RELATIONSHIP OF MEAL PLANNERS' NUTRITION ATTITUDES AND KNOWLEDGE TO THEIR FAT AND FIBER INTAKES AND THAT OF THEIR PRESCHOOL-AGED CHILDREN

by

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(ABSTRACT)

The relationship of meal planners' nutrition attitudes and knowledge to their fat and fiber intakes and to the intakes of 2-5 year-old children in their households was examined using data from USDA's 1989-91 Continuing Survey of Food Intakes by Individuals (CSFII) and corresponding Diet and Health Knowledge Survey (DHKS). Selected households (N=478) provided 24-hour diet recalls. Data on meal planners' attitudes and knowledge were used to create variables that represented the constructs of a modified Health Belief Model. The relationships of these variables to percent of calories from fat and to fiber density of foods consumed at home and of total food consumed by meal planners and children were analyzed using multiple regression.

Several of the attitude-knowledge variables were significantly related to meal planners' fat and fiber intakes. The variables did not have a significantly different relationship with children's intakes, except for taste which was inversely related with children's fiber intakes. Although the relationship of meal planners' attitudes and knowledge was not significantly different with children's intakes than with meal planners' intakes, the constructs were not significantly related either, except for knowledge which was significantly related to less at-home fat consumption by children. Results indicate weak support for the gatekeeper theory; meal planners' nutrition knowledge and attitudes appear more operational in their diets than in the diets of their young children.

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CHAPTER I

INTRODUCTION

The focus of nutrition education efforts in the United States has shifted from preventing nutrient deficiency diseases to reducing diet-related chronic disease risks. The pool of scientific evidence linking diet and disease has been growing and dietary recommendations have been developed by a variety of government and private organizations to help Americans modify their diets, develop more healthful food habits and reduce the risk for chronic disease.

The Dietary Guidelines for Americans, jointly published by the US Department of Health and Human Services and the US Department of Agriculture (USDA and HHS, 1990), outlines seven recommendations aimed at reducing risk for disease. The guidelines are generally intended for healthy Americans over the age of two. Teaching children to eat a diet based on the Dietary Guidelines should produce healthier adults for the future without jeopardizing childhood health.

Many pediatric health care professionals, however, are wary that imposing the dietary guidelines on children will restrict fat intake and affect growth and development (American Academy of Pediatrics, 1986). Although pediatric health professionals are concerned about possible negative effects of a fat-moderated diet for children, the prevalence

of obesity among children has grown with a 39-54% increase in the last two decades (Dietz, 1986). Studies suggest that 25-30% of children 6-17 years of age may be obese (Dietz, 1986), while 13% of preschoolers may be obese (Knittle et al., 1981). Obesity can be attributed to energy intakes that exceed expenditure: while exercise and nutritious habits are key to balancing weight, too much fat in the diet can also play a major role.

Fiber is another dietary component of current emphasis. American consumption of crude fiber dropped from 6 g/day in 1909-1913 to 4 g/day in 1965 (McNutt, 1976). Newer techniques used to measure dietary fiber include analysis of other dietary fiber components in addition to crude fiber, so the fiber intake values cited by McNutt will appear much lower than more recent citations. For example, women in the 1985 Continuing Survey of Food Intake by Individuals (CSFII) consumed about 9 grams of dietary fiber a day, men about 15 grams (USDA, 1985abc). But the values still fall short of current recommendations suggesting consumption of 20-35 grams of dietary fiber a day (National Dairy Council, 1990).

One reason for low fiber consumption may be that many Americans, including children, dislike vegetables. Caliendo et al. (1977) found 40% of the surveyed preschoolers expressed a dislike for vegetables. Americans also seem to prefer simple carbohydrates which may replace and hence

reduce consumption of complex carbohydrates and, as a result, further decrease fiber intake. Again, children included: older preschool children in the NHANES II survey were found to have a carbohydrate intake that was 40% sucrose (Nicklas et al., 1987).

Because people eat what they do for many different reasons, determining factors that affect food-related behavior could lead to more effective intervention strategies. Many nutrition researchers have therefore taken a psycho-social approach to examining food-related behaviors. An especially important undertaking is gaining an understanding of factors that influence children's food habits. Eating habits are developed early in life and are generally carried through adulthood. And, unhealthy eating patterns in early life can affect not only the child's propensity for poor health but implications have been made that the childhood diet can affect adult health as well (Renner et al., 1991).

Children will most likely eat the same style of foods as the rest of the family at meals eaten in the home. Without any intervention, similar intake patterns have been found between parents and children (Oliveria et al., 1992; Perusse et al., 1988; Laskerzewski et al., 1980), among siblings (Eppright et al., 1969) and among spouses (Eastwood et al., 1982. It would follow then that efforts made toward

changing the attitudes, skills and/or behavior of one target family member would have positive ramifications that extend to other family members. Studies provide evidence. For example, a heart-healthy eating program targeted toward wives was shown to impact the husband's diet (Shattuck et al., 1992). The present study examined the relationship of a family meal planner's nutrition knowledge and attitudes to the fat and fiber intake of the meal planner and that of their preschool-aged children to determine how a meal planner's attitudes and knowledge relate to children's diets at home and for the total diet.

CHAPTER II

LITERATURE REVIEW

A. MEASURES OF PRESCHOOL CHILDREN'S DIETS

Until the 1960's few studies were available regarding the diets of U.S. preschool children. Since then the base of investigations has grown. Researchers have used two broad methods to analyze children's food intake patterns. One involves an overall diet quality assessment using indicator scores such as Diet Quality (Touliatos et al., 1984), Diet Diversity (Campbell and Sanjur, 1992; Caliendo et al., 1977) and Diet Complexity (Yperman and Vermeersch, 1979). These scores were based on the number of food group servings or the percent of RDAs represented in the diet and provided an indication of diet adequacy. However, when studying the dietary recommendations to reduce the risk for disease, it has been more appropriate to analyze diet in terms of the distribution of macro-nutrients (Perusse et al., 1988) and/or target dietary components associated with disease risk, such as cholesterol (Kimm et al., 1990; Laskerzewski et al., 1980), sodium (Oliveria et al., 1992) and sugar (Nicklas et al., 1987).

Recent studies have consistently found children's fat intakes to range between 33 and 40% of total energy intake. Using NHANES II (1976-80) data, Kimm et al. (1990) found 1-

10 year olds consumed 34-37% of their total calories as fat. Racial differences in fat intake were also found, with a trend toward higher fat consumption among black females. Nicklas et al. (1987), using data from the Bogalusa Heart Study, found fat to contribute 36-40% of the total calories consumed by children aged 1-4 years. Black children were found to consume slightly higher proportions of fat, but no gender differences were reported. Oliveria et al. (1992) looked at the intakes of 3-5 year olds in the Framingham Children's Study and found fat to comprise about 33% of total energy intake. And data from the Continuing Survey of Food Intake by Individuals (CSFII) for 1985-86 showed 34-35% of calories from fat in diets of children 1-5 years of age (USDA, 1986).

Fiber has been little studied in American diets, possibly because of the difficulties associated with measuring it as a dietary component. The CSFII computes a dietary fiber value from collected diet records. Estimated values obtained for children aged 1-5 years in 1985-86 data averaged 10 g/day, or about 7 g/1000 kcal (Surgeon General, 1988).

Most of the studies that address children's intake of dietary fiber do so in the context of actual high-fiber food consumption - fruits, vegetables and complex carbohydrates. An assessment of the nutritional status of preschool

children, based on 24-hour diet recalls, found 21% of the children had not eaten fruit and 13% had not had a serving of vegetables (Caliendo et al., 1977).

Nicklas et al. (1987) used data from the Bogalusa Heart Study to break carbohydrate consumption into starch and sugar components. Results showed a sucrose-starch ratio of 1.7 and 1.6 for 3 and 4 year olds respectively, indicating greater consumption of simple carbohydrates than the fiber-containing complex carbohydrate foods. Black children consumed a greater percentage of carbohydrate with a much higher proportion coming from starch than their white counterparts.

B. ASSOCIATION OF CHILDREN'S DIETS WITH PARENTAL FOOD INTAKE AND NUTRITION ATTITUDES AND KNOWLEDGE

1. Food Intake

Studies investigating similarities in the food preferences of children and their parents have yielded inconsistent results. Birch (1980b) found as many studies that reported little relation as those that reported a positive correlation between food preferences. Birch suggests any correlation merely reflects a commonality of subculture since parental preferences were no more strongly related to children's preferences than the preferences of unrelated adults of the same subculture. However, food preferences may not be predictive of food consumption.

Hertzler (1983) reviewed three studies that did not find preschoolers' preference a reliable predictor of their food consumption and six that found a significant correlation. None the less, correlations between the actual nutrient intake of parents and children have been found to be moderately positive for various nutrients.

For example, middle-class, white children aged 3-5 years were found to have nutrient intakes that correlated more strongly with mother's than father's intakes (Oliveria et al., 1992), but when mother and father values were averaged together (mid-parent), the same study found intakes of 10 out of 11 nutrients were statistically related between mid-parent and child ($p<0.01$). Only potassium did not correlate significantly.

Perusse et al. (1988) studied Canadian children 8 years and older and found significant parent-child correlations for macro-nutrient distribution ($p<0.01$). Additionally, it was found that correlations between foster parents and adopted children were of the same magnitude as those observed in parents with their biological children, suggesting an environmental, not just genetic factor, behind the similarities.

Laskerzewski et al. (1980) also found that environmental influences, that is, household or family effects, contributed to parent-child similarities in

nutrient intake. Looking at 6-19 year olds in the Princeton School District study, the authors found calories, fats, and carbohydrate intakes of children to correlate significantly with parents' intake ($p<0.01$). Only cholesterol was not significantly correlated. Black children had much stronger correlations with their parents than white families, but overall, 23-90% of the variance in children's diets was accounted for by parents' intake.

2. Nutrition Knowledge and Attitudes

Early studies examining nutrition knowledge and its effects on children's diets found knowledge to be related to homemakers' performance in feeding their families, but that actual performance was much better than knowledge would have indicated (Young et al., 1956). With the recent increase in nutrition awareness by the American public the situation may not be the same in today's households. A later finding indicated that the nutrition education level of the mother was the most highly and significantly correlated variable studied with the quality of preschool children's diets (Caliendo et al., 1977).

Few studies have examined the association of parents' nutrition attitudes, defined as beliefs or opinions, with children's food intake. Children of mothers with positive attitudes toward nutrition have been found to have better

diet quality (Caliendo et al., 1977) and diet complexity (Yperman and Vermeersch, 1979). Children whose mothers stated they enjoyed cooking also had a better quality diet (Owen et al., 1974).

C. THEORETICAL APPROACHES TO EXPLAINING DIETARY BEHAVIOR

Traditional approaches to the study of food-related behavior change have focused on knowledge, attitudes and behavior (KAB); that is, provide information, change the individual's attitude and a change in behavior should result. The KAB approach, however, was shown inadequate in explaining or predicting changed behavior. Blake and Melton (1992) reviewed several studies using the KAB approach and discovered in all studies either a weak or no correlation between nutrition attitudes and knowledge with dietary behavior. Nutrition researchers have more recently sought to examine the relationships among various attitude components by delineating several dimensions of the broad 'attitude' construct. More relevant relationships have been found between dietary behavior and the various dimensions of 'attitude' than with the more general, all-encompassing attitude construct. Theories borrowed from other disciplines, particularly from the social-psychological field, have aided nutrition researchers in identifying which facets of the broader attitude construct to address.

1. The Health Belief Model

One social-psychological theory that has frequently been used in food-related behavior studies is the Health Belief Model (HBM) (Rosenstock, 1974). Social psychologists with the Public Health Service (Drs. Godfrey Hochbaum, Irwin Rosenstock, Stephen Kegeles and Howard Leventhal) developed the model in an attempt to understand public health behaviors - or more specifically, to understand why the public was not taking advantage of preventive health measures such as screenings and vaccinations. The model is based on the idea that people gravitate toward positive regions in their life and try to avoid the negative regions. Illness was seen as a negative region and early HBM studies approached preventive health behavior as illness avoidance. More recently, however, studies have approached preventive health behavior as seeking a positive region - health.

According to the Health Belief Model, preventive health behavior is determined by four underlying beliefs (Becker and Maiman, 1975) as shown in Figure 2.1. The individual's:

<u>perceived susceptibility</u> (to a condition)

- how much at risk am I for coronary heart disease?

<u>perceived severity</u> (of the condition)

- how bad is coronary heart disease?

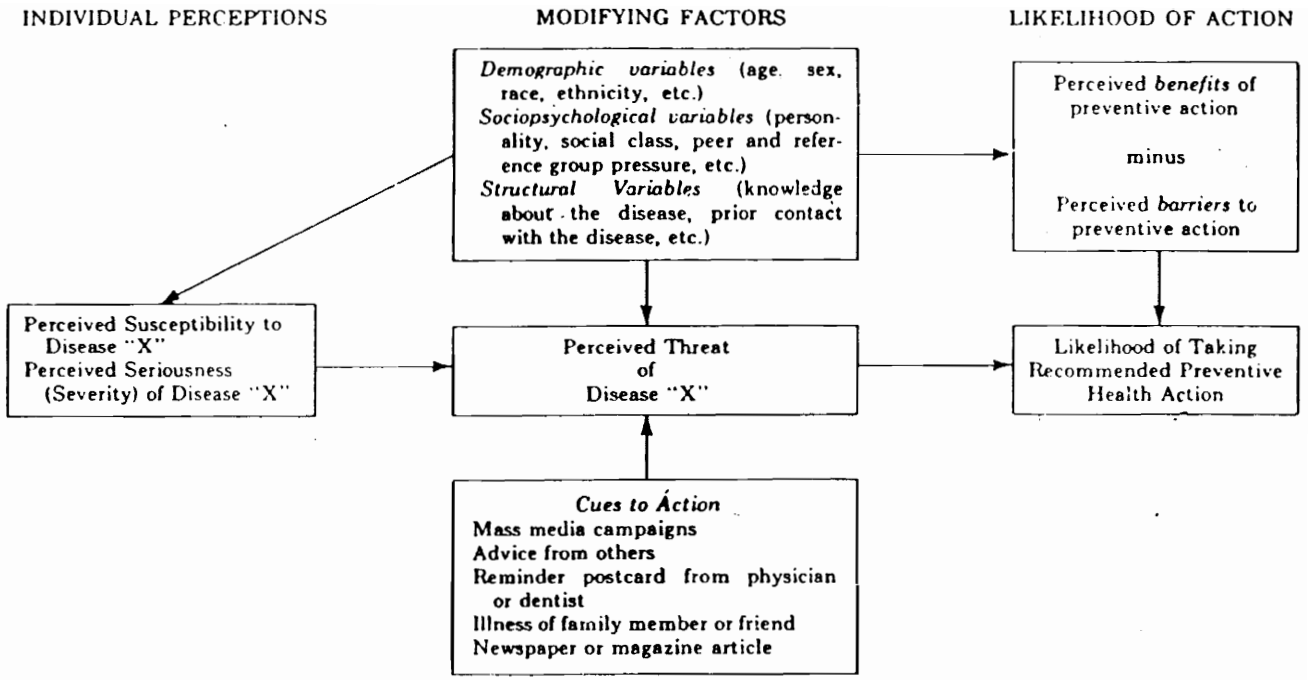

Figure 2.1. The Health Belief Model. (Becker and Maiman, 1975)

perceived barriers (to the behavior)

- low-fat food is taste-less

perceived benefits (of the behavior)

- I'll reduce my risk for a heart attack, lose weight and gain energy

The individual makes decisions about a preventive health behavior based on the four belief indices, but a cue to action is necessary to trigger the decision-making process. Cues to action are events or pieces of information that make the individual aware that a personal decision needs to be made in regards to the preventive behavior. For example, 'my cholesterol level check came back much higher than I thought it would', or a family member just suffered a heart attack.

Food-related studies that have used the HBM tended to be clinical in nature, examining dietary behaviors associated with diabetes, obesity, and hypertension (Janz and Becker, 1984). But, since the model provides a theoretical approach with a public health perspective, it is suitable for the study of attitudes toward dietary guidance for the reduction of chronic disease.

Contento et al. (1990) incorporated all HBM constructs as well as constructs from other behavior change theories in

a study designed to investigate differentiating characteristics of people who had made voluntary diet changes and those who had not. The results of a regression analysis conducted on the responses of 117 adult supermarket shoppers showed the HBM constructs of perceived susceptibility and perceived benefits provided the largest explanation of dietary change, 18% and 20% respectively.

Becker et al. (1977) also used the HBM in designing a study that examined the effect of a mother's attitudes on her child's adherence to a diet prescribed for obesity and the child's subsequent weight loss. The researchers added two additional variables to the model, 'feeling of control' and 'motivation to comply (with prescribed diet).' The resulting model accounted for 49% of the variance in weight change.

As the latter study suggests, cognitive factors associated with adults' health beliefs may affect children's health behavior. Children themselves are not often motivated for health reasons. Two theories define concepts helpful in identifying factors affecting children's health and dietary behavior: the Social Cognitive Theory's concept of modeling (Bandura, 1986) and the Channel Theory's concept of gatekeeping (Lewin, 1943).

2. Modeling

Bandura (1986) presented the concept of modeling in his Social Cognitive Theory. By definition, modeling goes beyond imitation to involve cognitive processes via observational learning. 'Learning by watching' allows an individual to observe consequences of a behavior and provides a stimulus that could increase the frequency of the behavior. The role model must be both relevant to the observer to compel attention and credible to deserve trust. The significance of a role model's relevance and credibility is illustrated by Harper's and Sanders' (1975) finding that children were more willing to try new foods with their mother's example than a stranger's.

Several studies have highlighted the potential power of modeling in affecting children's diets. Children have been shown to be more likely to try a new food if a parent or familiar adult eats the food rather than just offers a sample (Harper and Sanders, 1975). And studies involving the effect of parental involvement in weight-loss programs for children have found that children who had positive role models in their parents lost more weight (Brownell et al., 1983) or were able to maintain a weight below baseline for five years, unlike the children who had been treated without a parent's participation (Epstein et al., 1987). Other

sources of food behavior modeling may include peers (Birch, 1980a) and older siblings (Eppright et al., 1969).

3. The Gatekeeper Effect

The concept of gatekeeping has been used in many fields of study. Kurt Lewin (1943) introduced the concept into the nutrition field with the Channel Theory. Lewin defined 'channels' as the means by which food comes to the table and asserted that each channel has a gatekeeper who regulates the flow. The person who shops and plans meals for a family can be considered a gatekeeper of food, a position which holds great potential to influence the family food supply and food habits. Traditionally, the position was held by the female head of the household. With the changing definition of family in today's society, it can no longer be assumed that the gakekeeper is also the wife or mother.

Lewin pointed out that the gatekeeper concept is not entirely unidirectional. Children "undoubtedly influence the decisions [of the gatekeeper] indirectly through their rejection of food put before them" (Lewin, 1943, p40). Galst's and White's (1976) observation provides an example; children's attempts to influence food purchases in the supermarket were positively correlated with TV commercials that had been previously viewed by the children. Spouses, too, can influence the gatekeeper's purchasing and

preparation methods. Factors outside the gakekeeper's personal attitudes and preferences, then, do exert an influence on the gatekeeper's decisions, but the gatekeeper still plays a large part in regulating the family's food supply at home and has the potential to shape food habits, especially those of young children. In addition, foods young children eat outside the home may also be regulated by the gakekeeper - most directly in the situation of meals consumed together outside the home, but also indirectly via selection of daycare providers, preschools, etc. Foods served to children in the institutional settings may be a consideration in choice of daycare arrangements.

D. DIETARY GUIDELINES

The US Department of Agriculture has provided the American public with food guides since 1916 when it published "Food for Young Children" (USDA, 1916). Since that time several food guides have been developed by USDA including the Basic Seven (USDA, 1943), the Basic Four (usda, 1958) and the most recent Food Guide Pyramid (USDA, 1992). The purpose behind the food guides was to take scientific evidence regarding nutrient needs and translate the information into practical daily food choices. However, with the accumulating evidence linking diet with chronic disease, the need for public information about diet

modifications to reduce the risk for disease became apparent.

In 1977 the Senate Select committee on Nutrition and Human Needs issued a report, "Dietary Goals for the United States," which focused on chronic disease prevention. The report suggested Americans reduce the intake of fat, sugar, cholesterol, and salt and increase the consumption of complex carbohydrates - starch and fiber. These recommendations created controversy as opponents felt the scientific evidence linking diet with chronic disease was insubstantial. Yet the recommendations were supported in the subsequent publication of "Healthy People: The Surgeon General's Report on Health Promotion and Disease Prevention" (1979).

In 1980 the Departments of Agriculture and Health and Human Services collaborated to develop and jointly publish "Nutrition and Your Health: Dietary Guidelines for Americans." The seven dietary guidelines were based on investigations and Senate hearings conducted to assess American's health status and dietary habits. The Dietary Guidelines for Americans were revised slightly in 1985 and again in 1990 (USDA, 1980). The guidelines remained qualitative in nature because the reviewing committee did not feel the scientific evidence warranted quantified recommendations. In 1989 the National Academy of Sciences

published "Diet and Health: Implications for Reducing Chronic Disease Risk," which supported the recommendations in "Dietary Guidelines for Americans" but also provided quantitative guidelines.

The Dietary Guidelines for Americans represent the federal government's nutrition policy and are intended to help improve the health status of Americans. The guidelines provide information to the public on how to make healthful food choices; they provide a focal point for nutrition policy; and they provide the food industry a forecast for developing new products (Gillis, 1986).

The impact of consumers' increased nutrition awareness is readily apparent in the market place. Recent surveys show about a third of the shoppers polled were concerned with fat (National Food Processors Association, 1991; Food Marketing Institute, 1992). A national restaurant survey (Restaurants USA, 1986) showed half the respondents were making decisions to restrict certain nutrients, such as fat, while two-thirds were making efforts to include certain foods, like those high in fiber. The U.S. food supply has also undergone changes. One analysis showed a 15% increase from 1986 to 1989 in food products that were low-fat/low-cholesterol reformulations (Institute for Science in Society, 1992).

The Dietary Guidelines were deemed beneficial for anyone over 2 years of age, but a variety of disagreements exist among pediatric professionals. In 1986 the American Academy of Pediatrics (AAP) published its position, stating that the current dietary trends in the United States should be followed in moderation for children. Children should be screened for cardiovascular disease risk and measured for obesity before being placed on a restricted diet. The AAP felt optimal fat intakes could not be determined but that "30-40% seems sensible for adequate growth and development" (American Academy of Pediatrics, 1986, p523). Little has been said specifically about increased fiber intake.

SUMMARY

Nutrition education efforts in the United States currently highlight recommendations to moderate fat intake and increase fiber intake. However, evidence regarding the adequate moderation of children's fat intake has been inconsistent. Reports from recent studies show children, on the average, are not exceeding the 30-40% calories from fat guideline set by the American Academy of Pediatrics. Yet, the incidence of obesity is on the rise among children. Reports of fiber adequacy are consistently low, regardless of whether the measure is direct, as in the CSFII dietary fiber measure, or indirect, as with fruit and vegetable

consumption or simple versus complex carbohydrate intake ratios. Encouraging children to eat diets based on the Dietary Guidelines for Americans should benefit their immediate health status and reduce future risk for chronic disease.

To promote such dietary habits among children, the identification of factors that influence children's eating behavior becomes important in understanding how to affect a change toward eating the Guidelines' way. Studies have shown parallels between parent and child nutrient intake patterns for which genetics did not account for all the similarity. But the environmental effects may simply be due to a subcultural commonality - both individuals may be eating foods common to the culture. Another possibility is that the parents' and the children's eating habits are both stemming from the effects of the parents' attitudes and knowledge about food and nutrition.

The latter possibility has been examined in a few studies with findings that a higher level of maternal nutrition education and more positive maternal attitudes toward nutrition correlated with better quality diets of preschool children. Bandura's concept of modeling (Bandura, 1986) and Lewin's gatekeeper theory (Lewin, 1943) support this idea. If modeling and gatekeeping are indeed a strong dynamic behind preschool children's diets, the evaluation of

parents' nutrition attitudes and knowledge would become important in investigations of children's diets or in attempts to direct a nutrition intervention program to benefit children. This, however, assumes direct contact between gatekeeper and child which would more likely take place at home. If the gatekeeper worked outside the home and/or the child attended daycare or preschool, gatekeeper effects may operate indirectly and hence the relationship of meal planner attitudes and knowledge with a child's total diet may become diffused.

Several studies have shown that the Health Belief Model provides a helpful framework in which to investigate attitudes about healthy eating. The model delineates several dimensions of the 'attitude' component that may be useful in differentiating individuals who are more likely to engage in preventive health behaviors. The model may also help identify the types of attitudes that should be addressed in intervention programs that attempt to change health-related behavior. As such, the Health Belief Model lends itself to the study of a family meal planner's nutrition attitudes and how the attitudes effect dietary behaviors.

The strategies of many family-based intervention programs focus on changing the attitudes, skills and/or behavior of one target family member with the expectation

that positive effects will extend to other family members. The present study examined the relationship of meal planners' nutrition attitudes and knowledge with the fat and fiber intake of the meal planner and with that of their preschool children. A modified version of the Health Belief Model helped assess meal planners' attitudes concerning diet and health. Using the gatekeeper and modeling concepts as justification, the relationship of meal planners' attitudes and knowledge to preschoolers' diets was assessed for home foods and for the total diet.

CHAPTER III

MATERIALS AND METHODS

In 1989, the US Department of Agriculture's Human Nutrition Information Service (HNIS) began its second administration of the Continuing Survey of Food Intake by Individuals (CSFII). Data for the second series were collected across three years, 1989-91. With this second series, HNIS added a new survey, the Diet and Health Knowledge Survey (DHKS) to assess knowledge and attitudes concerning food and nutrition. The DHKS was designed as a follow-up survey to the CSFII and responses were coded to allow linkage with CSFII food intake records. Coupling the two surveys allows examination of the relationship of food-related attitudes and knowledge with dietary behavior.

A. Sample Population

1. Survey Population

Households surveyed for the CSFII/DHKS represent the 48 contiminous states. The households were drawn from a master sample previously developed by National Analysts, the agency contracted by HNIS to collect the survey data. The sample was based on 1980 estimates of the US population and adjustments were made to reflect the current population.

From the master sample, National Analysts created a multi-stage national probability sample of households in the following manner.

Strata were devised that took into account geographic location, degree of urbanization and socio-economic characteristics. Each stratum was divided into smaller, relatively homogenous units called primary sampling units (PSU) based on political, economic and demographic characteristics. Each PSU was further divided geographically along census boundaries into smaller clusters that contained at least 75 housing units. Households were drawn into the survey sample via a systematic selection of clusters with a random start. The target number of households for each survey year was 1500.

Two separate sample groups were surveyed: a basic, all-income group in which all households were eligible and a low-income group. Households were designated low-income if total family income during the previous month was at or below 130% of the poverty threshold. Setting low-income at 130% poverty allowed inclusion of non-elderly households who met one income eligibility requirement for the Food Stamp program.

2. Response Rates

Two-thirds of the households approached for participation in the CSFII completed the survey. Reasons for non-response to the CSFII include household screened but refused participation, refused screening, no one home, language barrier or unit was vacant or not a housing unit. Eighty-five percent of the CSFII respondents completed the DHKS. Reasons for non-response to the DHKS include failure to reach respondent, interview refused, the residence was since vacated, or the main meal planner was since deceased. Non-respondents present potential bias in the data: the sample population may not be as representative of the general population as it would have been had all targeted households participated. Table 3.1 shows the number of participating households by survey year.

3. Study Subsample

A subsample of CSFII/DHKS respondents was created for the present study. The study sample was drawn from both basic and low-income households from all three survey years, 1989-1991. As a result, low-income households were over represented. To compensate, 'percent of poverty' was included as a control variable in the multi-variate analyses to help relieve any bias from the unequal representation of income groups.

Table 3.1 Number of survey households that participated in the CSFII and DHKS each survey year, with percent CSFII households that responded to the follow-up DHKS interview (Goldman, 1994).

		1989	1990	1991
Basic	CSFII	1489	1458	1533
	DHKS	1280 (86%)	1280 (88%)	1280 (83%)
Low Income	CSFII	725	734	779
	DHKS	626 (86%)	619 (84%)	645 (83%)
Total	CSFII	2214	2192	2312
	DHKS	1906 (86%)	1899 (87%)	1925 (83%)
3-Year Total	CSFII	6718		
	DHKS	5730 (85%)		

Households were selected for the study if they contained both a DHKS respondent who was also identified as the household's 'main meal planner/preparer' (referred to from here as the 'main meal planner' or 'meal planner') and a child of the household head who was 2-5 years old. The main meal planner was asked to respond to the DHKS, but about 4% of the DHKS respondents were not the main meal planner. Reasons include the main meal planner's extended absence from home, death or misidentification of the main meal planner during the CSFII interview. Several 2-5 year olds were either the grandchild of the household head or the child of another household member.

As was expected, a few households presented with more than one preschooler. To avoid a household clustering effect, one child was selected from each household. Selection was made by taking the first 2-5 year old listed for the household. Preliminary investigations using this method with 1989-90 data yielded a focal group of children that had slightly but not significantly more boys than the initial group of all household preschoolers. The smaller focal group was also slightly and significantly older than the initial group (3.66 vs 3.45 yrs; $p<0.003$). Although the 2-month average difference in age is statistically significant, the slight difference should not induce any relevant bias in results. Older preschool children would be

further away from infant feeding habits and would have had more time to begin developing their own food habits. Each factor would be advantageous to the purposes of the study.

Additionally, households were excluded if a focal individual (that is, the meal planner or the preschooler) did not provide a complete food intake record on the first survey day. Households were also eliminated if either the meal planner or the preschool child had eaten no food at home during the first survey day (66 children, 79 meal planners, 118 households). Households were also eliminated if no response was given to or if data were missing for any survey questions selected for use in the study (68 households).

Applying the above criterion produced a total 478 households eligible for the study. Table 3.2 shows the sample size resulting after each criterion was applied.

B. Data Collection

1. Dietary Intake - the CSFII

The CSFII collected information about the diets of each member of a survey household. Initial on-site interviews were conducted at each household. Trained interviewers used a food instruction booklet to help respondents adequately and more accurately report foods and amounts consumed

Table 3.2 Study sample size based on 1989-91 CSFII/DHKS data and selection criteria.

CRITERIA	RESULTING COUNT
DHKS households	5730 hhlds
DHKS respondent is also MMP	5487 hhlds
children of hhld head 2-5 years old	1010 children
children with adequate Day 1 record	825 children
one child per household	652 hhlds/children
households with Day 1 homefood records	534 hhlds
hhlds with no missing data for study questions	478 hhlds

hhld=household MMP=main meal planner

(National Analysts, 1989). A 24-hour diet recall starting with the first food item consumed for the day was recorded for each household member. Households were then given the instruction booklet along with measuring cups, spoons and a ruler and were instructed on how to complete diet records for the following two days. The meal planner was asked to record dietary information for children under the age of 12 years.

The 24-hour diet records included information on the type and amount of food eaten and whether or not the foods came from home or were procured and eaten away from home. The interviewer also collected information on household characteristics, such as socio-economic status. The initial CSFII interview took an average 20 minutes to complete.

Nutrient Value Calculations

Nutrient values were estimated for each food item listed on CSFII food records using a data base HNIS developed for use with the CSFII.

Day 1 Intake Records

Although the CSFII includes dietary data for three consecutive days, intake records collected on the first survey day were chosen for use in the study for several reasons. Not all surveyed households completed intake

records for the additional two survey days so use of Day 1 food records allowed a larger sample size. It also precluded the elimination of households that may have been less interested in nutrition and dietary matters and hence were not as willing to fill out a second or third food record. Additionally, only Day 1 food records were completed with the help of the interviewer and may as a result be more accurate and complete.

2. Attitudes and Knowledge - the DHKS

The DHKS was designed as a follow-up telephone interview conducted approximately six weeks after completion of the CSFII survey. The DHKS surveyed only the person identified in the CSFII as the household's main meal planner-preparer. Almost half of the CSFII households could not be reached by phone, in which case on-site interviews were conducted in the home. The DHKS interview ran an average 27 minutes.

No incentives were offered for completion of the DHKS (CSFII respondents received two dollars for a complete set of 3-day records). However, interest among respondents appeared high based on pretests and interviewer debriefings. Eighty-six percent of CSFII households responded to the DHKS. Table 3.1 gives response rates for each of the three survey years.

The DHKS addressed three main topic areas: the meal planner's 1) attitudes and knowledge about food and nutrition, 2) food safety and 3) food labeling. Questions probing the meal planner's attitudes toward food and nutrition were based on the Dietary Guidelines for Americans. Questions were also asked concerning food sources of various dietary components.

C. MEASURES

1. Dietary Behavior Measures - Fat and Fiber Intakes

The study focused analysis on the intake of fat and fiber. Fat included table and cooking fats, the fat content of single food items and the 'hidden fats' of mixed food products. Fiber assessment techniques used in developing the nutrient data base used for analysis included crude and dietary fiber components.

Dietary fiber intake is difficult to measure, but because methods for computing such a value were consistent for all respondents and because values were not compared to any standards, the estimates of fiber intake used in the study should be sufficient to determine whether a relationship existed between attitude/knowledge and the fiber intakes of children and meal planners.

Actual intake values were not used for analyses but were converted to a percentage basis. Percentage values

allowed comparisons between child and adult intakes despite different energy intakes and helped neutralize any gender differences in total energy intake.

'Percent fat' was calculated as a percent of total kcalories and 'fiber density' was calculated as the number of grams of fiber per 1000 kcalories:

$$\text{percent fat} = \frac{\text{grams fat consumed X 9}}{\text{total kcalories consumed}} \times 100$$

$$\text{fiber density} = \frac{\text{grams fiber consumed X 1000}}{\text{total kcalories consumed}}$$

2. Attitude and Knowledge Measures

Attitude and knowledge constructs were defined to accommodate a modified version of the Health Belief Model as shown in Figure 3.1. Selected CSFII/DHKS questions served as proxy measures.

a. Awareness Studies have suggested that severity may not operate differently than susceptibility in dietary behaviors; the two variables may actually be measuring the same concept (Melton and Blake, 1992). The popular media has focused attention on diet-related diseases that are chronic and potentially fatal, such as coronary heart disease and cancer. Individuals would therefore be likely

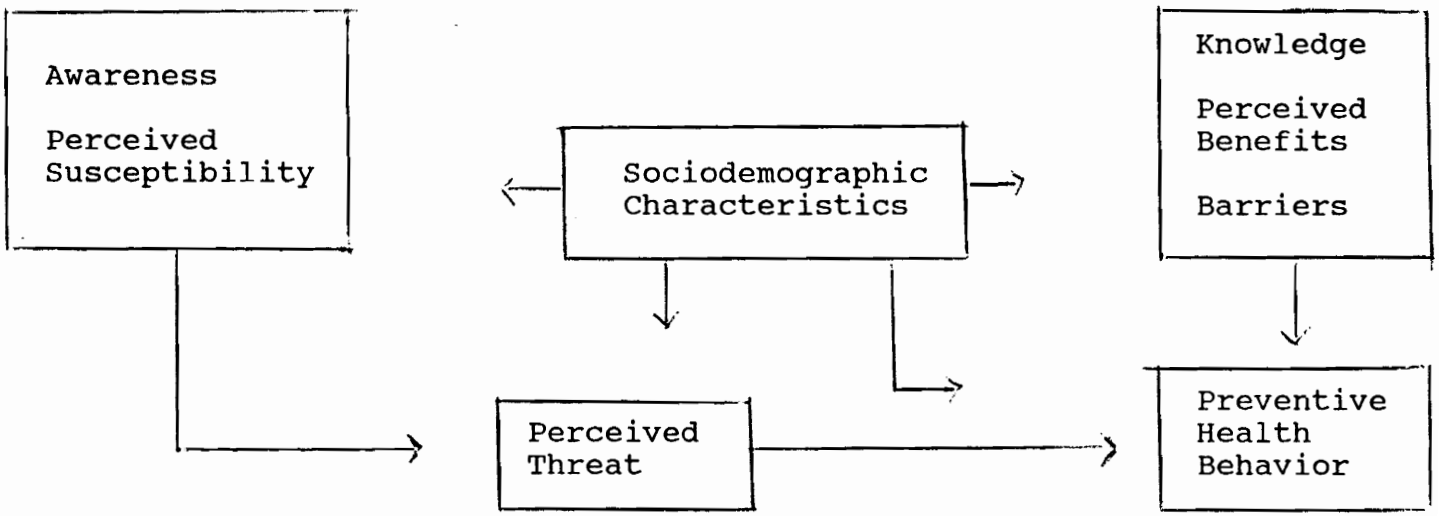

Figure 3.1 Modified Health Belief Model

to attribute a high degree of severity to these particular health conditions if they felt susceptible. Hence, the present study assumed that the construct of perceived severity overlaps susceptibility and did not address severity as a separate construct.

However, individuals may not be aware that a relationship exits between some diseases and dietary behavior. Therefore, an awareness variable was assessed using the meal planner's response to the question, "Have you heard of any diseases related to: fat, saturated fat, fiber, sodium, calcium, cholesterol, sugar, iron, being overweight?" Awarding one point for each positive response (regardless of the accuracy of disease associations) resulted in a possible 0-9 points on the awareness scale.

b. Perceived susceptibility Perceived susceptibility was a measure of the meal planner's self-rated health status. Respondents were asked, "In general, would you say your health is excellent, very good, good, fair or poor?" Responses were coded numerically with 1=excellent to 5=poor, yielding a 1-5 point range for the susceptibility scale.

c. Perceived benefits Meal planners' attitudes about potential dietary health benefits was assessed with the question, "How much do you agree or disagree that what you eat can make a big difference in your chance of getting a disease, like heart disease or cancer?" Responses were made

on a 6-point scale with 1 = strongly disagree to 6 = strongly agree, yielding a 1-6 point range for the benefits score.

d. Perceived barriers Two types of potential barriers to healthy eating were examined: utility and taste. The survey question which most closely addressed the issue of barriers to healthy eating was developed as a shopping question: "How important are each of the following to you when you shop for food?" While the question more directly reflects barriers to procuring rather than consuming nutritious foods, the two behaviors are related under the gatekeeper concept; procurement determines which foods will be available for consumption. Although the question addressed six factors (product safety, nutrition, price, how well the food keeps, ease of preparation, and taste) the study examined only the last four as potential barriers to nutritious eating. Responses were made on a 6-point scale with 1 = not at all important to 6 = very important when shopping.

The factors of price, perishability and ease of preparation were combined to represent a single variable which the study termed 'utility.' Each response of 5 or 6 (important or very important) to any of the three factors was awarded one point. Summing the points yielded a

possible utility score of 0 - 3 (utility = price + perishability + ease of preparation).

Taste was examined independently as a barrier. Taste scores were based on original responses, allowing a taste score of 1-6 points.

e. Knowledge The HBM allows for a knowledge construct under 'modifying variables.' The present study treated knowledge as a separate variable in order to examine its potential mediating capabilities, that is, whether it is needed for effective dietary behaviors. The knowledge variable represented the meal planner's general nutrition knowledge and was based on the 26 DHKS questions listed in Table 3.3. Questions 1-3 were rated on a 6-point scale with 1 = strongly disagree to 6 = strongly agree. A response of 5 or 6 to any of the first three questions was awarded one point. One point was awarded for each correct answer to questions 4-26. This yielded a knowledge score range of 0-26 points.

Questions on the 1989, 1990 and 1991 versions of the DHKS were not based on any particular theoretical model. The questions were instead arbitrarily designed to meet the need for information on attitudes and knowledge concerning the Dietary Guidelines, food safety and food labels. As is common with secondary analyses, too few indicators may exist

Table 3.3 DHKS questions used to assess nutrition knowledge of the meal planners. Correct responses are indicated in bold print. Respondents were awarded one point for each correct response yielding a 0-26 point range for the knowledge score.

---

1. How much do you agree or disagree that different kinds of fiber in food have different health benefits? (6 point scale)

2. How much do you agree or disagree that starchy foods, like potatoes and rice, make people fat? (6 point scale)

3. How much do you agree or disagree that most starchy foods have many vitamins and minerals? (6 point scale)

Based on your knowledge, which has more fiber:

4. - FRUIT or meat?
5. - corn flakes or OATMEAL?
6. - WHOLE WHEAT BREAD or white bread?
7. - orange juice or an APPLE?
8. - KIDNEY BEANS or lettuce?
9. - POPCORN or pretzels?

10. Ounce for ounce, which is highest in calories? would you say butter, sugar, potatoes or straight alcohol? BUTTER

11. Which is the next highest? ALCOHOL

Based on your knowledge, which has more cholesterol:

12. - LIVER or T-bone steak?
13. - BUTTER or margarine?
14. - egg whites or EGG YOLKS?
15. - skim milk or WHOLE MILK?

Which has more fat:

16. - REGULAR HAMBURGER or ground round?
17. - loin pork chops or PORK SPARE RIBS?
18. - HOT DOGS or ham?
19. - PEANUTS or popcorn?
20. - yogurt or SOUR CREAM?
21. - PORTERHOUSE STEAK or round steak?
22. - ICE CREAM or sherbet?
23. - roast chicken leg or FRIED CHICKEN LEG?

24. Which kind of fat is more likely to be a liquid rather than a solid: saturated fats, polyunsaturated fats or are they equally likely to be liquids? POLYUNSATURATED FATS

25. If a food is labeled cholesterol free, is it also low in saturated fat, high in saturated fat, or it could be either high or low in saturated fat? COULD BE EITHER

26. Is cholesterol found in vegetables and vegetable oils, animal products like meat and dairy products, or all foods containing fat or oil? ANIMAL PRODUCTS

in the survey to reliably measure the theory-specific study variables.

3. Home Foods vs Total Diet

Fat and fiber intake from foods eaten at home were compared with foods eaten all day by examining home foods separately. Examination of home food data allowed investigation of eating situations where the meal planner's modeling and gatekeeper effects would have had a more direct role. Alternately, examination of foods consumed during the entire day allowed a broader picture of food habits and provided some indication of 1) whether meal planners' attitudes and knowledge function differently at home versus in a total day's setting (if all foods were not eaten at home) and 2) whether or not gatekeeper and modeling effects may have carried over for children.

The CSFII requested information about the source of a food item to determine whether the food was

- eaten at home,
- brought into the home but later eaten away from home,
- or never brought into the home.

The first two situations were considered foods from the home food supply and were further differentiated as coming from

- a fast food/carry-out place,
- Meals on Wheels,
- or some other place.

For purposes of the present study 'homefood' was defined as food eaten at home regardless of its source.

D. ANALYSIS

1. Multi-variate Analysis

Multiple regression was used to examine the relationship of the meal planners' nutrition attitudes and knowledge to their fat and fiber intakes and to the intakes of their preschool children. Interaction terms were used to determine if the relationship of the attitudes/knowledge variables to meal planners' and children's diets differed significantly. Separate regression tests were run for home fat and fiber and for total fat and fiber consumption (4 runs) using the following equation:

$$Y = aMMP + bCHILD + cQ1 + dQ2 + eQ1C + fQ2C$$

where Y represented the particular intake behavior to be examined (percent fat or fiber density). MMP had a value of 1 if the observation was for the main meal planner (0 otherwise) and CHILD had the value of 1 if the observation was for a child (0 otherwise). (NOTE: Both of these

variables may be specified in a SAS regression model if the SAS 'no intercept' option is also specified.) Q1 and Q2 represented the various constructs to be examined (awareness, susceptibility, etc.). Q1C and Q2C represented the interaction terms Q1*CHILD and Q2*CHILD which would indicate if the meal planners' responses to Q1 and Q2 had an added or different effect on the child's intake than on their own. The a-f represented regression coefficients.

The equation assessed the relationship of the attitude/knowledge variables to the meal planners' intake and also assessed whether the variables had a different relationship with the children's intakes. To determine the direct relationship of the meal planners' nutrition attitudes and knowledge on the children's diets, a similar equation was used with the reverse interaction term:

$$Y = aMMP + bCHILD + cQ1 + dQ2 + eQ1M + fQ2M$$

where Y was the intake behavior (percent fat or fiber density). MMP and CHILD were the dummy variables designating respective observations. Q1 and Q2 were the various constructs to be studied. Q1M and Q2M represented the interaction term Q1 X MMP and Q2 X MMP. And a-f represented regression coefficients.

2. Control Variables

Analyses were conducted using the SAS statistical package which assumes a simple random study design. The national survey sample, however, was selected on a stratified cluster basis. Therefore, control variables were added to the regression equations as suggested by HNIS (USDA, 1993). Co-variate variables used in the present study to control for sociodemographic bias and design effects are listed in Table 3.4. Variables were defined in a dichotomized fashion for easier interpretation with regression procedures and are more fully explained in Appendix A. Thus, the final regression equations followed the format

$$Y = aMMP + bCHILD + cQ1 + dQ2 + eQ1X + fQ2X + gP1 + hP2$$

where X represents the respective interaction variable and P1 and P2 represent the control variables.

E. QUESTIONS ADDRESSED:

Relationships examined in the study are graphically outlined in Figure 3.2. The following questions were addressed.

Table 3.4 Control variables used as co-variates in regression equations.

CITY	Is household located in a central city?
NONWHITE	Is meal planner non-white?
NOHIEDUC	Was meal planner's last grade 12th or less?
MMPWKS	Is meal planner employed?
SINGLEPT	Is meal planner a single parent?
LOWINC	Is household income <185% poverty?
FALLWNTR	Was survey conducted during October-March?
WEEKEND	Was survey conducted on Saturday or Sunday?
RCV_FDST	Does household receive food stamps?
NEREGION, MWREGION, SREGION	Was household located in northeast, midwest, south or west (inferred)?

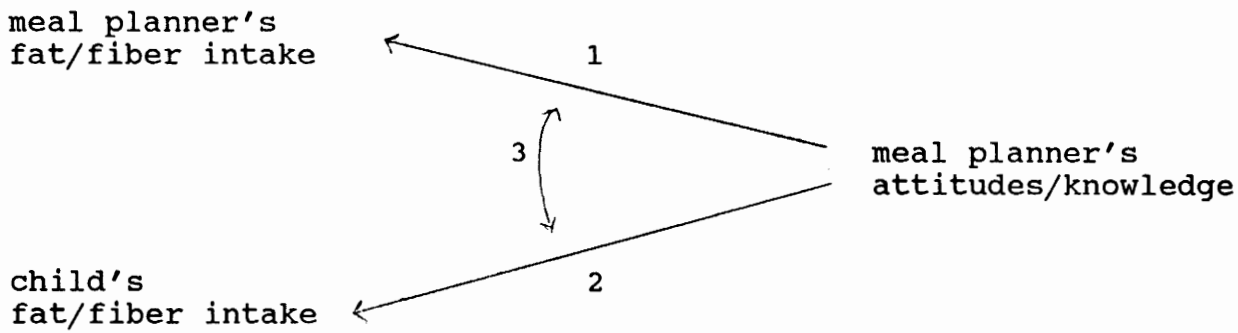

Figure 3.2 A schematic of inquiry: the relationship of meal planner's nutrition attitudes/knowledge on fat and fiber intake. Arrows indicate relationships examined in the study.

1. How were the nutrition knowledge and attitudes of the meal planners related to the meal planners' intake of fat and fiber?

2. How were the nutrition knowledge and attitudes of the meal planners related to the preschool children's intake of fat and fiber?

3. Was the relationship of the meal planners' nutrition knowledge and attitudes to their fat and fiber intakes different from the relationship to their preschool children's intakes?

4. Were the relationships between meal planners' nutrition knowledge/attitudes and fat and fiber intakes different for home foods and the total diet?

CHAPTER IV

RESULTS AND DISCUSSION

A. Characteristics of Study Subsample

Meal planners in the 478 households consisted of 454 women and 24 men with a mean age of 30.0 ± 5.9 years. The mean age of the selected children was 3.2 ± 1.1 years with equal representation of boys and girls - 239 each. The distribution of socio-demographic characteristics for the study subsample is shown in Table 4.1. Of the meal planners, 77% were white, 26% had more than a high school education, 26% were single parents and 36% were employed. Households were concentrated in the south and midwest with 35% located in central cities. Sixty-eight percent of the households were below 185% of the poverty level and 31% received food stamps.

Mean macronutrient and fiber consumption of meal planners and children are listed in Table 4.2. On the average, 84 and 85% of calories in the adults' and children's diets, respectively, were obtained from foods eaten at home. Distribution of the macronutrients was similar between foods eaten at home and foods in the total diet and was similar between meal planners and preschoolers: overall, percent total energy contributed by protein was

Table 4.1 Characteristics of households and main meal planners (MMP) in study subsample (N=478).

CHARACTERISTIC	NUMBER RESPONDING	
	YES	NO
Residence: in city	166	312
MMP race: non-white	111	367
MMP education: 12th grade or less	356	122
MMP employed	174	304
Single parent household	125	353
Low income: <185% poverty	323	155
Food Stamp participation	147	331
Region: Northeast	81	-
South	157	-
Midwest	144	-
West	96	-
Interview date in fall or winter	232	246
on weekend	117	361

* see Appendix A for fuller explanation of variables

Table 4.2 Mean macronutrient and fiber consumption for meal planners (N=478) and preschool-aged children (N=478) from foods eaten at home and for total diet.

NUTRIENT	HOME FOODS		TOTAL DIET	
	mean	range	mean	range
MEAL PLANNERS				
Energy (kcal)	1463	(10 - 6509)	1738	(164 - 6509)
Protein (g)	60.5	(0.5 - 336)	70.3	(1.7 - 336.3)
Fat (g)	57.0	(0.2 - 301)	68.8	(1.9 - 301.2)
Carbohydrate (g)	180	(2 - 735)	212	(13 -735)
Fiber (g)	10.3	(0 - 54.6)	12.1	(0.7 - 54.6)
CHILDREN				
Energy (kcal)	1197	(79 - 3101)	1407	(299 - 3186)
Protein (g)	47.2	(3.1 - 130.3)	54.5	(4.4 - 144.8)
Fat (g)	45.1	(1.2 - 135.4)	53.7	(2.0 - 152.2)
Carbohydrate (g)	154	(9 - 461)	181	(25 -461)
Fiber (g)	7.8	(0 - 40.2)	9.2	(0.6 - 40.2)

about 16%, fat about 34-35%, and carbohydrate about 49-51%. Thirty-four percent energy from fat is above the recommended 30% or below range for Americans (NAS, 1989). However, the 34% kcalories from fat is within the range the American Association of Pediatrics suggests is sensible for children - 30-40% (AAP, 1986).

Fiber density (grams per 1000 kcal) was also similar between adults and children with about 7 gm/1000 kcal in both home foods and the total diet. Meal planners consumed a mean 12 grams of fiber during the survey day and children a mean 9 grams. Both fall short of the recommended 20-35 grams of fiber a day (National Dairy Council, 1990).

Mean percent fat and mean fiber density of meal planners' and children's home and total diets are recorded in Table 4.3. Correlation coefficients comparing meal planners' and children's fat and fiber intakes are listed in Appendix C. Correlations between home and total diets are also listed in Appendix C. Correlations reflect high parallels between the intakes of meal planners and children.

The means and ranges of attitude and knowledge scores are shown in Table 4.4. Although most meal planners seemed to agree that diet can make a difference in an individual's risk for disease, the respondents appeared to vary more widely in awareness of disease risks associated with the specific dietary components asked about in the DHKS proxy

Table 4.3 Mean percent energy from fat (percent fat) and mean grams of fiber per 1000 kcal (fiber density) in home foods and in total diet of meal planners and preschool- aged children.

	HOME FOODS	TOTAL DIET
MEAL PLANNERS		
Mean Percent Fat	35.1 ± 10.4	35.6 ± 9.5
Mean Fiber Density	7.0 ± 4.3	7.0 ± 3.9
CHILDREN		
Mean Percent Fat	33.9 ± 8.6	34.3 ± 7.7
Mean Fiber Density	6.5 ± 3.3	6.5 ± 2.9

Differences in home and total intakes were not significant.

Table 4.4 Means with standard deviation and ranges of meal planners' attitude and knowledge scores. Actual scale range represents the range of points possible for each category. (N=478)

VARIABLE	MEAN SCORE	RESPONDENTS' SCORE RANGE	ACTUAL SCALE RANGE
Awareness	6.2 ± 2.4	0 - 9	0 -9
Susceptibility	2.3 ± 1.0	1 - 5	1 -5
Benefit	5.1 ± 1.3	1 - 6	1 -6
Utility	2.0 ± 0.9	0 - 3	0 -3
Taste	5.7 ± 0.7	1 - 6	1 -6
Knowledge	17.0 ± 2.8	9 - 24	0 -26

question: fat, saturated fat, fiber, sodium, calcium, cholesterol, sugar, iron and being overweight. The lower susceptibility scores indicate that many respondents rated their health status as 'very good.' Taste was an important food purchasing consideration for almost all respondents and the majority considered utilitarian features of food products (price, ease of preparation and perishability) an important consideration as well. The mean knowledge score was relatively high; however, none of the respondents answered all 26 questions correctly. Appendix D lists the frequency of attitude and knowledge scores for each scale level.

B. Relationship of Attitudes and Knowledge to Fat and Fiber Intake

Full regression results are contained in Appendix E. Although it has been suggested that a more conservative significance level ($p<0.01$) be employed when using statistical software packages like SAS to process CSFII/DHKS data (USDA, 1993), results from the present study show a cluster of variables with p-values of 0.03 or less while most of the remaining variables carried p-values of 0.10 or greater. Since a distinct break was apparent, relationships with a p-value of 0.03 or less were considered significant for purposes of the study.

1. Percent Fat:

A summary of regression results for fat intake are shown in Tables 4.5-4.8. Meal planners' fat consumption both at home and in the total diet was significantly but inversely related to their perceived susceptibility to health problems. Meal planners who believed that their health status was less than ideal may have been motivated to trim fat from the diet.

Utility was significantly and positively associated with meal planners' home and total fat consumption. The more concerned about time, price and food waste, the more fat the meal planner consumed. Ready-to-eat food products, such as frozen meals, luncheon meats and reconstitutable dry mixes, as well as fast-food offerings, are often high in fat.

Meal planners' knowledge was significantly related to less fat consumption from home foods, but the relationship of knowledge with total fat consumption failed to reach significance. That meal planners with higher nutrition knowledge scores had significantly less calories from fat for foods consumed at home than their counterparts with lower knowledge scores suggests knowledge may facilitate lower fat food choices at home. Information about the fat content of foods consumed outside the home may have been less available or it may have been harder to make choices

Table 4.5 Fat Intake, Home foods: Relationship of household meal planner's attitudes and knowledge with percent energy from fat for foods consumed at home by the meal planner (n=478) and preschool child (n=478). The difference between the attitude-fat intake relationship of the meal planner and the child is also shown.

VARIABLE	MEAL PLANNER		CHILD		DIFFERENCE	
	β-weight	p-value	β-weight	p-value	β-weight	p-value
Awareness	0.31	0.13	0.21	0.31	-0.10	0.72
Susceptibility	-1.32	0.005	-0.26	0.57	1.05	0.11
Benefit	0.01	0.97	0.30	0.38	0.29	0.55
Taste	0.53	0.42	-0.06	0.92	-0.60	0.52
Utility	1.20	0.02	0.60	0.24	-0.60	0.40
Knowledge	-0.47	0.01	-0.38	0.03	0.08	0.74

Table 4.6 Fat Intake, Home foods: Significantly related sociodemographic/control variables (significant for both meal planner and child).

Variable	Direction of Significance \ p-value
Meal planner works	- (.001)
Midwest	+ (.03)

Table 4.7 Fat Intake, Total: Relationship of household meal planner's attitudes and knowledge with percent energy from fat for the total diet of the meal planner (n=478) and preschool child (n=478). The difference between the attitude-fat intake relationship of the meal planner and the child is also shown.

VARIABLE	MEAL PLANNER		CHILD		DIFFERENCE	
	β-weight	p-value	β-weight	p-value	β-weight	p-value
Awareness	0.05	0.80	-0.03	0.87	-0.08	0.77
Susceptibility	-1.15	0.01	-0.33	0.44	0.81	0.17
Benefit	0.17	0.58	0.10	0.75	-0.07	0.86
Taste	0.23	0.70	-0.18	0.76	-0.41	0.63
Utility	1.03	0.03	0.30	0.51	-0.73	0.26
Knowledge	-0.28	0.09	-0.30	0.07	-0.02	0.92

Table 4.8 Fat Intake, Total: Significantly related sociodemographic/control variables (significant for both meal planner and child).

Variable	Direction of Significance / p-value
Midwest	+ (.01)

outside the home due to a limited selection of food. Therefore, the relationship of knowledge with the total diet may have been diffused.

Knowledge had a significant direct relation with children's fat intakes at home. Children of meal planners with more nutrition knowledge ate significantly less fat. It appears that more nutritionally educated meal planners are providing their young children less fatty foods at home or that their children have preferences for less fatty foods while at home. Since the relationship was not significant for the total diet, the association does not seem to extend to eating situations outside the home. Perhaps, as in day care situations, the meal planner has less control over the foods served or made available to the child.

Overall, results indicate that the relationship of meal planners' attitudes and knowledge to their fat intakes and to their children's fat intakes were similar but for children the relationship was weaker.

Few control variables were significantly related to fat intake. Children and meal planners living in households whose meal planner was employed had significantly less percent fat from foods eaten at home. Children and meal planners living in households in the midwest had a significantly greater percent fat in home foods and the total diet. The results are consistent with reports from

1985 CSFII data which found region to be significantly related to the fat intake of women 19-50 years of age (Krebs-Smith, 1988).

Other researchers have found racial differences in children's fat intakes (Kimm et al., 1990; Nicklas et al., 1987) and in the correlation strength of parent-child fat intakes (Laskerzewski et al., 1980). The present study did not assess nutrient intake levels by race, but results of the study do not show significant differences between white and non-white families in terms of how meal planner attitudes and knowledge relate to preschool children's intakes of fat.

2. Fiber Density:

A summary of regression results for fiber intake are shown in Tables 4.9-4.12. The importance of taste and utility concerns of the meal planner were significantly related to less fiber dense diets consumed by the meal planner at home and for the entire day. Guthrie (1988) also found that consumers who considered taste to be of greater importance consumed less fiber than their counterparts who attributed greater importance to health beliefs. Fresh fruits and vegetables are good sources of fiber but are highly perishable and often require more preparation time -

Table 4.9 Fiber Intake, Home foods: Relationship of household meal planner's attitudes and knowledge with fiber density of foods consumed at home by the meal planner (n=478) and preschool child (n=478). The difference between the attitude-fiber intake relationship of the meal planner and the child is also shown.

VARIABLE	MEAL PLANNER		CHILD		DIFFERENCE	
	β-weight	p-value	β-weight	p-value	β-weight	p-value
Awareness	-0.05	0.54	0.04	0.60	0.09	0.42
Susceptibility	0.23	0.21	0.32	0.08	0.09	0.72
Benefit	-0.13	0.32	-0.13	0.33	0.003	0.98
Taste	-0.72	0.005	0.08	0.75	0.80	0.03
Utility	-0.68	0.001	-0.30	0.13	0.38	0.17
Knowledge	0.21	0.002	0.11	0.09	-0.10	0.31

Table 4.10 Fiber Intake, Home foods: Significantly related sociodemographic/control variables (significant for both meal planner and child).

Variable	**Direction of Significance / p-value**
High School or less	- (.02)
Single parent	- (.01)
Northeast	- (.0001)
Midwest	- (.0001)

Table 4.11 Fiber Intake, Total: Relationship of household meal planner's attitudes and knowledge with fiber density of the total diet of the meal planner (n=478) and preschool child (n=478). The difference between the attitude-fiber intake relationship of the meal planner and the child is also shown.

VARIABLE	MEAL PLANNER		CHILD		DIFFERENCE	
	β-weight	p-value	β-weight	p-value	β-weight	p-value
Awareness	-0.05	0.52	0.06	0.43	0.11	0.31
Susceptibility	-0.03	0.83	0.24	0.14	0.28	0.23
Benefit	-0.07	0.55	-0.09	0.45	-0.02	0.91
Taste	-0.53	0.02	0.18	0.45	0.71	0.03
Utility	-0.67	0.0002	-0.22	0.23	0.45	0.07
Knowledge	0.14	0.02	0.07	0.25	-0.07	0.43

Table 4.12 Fiber Intake, Total: Significantly related sociodemographic/control variables (significant for both meal planner and child).

Variable	Direction of Significance / p-value
High school or less	- (.01)
Northeast	- (.001)
Midwest	- (.002)

both factors might also discourage fiber consumption for utilitarian reasons. Nutrition knowledge was significantly related to greater fiber intakes by meal planners for both home foods and total diet. This indicates that knowledge may facilitate selection of higher fiber foods.

The relationship of meal planners' attitudes and knowledge with the fiber density of their diets and that of their children did not always follow similar trends. Higher taste concerns were related to a less fiber dense diet for meal planners but a more fiber dense diet for children both at home and for the total diet. The difference associated with taste concerns was significant for home and total diets. Taste preferences of meal planners do not appear to have been a controlling factor in the foods served to the children.

Although the relationship of taste and fiber intake was significantly different between meal planners and children, none of the meal planner's concerns assessed in the study were significantly related to children's fiber intakes. As with results for fat intakes, the finding indicates a weak relationship between meal planner's attitudes/knowledge and children's fiber intake.

Several control variables were significantly related to fiber intake. Meal planners and children in households located in the midwest and northeast and those whose meal

planner had a high school education or less consumed significantly less fiber at home and in the total diet. Meal planners and children of single parent households also consumed significantly less fiber at home. The results are consistent with findings reported for fiber intake of women 19-50 years with 1985 CSFII data (Cronin, 1989).

C. LIMITATIONS

As with any methodology, nutrient calculations from self-reported food intake records may not reflect true intakes of the respondents. Mertz et al. (1991) reported that individuals tend to underestimate and under-report energy intakes by 18%. Whether the nature of this under-reporting is random or consistent across some variable is not known. One study suggests the degree of under-reporting may vary with body mass index (Mertz et al., 1991). Other authors have suggested that reported estimates vary according to the amount of food consumed, with big eaters under-reporting and small eaters over-reporting (Cameron and Van Staveren, 1988). No studies have directly evaluated the later non-constant bias, referred to as the flat-slope syndrome since values gravitate toward the mid-range. Cameron and Van Staveren (1988) note that regression lines calculated for this type of data would also regress to the mean.

Other problems endemic to self-reports include memory faults and imperfect knowledge. The individual may not remember and report every food item consumed during the survey period or may not be able to fully describe food items, for example, of a cafeteria meal. The interest level of the respondent may also influence the accuracy of reports.

Additionally, researchers would need to assume that the individual's food intake during the 24 hour period was representative of the individual's typical diet. Preschool children are characterized by irregular eating patterns. Using only one day's intake, this sporadicity may affect attempts to investigate any relationships between a meal planner's attitude/knowledge and the dietary behavior of preschoolers.

Proxy reporting for children under 12 years of age presents another potential bias in CSFII nutrient data. As Hertzler reported (1990), most studies have used secondary data sources, usually a child's caregiver, to collect food intake information for preschool children. Few studies have evaluated the reliability of food intake data collected directly from preschool children. Alternatives to proxy reporting for preschool children may not be feasible, but various limitations ensue when data are collected from a secondary source. The caregiver may not have exact

knowledge of the food a child has eaten, especially if the child has eaten meals and snacks away from home. Or meal planners may be prone to report food they feel the child should be eating, regardless of what the child actually ate. Meal planners may also have a tendency to report for the child foods similar to their own diet thus creating artificially high correlations between child and caregiver intakes.

Controlled feeding studies do provide accurate measurement, but the cost and time involved prohibits use on a large scale. The tradeoff for collecting and using data that represent a national cross-section, of all ages, is less accurate food intake data.

D. HOME FOODS VS TOTAL DIET

No significant differences resulted with percent fat or fiber density of home foods compared to total diet for children or meal planners. Attitude and knowledge variables also appear to have operated similarly for home and total diets. One exception is knowledge, which was significantly related to home fat intakes but not fat in the total diet of meal planners and children. This, again, may be a result of limited knowledge of the fat content of foods procured away from home and/or a limited selection of foods from which to choose.

The findings suggest that meal planners' attitudes and knowledge have similar associations with fat and fiber for meal planners' and children's total diet (to include food eaten outside the home) as for foods consumed at home. One exception may be meal planner knowledge and children's fat intakes as previously discussed. Although the source and possibly the types of foods may have been different - restaurant or day care meals in the total diet versus home-prepared meals in the home - the food choices appear to have been similar.

E. THE MODEL

Discussion of the usefulness of the modified Health Belief Model is limited. Because the regression equations were constructed with a 'no intercept' specification, it is not possible to determine how much variance was accounted for by the model. In addition, the reliability of the proxy questions in measuring the theoretical constructs was not assessed. However, the model was helpful in guiding the delineation of the attitude constructs. Several of the attitude dimensions studied carried significant relationships with fat and fiber intake. This does not necessarily indicate that the other dimensions have no bearing on dietary behavior - they may operate more fully with behaviors other than fat and fiber intakes, such as

food choices. Overall, the model appears useful in examining how attitudes and perceptions, especially those regarding dietary recommendations, relate to dietary behaviors.

CHAPTER V

CONCLUSIONS AND IMPLICATIONS

The main objective of the present study was to examine the relationship of household meal planners' nutrition attitudes and knowledge to their intake and to that of their preschool children. In other words, if household meal planners have adequate nutrition knowledge and are cognizant of and believe in the dietary recommendations to improve health, would their diet reflect a lower-fat, higher-fiber profile and/or would their preschoolers' diets reflect lower-fat, higher-fiber patterns. Family intervention programs assume that the diets of other household members will reflect positive changes as a result of intervention efforts directed toward one key family member.

The results of the study indicate that meal planners' nutrition attitudes and knowledge are more operational in their own diets than in the diets of their children. Several attitude and knowledge variables were significantly related to the fat and fiber intakes of the meal planner. However, only one of these variables was significantly related to children's diets -meal planner knowledge to children's at-home fat intake. And only one variable, taste concerns, had a significantly different relationship with meal planner diets than with children's diets for both fat and fiber.

Overall, the relationships of meal planners' knowledge and attitudes to fat and fiber intakes of themselves and their children were similar, but the relationship for children was not as strong.

The finding implies that gatekeepers do exert some effect on the household food supply according to their attitudes/knowledge but that the effect is not strong. Bi-directional influences on the family food supply were not examined in the study and may be one reason for the weak unidirectional relationship found between meal planners' nutrition attitudes and knowledge and the diets of preschool children. The preschool children in the study households may have expressed a preference or dislike for certain foods. If meal planners catered to the children's palate, different eating patterns would result with potentially different overall fat and fiber intakes.

Additionally, the concept of 'food for children' may have mediated different food selection patterns. Certain foods deemed appropriate for or needed by children would be served to the children but not necessarily to adults. An example would be whole milk and fruits. Conversely, foods may be classified as being a more adult food, such as salads, and would not be served to children.

Meal planners' taste concerns consistently carried an inverse relationship with children's diets which supports

both explanations. Meal planners who rated taste as an important consideration consumed more fat and significantly less fiber, but their children consumed less fat and significantly more fiber. This indicates that meal planners' taste preferences were not dictating which foods the children ate.

The results suggest that nutrition education programs that direct efforts at changing household meal planners' general nutrition attitudes and knowledge may not be the most effective means to impact preschool children's diets. Meal planners may have specific attitudes toward preschool children's food consumption that are different from their own food patterns. Determining how meal planners differentiate between food choices for young children and themselves should be further investigated.

The present study examined fat and fiber intakes and did not address food sources of fat and fiber. Explanations for differences in the fat and fiber intakes of meal planners and children center around food choices - consumers choose foods, not nutrients. And many nutrition education programs teach selection of food groups, not single nutrients. Attitude and knowledge constructs examined in the study appear to have more significant relationships with meal planners' consumption and yet their children consumed equivalent ratios of fat and fiber.

Results of the study suggest that another dynamic may be operating in the schema of preschool children's food intake. Meal planners may base their feeding behavior on perceptions additional to those assessed by the model that are more specific to children's diets. Or the attitudes assessed by the model may operate differently at the consumer (i.e., food) level than at the nutrient level. Further research is needed to determine whether a difference exists among meal planners' and children's dietary sources of fat and fiber, whether the meal planners' nutrition attitudes and knowledge make a significant difference in the food choices for each individual and whether meal planners' beliefs about children's diets are different than for their own diet.

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APPENDIX A

CONTROL VARIABLES USED IN MULTI-VARIATE ANALYSIS

To relieve potential bias induced by socio-economic characteristics and the effects of the stratified cluster design, the co-variate variables listed in Table 3.4 were introduced into the multi-variate equations. Demographic characteristics included degree of urbanization, race of the meal planner, education level of the meal planner, employment status of the meal planner, head of household status, household income level, household Food Stamp participation and geographic region of the household. In addition, the month and day of the survey interview was included.

Control variables were defined in a dichotomized fashion for easier interpretation with multi-variate analysis. Table A presents value assignments for the variables. Additional notes:

- Low income was set at below 185% poverty for purposes of the control variable. Although this differs from the low income sample selection criteria (130% poverty for previous month), the 185% poverty level reflects the income criteria for WIC participation. Using 185% poverty as the cutoff for the control variable allows those children receiving WIC benefits to be included in the low-income group.

- Four geographic regions were designated: northeast, south, midwest and west. Entering the first three as dummy variables allows the fourth to be inferred.

- Fat and fiber intake may vary with season. People may consume heartier dishes in cooler weather resulting in a greater fat intake. Fruits and vegetables are usually more readily available in the warmer months which would promote more fiber consumption. Since surveys were conducted year-round, controlling for the survey month should alleviate seasonal effects on fat and fiber intake.

- Interviews were scheduled to provide data representative of each day of the week. Some interviewers were reluctant to conduct interviews on Sunday which, as a result, is less represented. Any major differences in nutrient intake resulting from a difference in the day of the week would largely be a difference between weekday eating patterns versus weekend patterns. To control for any such bias, the interview day, categorized as weekday/weekend, was included as a control variable. The binomial categorization should help alleviate any bias stemming from the under-representation of Sundays.

Table A. Binomial assignment of control variables included in multi-variate analyses.

VARIABLE (characteristic)	RESPONSES RECEIVING VALUE OF 0 (no)	RESPONSES RECEIVING VALUE OF 1 (yes)
CITY (urbanization)	- suburban - nonmetropolitan	- central city
NONWHITE (race)	- White	- Black - Asian / Pacific Islander - Aleut, Eskimo, American Indian - Other
NOHIEDUC (education level)	- more than high school education	- completed 12th grade or less
MMPWKS (employment status)	- meal planner not employed	- meal planner employed full or part time
SINGLEPT (hhld head status)	- both male and female heads of hhld	- only female head of hhld - only male head of hhld
LOWINC (income level)	- annual hhld income >185% poverty	- annual hhld income <185% poverty
RCV_FDST (food stamps)	- hhld does not receive	- hhld presently receives
NEREGION (northeast)	- hhld not located in NE	- hhld located in northeast
SREGION (south)	- hhld not located in MW	- hhld located in south
MWREGION (midwest)	- hhld not located in S	- hhld located in midwest
FALLWNTR (season of survey)	- survey conducted during April - September	- survey conducted during October - March
WEEKEND (day of survey)	- survey conducted during Monday - Friday	- survey conducted on a Saturday or Sunday

hhld = household

APPENDIX B

LIST OF STUDY VARIABLES

Variable Name	Variable Type	Variable Description
DEPENDENT VARIABLES	continuous	
HPCTFAT		Percent fat in home foods
HFIBDEN		Fiber density of home foods
DPCTFAT		Percent fat in total diet
DFIBDEN		Fiber density of total diet
INDEPENDENT VARIABLES	categorical	
AWARENESS		Meal planner's awareness of diet-health relationships (score range: 0-9)
SUSCEPTIBILITY		Meal planner's perceived susceptibility to health problems (score range: 1-6)
BENEFIT		Meal planner's belief that diet can affect chance for disease
UTILITY		Meal planner's concern for food price, ease of preparation and perishability (score 0-3)
TASTE		Meal planner's concern for taste when food shopping (score range: 1-6)
KNOWLEDGE		Meal planner's nutrition knowledge (score range: 0-26)
variableC		Interaction term: variable X CHILD - assesses difference in relation to variable with child
variableM		Interaction term: variable X MMP - assesses difference in relation to variable with MMP

Variable Name	Variable Type	Variable Description (cont'd)
MMP	(dummy)	Indicates observation is for meal planner
CHILD	(dummy)	Indicates observation is for child
CONTROL VARIABLES	categorical	(see also Appendix B)
CITY		Degree of urbanization
NONWHITE		Race of meal planner
NOHIEDUC		Education level of meal planner
MMPWKS		Employment status of meal planner
SINGLEPT		Head of household status
LOWINC		Household income level
RCV_FDST		Food Stamp participation
NEREGION		Household located in northeast
MWREGION		Household located in midwest
SREGION		Household located in south
FALLWNTR		Season of survey
WEEKEND		Day of survey

APPENDIX C

INTAKE CORRELATIONS

A. CORRELATIONS BETWEEN MEAL PLANNER AND CHILD INTAKES

Pearson correlation coefficients comparing percent energy from fat (percent fat) and grams of fiber per 1000 kcal (fiber density) of meal planners' versus children's home and total diet.

MEAL PLANNERS	CHILDREN			
	PERCENT FAT		FIBER DENSITY	
	Home Foods	Total Diet	Home Foods	Total Diet
PERCENT FAT				
Home Foods	.46	.38	-.15	-.15
Total Diet	.37	.39	-.13	-.13
FIBER DENSITY				
Home Foods	-.11	-.18	.41	.41
Total Diet	-.12	-.15	.35	.40

APPENDIX C - continued

B. CORRELATIONS BETWEEN HOME FOODS AND TOTAL DIET

Pearson correlation coefficients comparing percent energy from fat (percent fat) and grams fiber per 1000 kcal (fiber density) of meal planners' and childrens' home versus total diets

TOTAL DIET	HOME FOODS			
	PERCENT FAT		FIBER DENSITY	
	Meal planners	Children	Meal planners	Children
PERCENT FAT				
Meal planners	.88	.37	-.30	-.13
Children	.39	.89	-.18	-.27
FIBER DENSITY				
Meal planners	-.32	-.12	.90	.35
Children	-.15	-.23	.41	.92

APPENDIX D

FREQUENCY OF ATTITUDE AND KNOWLEDGE SCORES OF THE 478 MEAL PLANNERS

CONSTRUCT	SCORE	NUMBER OF RESPONDENTS	% OF RESPONDENTS	CUMULATIVE FREQUENCY
Awareness	0	11	2.3	11
	1	17	3.6	28
	2	14	2.9	42
	3	31	6.5	73
	4	37	7.7	110
	5	46	9.6	156
	6	71	14.9	227
	7	68	14.2	295
	8	82	17.2	377
	9	101	21.1	478
Susceptibility	1	106	22.2	106
	2	174	36.4	280
	3	152	31.8	432
	4	39	8.2	471
	5	7	1.5	478
Benefits	1	20	4.2	20
	2	11	2.3	31
	3	23	4.8	54
	4	54	11.3	108
	5	101	21.1	209
	6	269	56.3	478

CONSTRUCT	SCORE	NUMBER OF RESPONDENTS	% OF RESPONDENTS	CUMULATIVE FREQUENCY
Utility	0	33	6.9	33
	1	111	23.2	144
	2	172	36.0	316
	3	162	33.9	478
Taste	1	2	0.4	2
	2	0	0	2
	3	2	0.4	4
	4	28	5.9	32
	5	93	19.5	125
	6	353	73.8	478
Knowledge	9	2	0.4	2
	10	2	0.4	4
	11	9	1.9	13
	12	11	2.3	24
	13	26	5.4	50
	14	38	7.9	88
	15	64	13.4	152
	16	56	11.7	208
	17	61	12.8	269
	18	69	14.4	338
	19	39	8.2	377
	20	45	9.4	422
	21	30	6.3	452
	22	15	3.1	467
	23	7	1.5	474
	24	4	0.8	478
	25	0	0	478
	26	0	0	478

APPENDIX E

RESULTS FROM REGRESSION MODELS

The following charts present full results from the two regression models run for percent fat (PCTFAT) and fiber density (FIBDEN) for home foods (H) and for total diet (D). Interaction terms involving children (variableC) and meal planners (variableM) pull out the effects of the respective individual from the non-interaction variables. Hence, regression model 1 presents the direct relationship of the attitude/knowledge variables to meal planners' intakes and model 2 presents the direct relationship of the variables to children's intakes.

Model: MODEL1
NOTE: No intercept in model. R-square is redefined.
Dependent Variable: HFATPCT

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	26	1073313.29	41281.280385	471.196	0.0001
Error	930	81476.97837	87.60965		
U Total	956	1154790.2684			

Root MSE	9.36000	R-square	0.9294
Dep Mean	33.42242	Adj R-sq	0.9275
C.V.	28.00516		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
MMP	1	35.930185	5.22676882	6.874	0.0001
CHILD	1	35.073785	5.22676882	6.710	0.0001
AWARENES	1	0.314310	0.20735581	1.516	0.1299
KNWLG	1	-0.465648	0.17894027	-2.602	0.0094
SUSCEP	1	-1.317179	0.46654246	-2.823	0.0049
BENEFIT	1	0.012755	0.33582179	0.038	0.9697
TASTE	1	0.531874	0.66038152	0.805	0.4208
UTILITY	1	1.196332	0.50874128	2.352	0.0189
AWAREC	1	-0.103594	0.29150954	-0.355	0.7224
KNWLGC	1	0.081087	0.24618075	0.329	0.7419
SUSCEPC	1	1.052368	0.65105373	1.616	0.1063
BENEFITC	1	0.285097	0.47334729	0.602	0.5471
TASTEC	1	-0.595201	0.92697308	-0.642	0.5210
UTILITYC	1	-0.599783	0.70767779	-0.848	0.3969
CITY	1	-1.247597	0.68945407	-1.810	0.0707
NONWHITE	1	0.334070	0.83341138	0.401	0.6886
NOHIEDUC	1	1.197273	0.79971310	1.497	0.1347
MMPWORKS	1	-2.183202	0.68298108	-3.197	0.0014
SINGLEPT	1	-0.227213	0.92019924	-0.247	0.8050
LOWINC	1	0.382704	0.81046369	0.472	0.6369
FALLWNTR	1	0.606985	0.62194655	0.976	0.3293
WEEKEND	1	0.394431	0.72237088	0.546	0.5852
NEREGION	1	0.869294	1.03208333	0.842	0.3999
MWREGION	1	2.001587	0.89545365	2.235	0.0256
SREGION	1	1.208806	0.88669688	1.363	0.1731
RCV_FDST	1	-0.087584	0.90498717	-0.097	0.9229

Model: MODEL2
NOTE: No intercept in model. R-square is redefined.
Dependent Variable: HFATPCT

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	26	1073313.29	41281.280385	471.196	0.0001
Error	930	81476.97837	87.60965		
U Total	956	1154790.2684			

Root MSE	9.36000	R-square	0.9294
Dep Mean	33.42242	Adj R-sq	0.9275
C.V.	28.00516		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
MMP	1	35.930185	5.22676882	6.874	0.0001
CHILD	1	35.073785	5.22676882	6.710	0.0001
AWARENES	1	0.210715	0.20735581	1.016	0.3098
KNWLG	1	-0.384561	0.17894027	-2.149	0.0319
SUSCEP	1	-0.264811	0.46654246	-0.568	0.5704
BENEFIT	1	0.297853	0.33582179	0.887	0.3753
TASTE	1	-0.063327	0.66038152	-0.096	0.9236
UTILITY	1	0.596549	0.50874128	1.173	0.2413
AWAREM	1	0.103594	0.29150954	0.355	0.7224
KNWLGM	1	-0.081087	0.24618075	-0.329	0.7419
SUSCEPM	1	-1.052368	0.65105373	-1.616	0.1063
BENEFITM	1	-0.285097	0.47334729	-0.602	0.5471
TASTEM	1	0.595201	0.92697308	0.642	0.5210
UTILITYM	1	0.599783	0.70767779	0.848	0.3969
CITY	1	-1.247597	0.68945407	-1.810	0.0707
NONWHITE	1	0.334070	0.83341138	0.401	0.6886
NOHIEDUC	1	1.197273	0.79971310	1.497	0.1347
MMPWORKS	1	-2.183202	0.68298108	-3.197	0.0014
SINGLEPT	1	-0.227213	0.92019924	-0.247	0.8050
LOWINC	1	0.382704	0.81046369	0.472	0.6369
FALLWNTR	1	0.606985	0.62194655	0.976	0.3293
WEEKEND	1	0.394431	0.72237088	0.546	0.5852
NEREGION	1	0.869294	1.03208333	0.842	0.3999
MWREGION	1	2.001587	0.89545365	2.235	0.0256
SREGION	1	1.208806	0.88669688	1.363	0.1731
RCV_FDST	1	-0.087584	0.90498717	-0.097	0.9229

Model: MODEL1
NOTE: No intercept in model. R-square is redefined.
Dependent Variable: DFATPCT

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	26	1123716.8191	43219.877658	591.835	0.0001
Error	930	67915.04705	73.02693		
U Total	956	1191631.8661			

Root MSE	8.54558	R-square	0.9430
Dep Mean	34.23403	Adj R-sq	0.9414
C.V.	24.96223		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
MMP	1	35.544823	4.77198245	7.449	0.0001
CHILD	1	38.041945	4.77198245	7.972	0.0001
AWARENES	1	0.048490	0.18931357	0.256	0.7979
KNWLG	1	-0.275251	0.16337050	-1.685	0.0924
SUSCEP	1	-1.145144	0.42594814	-2.688	0.0073
BENEFIT	1	0.171706	0.30660160	0.560	0.5756
TASTE	1	0.230512	0.60292106	0.382	0.7023
UTILITY	1	1.030431	0.46447520	2.218	0.0268
AWAREC	1	-0.078830	0.26614500	-0.296	0.7671
KNWLGC	1	-0.023430	0.22476032	-0.104	0.9170
SUSCEPC	1	0.814337	0.59440490	1.370	0.1710
BENEFITC	1	-0.075830	0.43216087	-0.175	0.8608
TASTEC	1	-0.413742	0.84631622	-0.489	0.6250
UTILITYC	1	-0.727468	0.64610204	-1.126	0.2605
CITY	1	-0.673261	0.62946398	-1.070	0.2851
NONWHITE	1	-0.363675	0.76089543	-0.478	0.6328
NOHIEDUC	1	0.797915	0.73012926	1.093	0.2747
MMPWORKS	1	-0.838431	0.62355422	-1.345	0.1791
SINGLEPT	1	0.927104	0.84013178	1.104	0.2701
LOWINC	1	0.352504	0.73994444	0.476	0.6339
FALLWNTR	1	0.633834	0.56783036	1.116	0.2646
WEEKEND	1	0.157968	0.65951667	0.240	0.8108
NEREGION	1	0.618273	0.94228073	0.656	0.5119
MWREGION	1	2.183945	0.81753933	2.671	0.0077
SREGION	1	1.012383	0.80954450	1.251	0.2114
RCV_FDST	1	-0.188190	0.82624333	-0.228	0.8199

Model: MODEL2
NOTE: No intercept in model. R-square is redefined.
Dependent Variable: DFATPCT

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	26	1123716.8191	43219.877658	591.835	0.0001
Error	930	67915.04705	73.02693		
U Total	956	1191631.8661			

Root MSE	8.54558	R-square	0.9430
Dep Mean	34.23403	Adj R-sq	0.9414
C.V.	24.96223		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
MMP	1	35.544823	4.77198245	7.449	0.0001
CHILD	1	38.041945	4.77198245	7.972	0.0001
AWARENES	1	-0.030340	0.18931357	-0.160	0.8727
KNWLG	1	-0.298681	0.16337050	-1.828	0.0678
SUSCEP	1	-0.330807	0.42594814	-0.777	0.4376
BENEFIT	1	0.095876	0.30660160	0.313	0.7546
TASTE	1	-0.183230	0.60292106	-0.304	0.7613
UTILITY	1	0.302963	0.46447520	0.652	0.5144
AWAREM	1	0.078830	0.26614500	0.296	0.7671
KNWLGM	1	0.023430	0.22476032	0.104	0.9170
SUSCEPM	1	-0.814337	0.59440490	-1.370	0.1710
BENEFITM	1	0.075830	0.43216087	0.175	0.8608
TASTEM	1	0.413742	0.84631622	0.489	0.6250
UTILITYM	1	0.727468	0.64610204	1.126	0.2605
CITY	1	-0.673261	0.62946398	-1.070	0.2851
NONWHITE	1	-0.363675	0.76089543	-0.478	0.6328
NOHIEDUC	1	0.797915	0.73012926	1.093	0.2747
MMPWORKS	1	-0.838431	0.62355422	-1.345	0.1791
SINGLEPT	1	0.927104	0.84013178	1.104	0.2701
LOWINC	1	0.352504	0.73994444	0.476	0.6339
FALLWNTR	1	0.633834	0.56783036	1.116	0.2646
WEEKEND	1	0.157968	0.65951667	0.240	0.8108
NEREGION	1	0.618273	0.94228073	0.656	0.5119
MWREGION	1	2.183945	0.81753933	2.671	0.0077
SREGION	1	1.012383	0.80954450	1.251	0.2114
RCV_FDST	1	-0.188190	0.82624333	-0.228	0.8199

Model: MODEL1
NOTE: No intercept in model. R-square is redefined.
Dependent Variable: HFIBDEN

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	26	46040.36479	1770.78326	132.778	0.0001
Error	930	12402.84929	13.33640		
U Total	956	58443.21408			

Root MSE	3.65190	R-square	0.7878
Dep Mean	6.82151	Adj R-sq	0.7818
C.V.	53.53508		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
MMP	1	10.920087	2.03927863	5.355	0.0001
CHILD	1	5.866359	2.03927863	2.877	0.0041
AWARENES	1	-0.050055	0.08090204	-0.619	0.5363
KNWLG	1	0.215241	0.06981542	3.083	0.0021
SUSCEP	1	0.229323	0.18202643	1.260	0.2080
BENEFIT	1	-0.130548	0.13102439	-0.996	0.3193
TASTE	1	-0.722306	0.25765477	-2.803	0.0052
UTILITY	1	-0.677935	0.19849074	-3.415	0.0007
AWAREC	1	0.092380	0.11373550	0.812	0.4169
KNWLGC	1	-0.096710	0.09605000	-1.007	0.3143
SUSCEPC	1	0.092434	0.25401544	0.364	0.7160
BENEFITC	1	0.003541	0.18468141	0.019	0.9847
TASTEC	1	0.803155	0.36166826	2.221	0.0266
UTILITYC	1	0.379561	0.27610790	1.375	0.1696
CITY	1	0.345656	0.26899773	1.285	0.1991
NONWHITE	1	0.274473	0.32516418	0.844	0.3988
NOHIEDUC	1	-0.738079	0.31201644	-2.366	0.0182
MMPWORKS	1	-0.097456	0.26647223	-0.366	0.7147
SINGLEPT	1	-0.874302	0.35902538	-2.435	0.0151
LOWINC	1	-0.015296	0.31621090	-0.048	0.9614
FALLWNTR	1	-0.224219	0.24265897	-0.924	0.3557
WEEKEND	1	0.180988	0.28184057	0.642	0.5209
NEREGION	1	-1.571286	0.40267813	-3.902	0.0001
MWREGION	1	-1.339556	0.34937062	-3.834	0.0001
SREGION	1	-0.561384	0.34595408	-1.623	0.1050
RCV_FDST	1	-0.093288	0.35309023	-0.264	0.7917

Model: MODEL2
NOTE: No intercept in model. R-square is redefined.
Dependent Variable: HFIBDEN

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	26	46040.36479	1770.78326	132.778	0.0001
Error	930	12402.84929	13.33640		
U Total	956	58443.21408			

Root MSE	3.65190	R-square	0.7878
Dep Mean	6.82151	Adj R-sq	0.7818
C.V.	53.53508		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
MMP	1	10.920087	2.03927863	5.355	0.0001
CHILD	1	5.866359	2.03927863	2.877	0.0041
AWARENES	1	0.042325	0.08090204	0.523	0.6010
KNWLG	1	0.118531	0.06981542	1.698	0.0899
SUSCEP	1	0.321757	0.18202643	1.768	0.0774
BENEFIT	1	-0.127007	0.13102439	-0.969	0.3326
TASTE	1	0.080849	0.25765477	0.314	0.7538
UTILITY	1	-0.298374	0.19849074	-1.503	0.1331
AWAREM	1	-0.092380	0.11373550	-0.812	0.4169
KNWLGM	1	0.096710	0.09605000	1.007	0.3143
SUSCEPM	1	-0.092434	0.25401544	-0.364	0.7160
BENEFITM	1	-0.003541	0.18468141	-0.019	0.9847
TASTEM	1	-0.803155	0.36166826	-2.221	0.0266
UTILITYM	1	-0.379561	0.27610790	-1.375	0.1696
CITY	1	0.345656	0.26899773	1.285	0.1991
NONWHITE	1	0.274473	0.32516418	0.844	0.3988
NOHIEDUC	1	-0.738079	0.31201644	-2.366	0.0182
MMPWORKS	1	-0.097456	0.26647223	-0.366	0.7147
SINGLEPT	1	-0.874302	0.35902538	-2.435	0.0151
LOWINC	1	-0.015296	0.31621090	-0.048	0.9614
FALLWNTR	1	-0.224219	0.24265897	-0.924	0.3557
WEEKEND	1	0.180988	0.28184057	0.642	0.5209
NEREGION	1	-1.571286	0.40267813	-3.902	0.0001
MWREGION	1	-1.339556	0.34937062	-3.834	0.0001
SREGION	1	-0.561384	0.34595408	-1.623	0.1050
RCV_FDST	1	-0.093288	0.35309023	-0.264	0.7917

Model: MODEL1
NOTE: No intercept in model. R-square is redefined.
Dependent Variable: DFIBDEN

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	26	46738.85150	1797.64813	162.390	0.0001
Error	930	10295.07882	11.06998		
U Total	956	57033.93032			

Root MSE	3.32716	R-square	0.8195
Dep Mean	6.90297	Adj R-sq	0.8144
C.V.	48.19891		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
MMP	1	11.221097	1.85793567	6.040	0.0001
CHILD	1	5.642410	1.85793567	3.037	0.0025
AWARENES	1	-0.047602	0.07370782	-0.646	0.5186
KNWLG	1	0.142897	0.06360708	2.247	0.0249
SUSCEP	1	-0.035277	0.16583972	-0.213	0.8316
BENEFIT	1	-0.071394	0.11937304	-0.598	0.5499
TASTE	1	-0.529292	0.23474281	-2.255	0.0244
UTILITY	1	-0.670002	0.18083994	-3.705	0.0002
AWAREC	1	0.105765	0.10362157	1.021	0.3077
KNWLGC	1	-0.069028	0.08750875	-0.789	0.4304
SUSCEPC	1	0.279440	0.23142710	1.207	0.2276
BENEFITC	1	-0.018087	0.16825860	-0.107	0.9144
TASTEC	1	0.705460	0.32950689	2.141	0.0325
UTILITYC	1	0.451054	0.25155499	1.793	0.0733
CITY	1	0.304150	0.24507709	1.241	0.2149
NONWHITE	1	0.031587	0.29624894	0.107	0.9151
NOHIEDUC	1	-0.759129	0.28427037	-2.670	0.0077
MMPWORKS	1	-0.023986	0.24277617	-0.099	0.9213
SINGLEPT	1	-0.518601	0.32709903	-1.585	0.1132
LOWINC	1	0.012047	0.28809183	0.042	0.9667
FALLWNTR	1	-0.288810	0.22108050	-1.306	0.1918
WEEKEND	1	0.177203	0.25677788	0.690	0.4903
NEREGION	1	-1.289510	0.36686995	-3.515	0.0005
MWREGION	1	-0.965293	0.31830282	-3.033	0.0025
SREGION	1	-0.270937	0.31519010	-0.860	0.3902
RCV_FDST	1	-0.251685	0.32169166	-0.782	0.4342

Model: MODEL2
NOTE: No intercept in model. R-square is redefined.
Dependent Variable: DFIBDEN

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	26	46738.85150	1797.64813	162.390	0.0001
Error	930	10295.07882	11.06998		
U Total	956	57033.93032			

Root MSE	3.32716	R-square	0.8195
Dep Mean	6.90297	Adj R-sq	0.8144
C.V.	48.19891		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
MMP	1	11.221097	1.85793567	6.040	0.0001
CHILD	1	5.642410	1.85793567	3.037	0.0025
AWARENES	1	0.058163	0.07370782	0.789	0.4303
KNWLG	1	0.073869	0.06360708	1.161	0.2458
SUSCEP	1	0.244163	0.16583972	1.472	0.1413
BENEFIT	1	-0.089481	0.11937304	-0.750	0.4537
TASTE	1	0.176167	0.23474281	0.750	0.4532
UTILITY	1	-0.218947	0.18083994	-1.211	0.2263
AWAREM	1	-0.105765	0.10362157	-1.021	0.3077
KNWLGM	1	0.069028	0.08750875	0.789	0.4304
SUSCEPM	1	-0.279440	0.23142710	-1.207	0.2276
BENEFITM	1	0.018087	0.16825860	0.107	0.9144
TASTEM	1	-0.705460	0.32950689	-2.141	0.0325
UTILITYM	1	-0.451054	0.25155499	-1.793	0.0733
CITY	1	0.304150	0.24507709	1.241	0.2149
NONWHITE	1	0.031587	0.29624894	0.107	0.9151
NOHIEDUC	1	-0.759129	0.28427037	-2.670	0.0077
MMPWORKS	1	-0.023986	0.24277617	-0.099	0.9213
SINGLEPT	1	-0.518601	0.32709903	-1.585	0.1132
LOWINC	1	0.012047	0.28809183	0.042	0.9667
FALLWNTR	1	-0.288810	0.22108050	-1.306	0.1918
WEEKEND	1	0.177203	0.25677788	0.690	0.4903
NEREGION	1	-1.289510	0.36686995	-3.515	0.0005
MWREGION	1	-0.965293	0.31830282	-3.033	0.0025
SREGION	1	-0.270937	0.31519010	-0.860	0.3902
RCV_FDST	1	-0.251685	0.32169166	-0.782	0.4342

VITA

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