excluded from the final multivariate model since it was too closely related to race/ethnicity. However, it is interesting to note that 78% of the Hispanic mothers in this study sample were foreign born, and over 90% of those foreign born Hispanic mothers were from Mexico. The trend among the Hispanic group in this study population is in contrast to the findings by the national Child Trends findings (cited above). Considering the unique profiles and shared contextual factors of the Hispanic population in Oregon may provide insight into the disparities observed.

Other findings in the literature regarding maternal nativity and family meals are primarily focused on families with adolescents. A cross sectional study among parents of adolescent girls in Minnesota found that parents of foreign born girls reported having more frequent meals [41]. A Child Trends analysis reports that foreign born adolescents are more likely than native born adolescents with foreign born parents to eat family meals together regularly [34]. This is especially interesting in comparison with the current thesis analysis, since this study reports lower family meal frequency among foreign born mothers with native born children. These trends appear to highlight the importance of supporting healthy acculturation among immigrant families with

U.S. born young children and adolescents. It is possible that the low family meal frequencies reported among immigrant families may be attributable to how one's original cultural values and eating patterns evolve in U.S. society [39]. Considered a proxy for acculturation, nativity may indicate how immigrant cultural patterns adapt in new environments, but may also indicate limited accessibility to resources, and changes in education and economic opportunities [42]. Exploring these factors may better explain the heterogeneities observed within racial/ethnic groups nationwide.

The racial/ethnic disparities in family meal frequency observed in this study may imply differences in cultural practice and value. However, race and ethnicity are social constructs that are characterized by constantly evolving concepts, including genetics, physiology, culture, socioeconomic status, and environment [43]. It is important to be cautious about explanations based on race/ethnicity and culture. There is a wide range of subcategories within each racial/ethnic group, each with unique experiences and social practices that may define behavioral patterns. For example, the construct of race in the U.S. is linked with a past history of disadvantage and discrimination, while the construct of culture may represent adaptation to limited options or the prevailing economic conditions [43].

Family meals represent a routine social practice, therefore it is important to connect social context with family feeding practices. Theoretical approaches to understanding population eating patterns emphasize the consideration of "social relations", as comprised of social structures such as class, race, and gender [2]. The unique eating patterns among different groups of people may reflect and be influenced by the configurations of social relations. As such, it is important to explore the combination of these social structures in order to better understand the strong racial/ethnic disparities observed in this study. The discussion below explores the relationship of family meal patterns with poverty status, employment, and family structure.

Socioeconomic Disparities

There are racial/ethnic differences in wealth across levels of income and education, and it is the combination of race/ethnicity and economic resources that define childhood experience of socioeconomic status [43]. In addition to race/ethnicity, both poverty status and maternal education were significantly associated with family meal frequency in the univariate models in this study. Consistent trends were observed for both characteristics, with increasing family meal frequency among those with higher income and educational attainment (See Table 4 & 5). Since maternal education was too closely related to poverty status, it was excluded from the final multivariate model to prevent multi-collinearity. Poverty status remained significant in the adjusted model. Compared with mothers who reported living below the poverty line, those living at or above 100% of the federal poverty level were about twice as likely to report always or usually having family meals together (See Table 8).

Strong associations between family meal frequency and socioeconomic status have been observed in several studies. Decreasing family meal frequency has been reported among youth from low socioeconomic backgrounds, determined by parental education level and economic stress (as measured by parental employment status, and family eligibility for public assistance, and free or reduced-cost school meals) [39]. In a cross-sectional study among children between 3 and 10 years of age, those with the lowest family incomes were observed to have the worst feeding practices [44]. Conversely, Child Trends analyses reports that adolescents living below the poverty level are more likely to eat meals six or seven days (51%) a week together as a family than those living between 100% and 200% of the federal poverty level (42%), and those above 200% of the federal poverty level (36%) [34]. Child Trends also reported similar trends with parental education. That is, that children and adolescents whose parents have less than a high

school degree are more likely to eat meals six or seven days a week, than those with parents who have more education [34].

Many studies have identified socioeconomic disparities in family meal frequency, food choice patterns, and nutrition [2, 39, 45]. Decreases in family meal frequency were observed among populations most vulnerable to poor nutrition and other developmental risk factors [39]. Studies examining how social structure is linked with food and health have demonstrated that meal patterns and lay knowledge of food/health involved in decision making around feeding children differs among social classes [2].

Maternal Employment

Exploring socioeconomic factors associated with family meals revealed much literature on the recent economic and employments trends in the United States. In this thesis analysis, the relationship between maternal employment status and family meal frequency was evaluated (See Table 9). Although employment status was not significant in the final multivariate model, it was included nonetheless, since it is an important variable that is commonly cited in the literature. Among the families sampled in this Oregon population, mothers who were unemployed but still looking for work, employed part-time, or employed full-time, reported less frequent family meals than mothers who were unemployed and not looking for work. Interestingly, a population based cross-sectional study among adolescents found higher family meal frequency associated with mothers who were either not employed or employed part-time [40]. It is possible that this trend reflects the challenges of maintaining routine family meals among less financially stable households, and/or households with mothers who face time constraints.

Many other studies have also demonstrated associations between family structure, maternal employment, and family meals. The analysis of two nationally representative time diary

collections (National Survey of Parents, and Family Interaction, Social Capital and Time Use Study) demonstrated that employed mothers eat meals less often with children, compared with their non-employed counterparts [46]. In a cross sectional analysis among parents and 11 year old children, less healthy eating was associated with working (part- or full-time) mothers, compared with full-time homemakers [45]. Analyses from the Study of Early Child Care and Youth Development (by the National Institutes of Child Health and Human Development) demonstrated positive? associations between maternal employment and children's body mass index (BMI), as well as implications of mothers' nonstandard work schedules (working evenings/nights, weekends, or an irregular shift) [47].

Comment [DP15]: What implications do you mean here?

The concept of "time poverty" may address the observed family meal patterns and eating trends associated with socioeconomic status, poverty, and employment. Since family eating habits have shifted with the growth of the service economy and increasing women in the labor force, lower-income households have been faced with more difficult choices[43]. It is understood from the socio- ecological perspective that behavior can be affected by individual and interpersonal characteristics, as well as factors at the organizational, community, and policy levels. Family behaviors can be affected by stressors both inside and outside of the household, including factors associated with employment. A study measuring "work-to-family spillover" scores examines the effect of participation in work on family roles, as it contributes to negative coping behaviors upon integrate work and family demands [48]. Overtime or part-time work hours (compared with full-time work) was associated with high work-to-family spillover scores. The study highlights factors such as job strain, shift work, multiple jobs as limiting workers' ability to participate in family meals. The combination of conflicting work and family roles have been linked with poor health outcomes, and fewer meals prepared and eaten at home[48].

Comment [DP16]: ?

Marital Status and Family Meals

This thesis analysis also considered the role of marital status on family meal frequency. Although marital status was not significant in the final model developed in this study (See Table 8), it was kept in the model as it is an important family characteristic that influences the home environment. Many studies have illustrated the challenges faced in single-parent households in maintaining household routines. Family instability, as defined as children's exposure to repeated changes in parents' union status, has negative consequences on youth behavior and academic performance [49]. Compared to two-parent families, single parent families have been shown to be less likely to have daily routines for meals for their young children [18]. A focus group study among single mothers with young children 3 to 5 years old explored the experiences and perspectives related to establishing and maintaining daily household routines [18]. Time constraints, fatigue, and lack of family support are a few specific challenges women faced in their efforts to accomplish routines. Television viewing was described as interfering with sharing meals together. The absence of predictable household routines, such as family meals, combined with family instability, is characteristic of a disorganized home environment, which places children at risk for further physical problems. It is possible that such underlying conditions of an unmarried household may explain the observed trends in family meal frequency.

The sub-analysis of the marital status variable from the various data sources utilized in this study illustrates the trends of family meal frequency and family instability (See Table 10). In general, married mothers reported more family meals than unmarried mothers. According to the sub-analysis of unmarried mothers from the birth certificate files, family meal frequency tends to be to lower among unmarried mothers who reported the father's name on the birth certificate, when compared with their unmarried counterparts who did not report the father's

name. In another sub-analysis of the PRAMS-2 survey question asking about with whom the mother is living, unmarried mothers who reported living with a partner or other adult had lower family meal frequency compared to married mothers. These trends seem to indicate that the role of marital status on family meal frequency is probably explained by the quality of household organization as determined by family structure and function.

These observed trends are especially interesting upon review of the theoretical perspectives of "family structure" and "family functioning". The family structure perspective states that two-parent households facilitate a better environment for youth well-being compared with single-parent homes [50]. However, the family functioning perspective suggests that children may be better off in a cohesive single-parent home than in a conflictive two-parent home [50]. In the current study sample, unmarried mothers living with no other adult reported similar rates of family meals as married mothers. These sub-samples may be representative of more "cohesive" households with higher quality of family functioning, as compared with those of unmarried mothers living with a partner or other adult.

In the restricted analysis of family meal frequency among married households only, employment status was found to be a stronger predictor of family meals, when compared with the full model (See Table 11 & Table 8). This finding appears consistent with previous studies that cite maternal employment as significantly impacting the management of daily routines in dual-parent households. Higher levels of "work-life stress", related to constraints faced at home because of job-related demands, have been associated with lower frequency of family meals among dual-parent households with employed mothers [51]. In the current economic climate, parents may experience greater pressures to maintain employment and devote more time to work. The subsequent stress of balancing the needs of work and home may directly influence the frequency of sharing family meals.

Understanding the Disparities

The socioeconomic disparities observed in this study highlight the diverse constraints that challenge the maintenance of routine family meals. The barriers faced by families of lower socioeconomic status may related to work and time stressors such as having multiple part-time jobs, or changes in workplace demands that allow for less flexibility in time schedules [6, 48]. It is possible that specific housing conditions may also influence family routines, such as having smaller living spaces that are not conducive to shared eating [39]. It would be important to assess the employment and living conditions of the Oregon study population to better understand the challenges experienced by local families of minority racial/ethnic backgrounds and/or lower socioeconomic status.

Comment [DP17]: ?

Strengths and Limitations

An important strength of this study is the complex sampling design and weighting technique utilized for the PRAMS and PRAMS-2 survey data. The oversampling and weighting technique creates a sample that is representative of the Oregon population of recent mothers. Oversampling for minority racial/ethnic groups allows for analysis of within Oregon sub-populations with sufficient statistical power. The dataset is linked to birth certificate files, which provides additional family characteristics and demographic data that are useful especially for investigating socioeconomic disparities.

Limitations of this study are related to the design of the family meals question, and the definition of the outcome variable, family meal frequency. The survey question measuring family meals asks, "Does your family eat meals together?" in which mothers could answer either (1) Always, (2) Usually, (3) Sometimes, or (4) Never. Some studies have measured frequency very precisely as number of days or meals per week, while others have measured frequency with more vague responses, such as "some days" or "most days" [5]. In comparison to other studies in the literature, the PRAMS-2 measurement specificity of family meal frequency is moderate in precision.

As a self-reported measure, the responses are subject to interpretation by each respondent, but it is likely that the bias is uniform throughout the sample of mothers. The study sample is restricted to families with two-year children who are likely to be accompanied by a family during meals, creating a bias towards reporting more frequent family meals. Therefore it is likely that the family meals prevalence reported in this study is an overestimate. However, the model developed in this study considers birth order to address potential distortions of the family meal frequency associations that could be attributable to having older children and bigger families.

Comment [DP18]: of the family meal prevalence in Oregon families generally?

The survey question does not specifically define a family meal, with respect to attending members of the "family" sharing the meal, the environment or setting of the meal, or external factors such as simultaneously ongoing activities during the meal. Some studies have qualified family meals if "other family members, some family members, or one of the parents" sat at the table together to share a meal [5]. It is possible that extended family members living with and/or providing care for the child are underreported if they are also actively involved with preparing and sharing the family meals. Whether family meals are prepared and/or consumed in or outside the home is not clearly defined, and may increase measurement variability. Some family meal surveys in the literature adjusted for ongoing activities such as television viewing during the meal, since it could disrupt communication between family members. It is important to note that this study does not account for such environmental factors that could counteract the potential protective effects of sharing the family meal.

Public Health Implications

Although this study is restricted to families with two-year old children, early childhood experiences related to socioeconomic position can have a cumulative and generational effect on health status throughout the life cycle. Disparities in home routines such as family meals have the potential to impede healthy development and future school success. This study identifies racial/ethnic and income disparities with family meal frequency and can inform strategic interventions to reduce or eliminate such disparities. The study result offers the opportunity to promote family meals through campaigns targeting at-risk populations. Previous educational programs, such as "Mealtime is Family Time" have been well-received by low income audiences [52]. Primary care providers can implement routine, brief but focused discussions on the risky and protective factors associated with family meals. Providers may employ motivational interviewing techniques to engage parents and understand barriers faced by individual families. The discussion could include environmental factors such as television viewing during meal, and describe national family meal trends. Since family home routines can be established early in life, it is important to counsel parents of toddlers about family meals and promote self-regulation. As family meals represent a relatively simple intervention for families to adopt, pediatricians could easily make recommendations during well child care visits.

It would be important to design realistic interventions and focus messages to address the needs of families undergoing time and budget constraints. Community based programs could focus messages to families most vulnerable, and plan educational outlets such as classes that provide time/budget management and meal preparation skills [39]. Collaborative efforts between families, community and state leaders, and pediatric health care providers can enhance the effectiveness of targeted interventions.

Future Research

Future research on family meals should be assessed more comprehensively with multiple questions about the mealtime environment. The comprehensive approach should measure the quality of the meal and environment, and may measure other characteristics of the family meal, including the length of the meal, the nutritional quality of the meal, and whether television viewing is occurring during the meal. Other characteristics of the meal including the location (at or away from the home, at a table, etc) and the relationship with other participating members of the meal are also important to measure in future research to evaluate the quality and protectiveness of routine meals.

Future survey questions measuring family meals should address the lack of specificity in measuring? the frequency of family meals through direct observations or validated questionnaires. Having more precise measurements of family meal frequency could improve the accuracy of findings with respect to disparities as well as improve our understanding of the protective nature of family meals.

Comment [DP19]: Can't do this with survey questions, though. Or am I minunderstanding this sentence

This study identified racial/ethnic disparities in the Oregon cohort of mothers, but it will be important to further explore disparities across diverse immigrant populations, as well as across various geographic regions. Exploring the trends of socioeconomic disparities may help elucidate particular barriers and challenges experienced by diverse at-risk populations.

Future research may also examine the evolution of family meals over time. It would be interesting to examine the types of food served, the family members who are eating together, and specific parameters of the meal itself, such as length and conversations during the meal. Evaluating the specific characteristics and barriers of modern family meals will help inform interventions to reach the vulnerable subpopulations struggling with maintaining home routines.

References

1. Anderson SE, Must A, Curtin C, Bandini LG. Meals in our household: Reliability and initial validation of a questionnaire to assess child mealtime behaviors and family mealtime environments. J Acad Nutr Diet 2012 Feb;112(2):276-84.

2. Delormier T, Frohlich KL, Potvin L. Food and eating as social practice--understanding eating patterns as social phenomena and implications for public health. Sociol Health Illn 2009 Mar;31(2):215-28.

3. O'Connell ML, Henderson KE, Luedicke J, Schwartz MB. Repeated exposure in a natural setting: A preschool intervention to increase vegetable consumption. J Acad Nutr Diet 2012 Feb;112(2):230-4.

4. Meier A, Musick K. Is the family dinner overrated? The New York Times. 2012 June 29, 2012;.

5. Valdes J, Rodriguez-Artalejo F, Aguilar L, Jaen-Casquero MB, Royo-Bordonada MA. Frequency of family meals and childhood overweight: A systematic review. Pediatr Obes 2013 Feb;8(1):e1-e13.

6. Fulkerson JA, Kubik MY, Rydell S, Boutelle KN, Garwick A, Story M, Neumark-Sztainer D, Dudovitz B. Focus groups with working parents of school-aged children: What's needed to improve family meals? J Nutr Educ Behav 2011 May-Jun;43(3):189-93.

7. Fiese BH, Foley KP, Spagnola M. Routine and ritual elements in family mealtimes: Contexts for child well-being and family identity. New Dir Child Adolesc Dev 2006 Spring;(111)(111):67-89.

8. Kral TV, Rauh EM. Eating behaviors of children in the context of their family environment. Physiol Behav 2010 Jul 14;100(5):567-73.

9. Berge JM, Wall M, Larson N, Loth KA, Neumark-Sztainer D. Family functioning: Associations with weight status, eating behaviors, and physical activity in adolescents. J Adolesc Health 2012 Aug 29.

10. Fulkerson JA, Kubik MY, Story M, Lytle L, Arcan C. Are there nutritional and other benefits associated with family meals among at-risk youth? J Adolesc Health 2009 Oct;45(4):389-95.

11. Farmer S, Hanratty B. The relationship between subjective wellbeing, low income and substance use among schoolchildren in the north west of england: A cross-sectional study. J Public Health (Oxf) 2012 Dec;34(4):512-22.

12. Neumark-Sztainer D, Wall M, Story M, Sherwood NE. Five-year longitudinal predictive factors for disordered eating in a population-based sample of overweight adolescents: Implications for prevention and treatment. Int J Eat Disord 2009 Nov;42(7):664-72.

13. Neumark-Sztainer D, Wall M, Story M, Fulkerson JA. Are family meal patterns associated with disordered eating behaviors among adolescents? J Adolesc Health 2004 Nov;35(5):350-9.

14. Ray C, Roos E. Family characteristics predicting favourable changes in 10 and 11-year-old children's lifestyle-related health behaviours during an 18-month follow-up. Appetite 2011 Oct 25.

15. Anderson SE, Whitaker RC. Household routines and obesity in US preschool-aged children. Pediatrics 2010 Mar;125(3):420-8.

16. Hughes SO, Power TG, Papaioannou MA, Cross MB, Nicklas TA, Hall SK, Shewchuk RM. Emotional climate, feeding practices, and feeding styles: An observational analysis of the dinner meal in head start families. Int J Behav Nutr Phys Act 2011 Jun 10;8:60.

17. Quick BL, Fiese BH, Anderson B, Koester BD, Marlin DW. A formative evaluation of shared family mealtime for parents of toddlers and young children. Health Commun 2011 Oct;26(7):656-66.

18. Koulouglioti C, Cole R, Moskow M. Single mothers' views of young children's everyday routines: A focus group study. J Community Health Nurs 2011 Jul;28(3):144-55.

19. Rollins BY, Belue RZ, Francis LA. The beneficial effect of family meals on obesity differs by race, sex, and household education: The national survey of children's health, 2003-2004. J Am Diet Assoc 2010 Sep;110(9):1335-9.

20. Babajafari S, Marks GC, Mamun AA, O'Callaghan MJ, Najman JM. Family food behaviours and adolescents' overweight status: A mother-offspring link study. Iran Red Crescent Med J 2011 Nov;13(11):783-94.

21. Anderson SE, Whitaker RC. Prevalence of obesity among US preschool children in different racial and ethnic groups. Arch Pediatr Adolesc Med 2009 Apr;163(4):344-8.

22. Flores G, Tomany-Korman SC, Olson L. Does disadvantage start at home? racial and ethnic disparities in health-related early childhood home routines and safety practices. Arch Pediatr Adolesc Med 2005 Feb;159(2):158-65.

23. Birch LL, Davison KK. Family environmental factors influencing the developing behavioral controls of food intake and childhood overweight. Pediatr Clin North Am 2001 Aug;48(4):893-907.

24. Department of Human Services, Health Services. Oregon PRAMS first year report, 1998-99. Portland, OR: Office of Family Health; 2000.

25. Department of Health and Human Services. Annual update of the HHS poverty guidelines. Federal Register January 24, 2006;71(15):3848-3849.

26. Department of Health and Human Services. Annual update of the HHS poverty guidelines. Federal Register 2007;72(15):3147-3148.

27. Department of Health and Human Services. Annual update of the HHS poverty guidelines. Federal Register 2008;73(15):3971-3971.

28. Faul F, Erdfelder E, Buchner A, Lang A-. Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. Behavior Research Methods 2009;41:1149-1160.

29. Archer KJ, Lemeshow S. Goodness-of-fit test for a logistic regression model fitted using survey sample data. Stata Journal 2006;6(1):97-105.

30. Bandiera FC, Pereira DB, Arif AA, Dodge B, Asal N. Race/ethnicity, income, chronic asthma, and mental health: A cross-sectional study using the behavioral risk factor surveillance system. Psychosom Med 2008 Jan;70(1):77-84.

31. Blum RW, Beuhring T, Shew ML, Bearinger LH, Sieving RE, Resnick MD. The effects of race/ethnicity, income, and family structure on adolescent risk behaviors. Am J Public Health 2000 Dec;90(12):1879-84.

32. Thorpe RJ,Jr, Kasper JD, Szanton SL, Frick KD, Fried LP, Simonsick EM. Relationship of race and poverty to lower extremity function and decline: Findings from the women's health and aging study. Soc Sci Med 2008 Feb;66(4):811-21.

33. Crouch JL, Hanson RF, Saunders BE, Kilpatrick DG, Resnick HS. Income, race/ethnicity, and exposure to violence in youth: Results from the national survey of adolescents. J Community Psychol 2000;28(6):625-41.

34. Child Trends Data Bank. Family meals: Indicators on children and youth. National Survey of Children's Health; 2012.

35. Fiese BH, Scwartz M. Reclaiming the family table: Mealtimes and child health and wellbeing. Social Policy Report 2008;XXII(IV):3-18.

36. Murphey D. The more we eat together: State data on frequency of family meals. Child Trends; 2012.

37. Wyse R, Campbell E, Nathan N, Wolfenden L. Associations between characteristics of the home food environment and fruit and vegetable intake in preschool children: A cross-sectional study. BMC Public Health 2011 Dec 16;11:938,2458-11-938.

38. CASA. The importance of family dinners VII. The National Center on Addiction and Substance Abuse at Columbia University; 2011.

39. Neumark-Sztainer D, Wall M, Fulkerson JA, Larson N. Changes in the frequency of family meals from 1999 to 2010 in the homes of adolescents: Trends by sociodemographic characteristics. J Adolesc Health 2013 Feb;52(2):201-6.

40. Neumark-Sztainer D, Hannan PJ, Story M, Croll J, Perry C. Family meal patterns: Associations with sociodemographic characteristics and improved dietary intake among adolescents. J Am Diet Assoc 2003 Mar;103(3):317-22.

41. Bauer KW, Neumark-Sztainer D, Fulkerson JA, Story M. Adolescent girls' weight-related family environments, minnesota. Prev Chronic Dis 2011 May;8(3):A68.

42. Sharkey JR, Johnson CM, Dean WR. Nativity is associated with sugar-sweetened beverage and fast-food meal consumption among mexican-origin women in texas border colonias. Nutr J 2011 Sep 30;10:101,2891-10-101.

43. Caprio S, Daniels SR, Drewnowski A, Kaufman FR, Palinkas LA, Rosenbloom AL, Schwimmer JB. Influence of race, ethnicity, and culture on childhood obesity: Implications for prevention and treatment: A consensus statement of shaping america's health and the obesity society. Diabetes Care 2008 Nov;31(11):2211-21.

44. Hendy HM, Williams KE. Mother's feeding practices for children 3-10 years of age and their associations with child demographics. Appetite 2012 Apr;58(2):710-6.

45. Sweeting H, West P. Dietary habits and children's family lives. J Hum Nutr Diet 2005 Apr;18(2):93-7.

46. Bianchi SM. “What gives” when mothers are employed? parental time allocation in dual earner and single earner two-parent families. Department of Sociology and Maryland Population Research Center (MPRC); 2006.

47. Morrissey TW, Dunifon RE, Kalil A. Maternal employment, work schedules, and children's body mass index. Child Dev 2011 Jan-Feb;82(1):66-81.

48. Devine CM, Stoddard AM, Barbeau EM, Naishadham D, Sorensen G. Work-to-family spillover and fruit and vegetable consumption among construction laborers. Am J Health Promot 2007 Jan-Feb;21(3):175-82.

49. Fomby P, Mollborn S, Sennott CA. Race/Ethnic differences in effects of family instability on adolescents' risk behavior. J Marriage Fam 2010 Apr;72(2):234-53.

50. Mandara J, Murray CB. Effects of parental marital status, income, and family functioning on african american adolescent self-esteem. J Fam Psychol 2000 Sep;14(3):475-90.

51. Bauer KW, Hearst MO, Escoto K, Berge JM, Neumark-Sztainer D. Parental employment and work-family stress: Associations with family food environments. Soc Sci Med 2012 Aug;75(3):496-504.

52. Lohse B, Rifkin R, Arnold K, Least C. A digital program informs low-income caregivers of preschool-age children about family meals. J Nutr Educ Behav 2012 May-Jun;44(3):256-61.