

**Nurturing family and eating behavior among midlife women: implications for
weight gain**

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Abstract

Midlife women (40-60 years) tend to gain weight with age, which increases risk of obesity-related chronic diseases. In their role as food provisioners within the household, women may focus on meeting needs and preferences of family members, and in the process compromise their own dietary needs with implications for long term weight gain. Findings from a previous research study established a set of six situation-based needs for specific eating occasions with respect to factors such as convenience, health, reward and nurturance. The three studies in this dissertation address issues with respect to the need to nurture family through “nurturing family meals” eating occasions.

The first study identified and prioritized barriers to healthy meals for women who indicated they commonly experience ‘nurturing family meals’ eating occasions. Midlife women (n=37) participated in focus group discussions that utilized a nominal group technique and identified issues of time and cost as the most important barriers, followed by the need to accommodate family food preferences. In the second study, food and nutrient intakes were compared between groups of women who reported experiencing ‘nurturing family meal’ dinner eating occasions (n=594) vs. dinner eating occasions focused on eating sensibly and caring for themselves (n=298). Data were from a larger study involving mailed survey responses from a national sample of 1,928 women including a one-day food record and meal/snack eating occasion questionnaires. Overall, dietary intakes were healthier when women focused on themselves vs. nurturing family, with lower consumption of refined grains, non low-fat foods (meat, dairy and fats), sugar-sweetened beverages, energy, fat, cholesterol, saturated fat, sucrose and sodium. Intakes for the group focused on nurturing family were higher in protein, calcium and iron

compared to the group focused on sensible eating for themselves, indicating that there were negative and positive consequences to experiencing ‘nurturing family meals’ eating occasions. The third study evaluated associations between factors including diet, restraint and weight control practices on weight change in a group of women who participated in an untreated control group (n=104) as part of a larger weight gain prevention study conducted in the Minneapolis/St. Paul metropolitan area over two years. Based on weight change, women were divided into a loss/maintain group (n=44) or gain group (n=59). All women in both groups reported commonly experiencing ‘nurturing family meals’ eating occasions. The gain group increased overall energy and fat intake over two years compared to the loss/maintain group, which may have contributed to their weight gain. No differences in food group intakes or reported frequency of weight loss/maintenance strategies were observed. Overall the findings from these studies suggest that experiencing ‘nurturing family meals’ eating occasions may contribute to less healthy eating for midlife women. Intervention programs need to address the values, beliefs, motivations and eating behaviors of women in nurturing roles as family food provisioners.

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Chapter I : General Introduction

Introduction

As food provisioners, women play an important role in food choices and eating behaviors of household family members with consequences for their own dietary intakes. Preliminary, qualitative research has shown that eating behavior of women carrying out this role may be negatively affected by a need to serve foods that family members prefer. Women with an orientation to nurturing others may suppress their own preferences resulting in negative implications with respect to their dietary intake and weight status. However, little is known about barriers to healthy meals that women serve when they intend to nurture their family, how the healthfulness of these meals may differ based on the situation-based needs surrounding these eating occasions, and how meal patterns based on these needs affect long term weight status. This information can be used to tailor nutrition education to help midlife women address diet-related issues relevant to prevention of weight gain.

This dissertation includes a review of literature, followed by a description of three studies addressing different aspects related to eating behavior and weight status of women who frequently experience situation-based needs within eating occasions that focus on nurturing family. Each study is presented as a separate chapter. The first addresses barriers that women encounter to having healthy meals when the meals are provided to nurture family members. The second involves a comparison of eating behavior with respect to nutrient and food intakes between women at dinner meal eating occasions where the primary need is to nurture family members vs. the need to eat sensibly. The third assesses the effects of diet, weight control practices and restraint on

weight change over two years among midlife women who report often experiencing situation-based needs within eating occasions based on nurturing family. A general discussion follows the description of the three studies.

Chapter II : Review of Literature

Obesity and weight gain – prevalence in midlife women

Obesity is a major issue of public health concern. According to data from a nationally representative sample of adult women (>20 years) collected as part of the U.S. National Health and Nutrition Examination Survey (NHANES) (2009-2010), the prevalence of obesity was 35.8% (Flegal, Carroll, Odgen & Curtin 2012). Midlife women (40-59 years) had a high prevalence of overweight and obesity; 66% were overweight or obese (BMI ≥ 25 kg/m²), while 36% were obese (BMI ≥ 30 kg/m²) (Flegal et al. 2012). However, over a recent period of 12 years (1999-2008), middle-aged women showed no statistically significant increase with respect to prevalence of obesity.

Recent studies have documented an increase in weight with age among women (Sternfeld et al. 2004; Koskava, Petrusek, Vondra & Skibova 2007; Brown, Williams, Ford, Ball & Dobson 2005; Owens, Matthews, Wing & Kuller 1992; Choi, Guterrez, Gilliss & Lee 2011). Sternfeld et al. (2004) found that middle-aged women experienced a steady increase in weight (2.1 kg) over a period of 3 years (1996-1997 to 1999-2000). Among a large sample of Australian midlife women (45-55 years), follow up surveys completed at three time points over five years showed an average weight gain of 0.5 kg/year (Brown et al. 2005). A prospective analysis of three large cohorts including the Nurses' Health Study I and II and the Health Professionals Study documented a gain in weight among women during midlife (40-60 years) of a mean 3.8 lb over a 4 year period (Mozaffarian, Hao, Rimm, Willett & Hu 2011). A longitudinal study examined weight change measured between 1990 and 2008 among Swedish adults and found a 5.5% increase in weight for women over 10 years (Norberg et al. 2011). With age, Czech women experienced increases in weight and fat mass, a relative decrease in bone and

muscle mass and progressive fat centralization (accumulation of fat mass in the abdomen) (Koskava et al. 2007). Fat centralization was associated with increased waist-hip-ratio. An increase in waist circumference has been associated with risk of chronic diseases such as cardiovascular disease and diabetes (Park et al. 2003).

Weight gain is typically associated with energy imbalance. In general, total energy expenditure decreases with age, which may be a result of parallel decreases in resting metabolic rate (RMR) and activity energy expenditure (Manini 2010). The high percentage (66%) of a national sample of midlife women (40-59 years) reported to be overweight and obese by Flegal et al. (2012) may be attributed to changes in energy balance that occur during and post menopause.

Lovejoy, Champagne, Jonge, Xie & Smith (2008) assessed changes in energy balance, body composition and fat distribution in 156 healthy women (initially pre-menopausal) over a period of 4 years. At the end of the 4 year period, an increase was observed in subcutaneous adipose tissue in all women. However, visceral adipose tissue significantly increased only in postmenopausal women. Sleeping and 24-hour energy expenditure decreased by approximately 200 kcal/day over the span of 4 years with sleeping energy expenditure decreasing 1.5 fold more in postmenopausal women compared to a control group of pre-menopausal women (7.9% vs. -5.3%). Fat oxidation decreased by 32% in postmenopausal women ($p < 0.05$). Spontaneous physical activity expenditure was reduced by >30% in both pre and postmenopausal women over 4 years. The study results suggest that weight gain may be attributed to decreased energy expenditure with age which is of concern to midlife women due to negative effects on energy balance, body composition and fat distribution (Lovejoy et al. 2008).

Another observational study in a similar population group documented physical activity levels and energy intake in pre-menopausal women at baseline and at the end of a 5-7 year study period (MacDonald, New, Campbell & Reid 2003). Physical activity level (PAL) was calculated by dividing energy expenditure by basal metabolic rate. Mean PAL (unit) declined from 1.88 ± 0.31 to 1.86 ± 0.33 over the study period. Energy intake declined from 8.20 ± 2.30 (MJ) to 7.89 ± 2.22 (MJ). Women gained weight from a baseline mean of 64.1 ± 11.0 to 67.4 ± 11.7 kg at the end of the study period. PAL explained 4.4% of the variation ($p < 0.001$) and energy intake accounted for 0.4% of the variation ($p = 0.013$) in weight change over time.

Golubic et al. (2012) examined the longitudinal association between weight change and physical activity over 10 years in adults between 39-79 years. The results suggested that weight gain was a strong determinant of physical inactivity. An increase in weight over time was associated with increased likelihood of physical inactivity. Similarly, a prospective analysis of women enrolled in the Women's Health Initiative Study suggested an inverse relationship between vigorous and total leisure time physical activity and risk of being overweight in midlife over a median follow up period of 11.6 years (Britton et al. 2012). As part of another longitudinal study, physical activity among a sample of multiethnic midlife women was examined over 2 years to evaluate the association between BMI and physical activity (Choi et al. 2011). After controlling for ethnicity, income and demographics, physical activity was an important predictor of BMI. Findings from the literature provide insight into the relationship between weight gain and physical activity and suggest that physical activity is an important factor to consider when addressing weight status in this population.

Studies have shown that women who gain weight at midlife are at risk of chronic diseases at midlife and later life (Biggs et al. 2010; Yang et al. 2007, Strandberg et al. 2003; Huang et al. 1998). Preventing weight gain may help reduce risk of obesity-related chronic diseases in midlife women.

Risk of chronic diseases associated with overweight/obesity among midlife women

Obesity negatively impacts women's health through its association with increased risk of cardiovascular disease, hypertension, type 2 diabetes, osteoarthritis and multiple cancers (Kulie et al. 2011). Results from the Health Survey of England (1993-2007) showed a considerable rise in the incidence of coronary heart disease, stroke, diabetes and hypertension associated with obesity in adults (Brown, Byatt, Marsh & McPherson 2010).

The relationship between risk of hypertension and factors such as BMI, weight gain, overweight and obesity has been evaluated in previous studies. As part of the Nurses' Health Study, BMI and weight change were examined as risk factors for hypertension in a cohort of 82,473 women at 18 years and at midlife (Huang et al. 1998). Compared to women with BMI $<20 \text{ kg/m}^2$ (reference group), women with BMI $\geq 31 \text{ kg/m}^2$ were at a higher risk of hypertension at both time points ($p < 0.001$) even though the association between BMI and risk of hypertension at 18 years of age was weaker than at midlife. With every 1% increase in BMI, a 12% increase in risk of hypertension was observed suggesting that weight gain increases risk of hypertension in women with age. Long-term weight loss was associated with lower risk of hypertension and long-term weight gain was associated with higher risk of hypertension. Compared to reference

group weight change ≤ 2 kg, the multivariate relative risk was 0.85 for a loss of 5.0 to 9.9 kg, 0.74 for a loss >10 kg, 1.74 for a gain of 5.0 to 9.9 kg, and 5.21 for a gain >25.0 kg (Huang et al. 1998). A more recent study involving a large cohort of Japanese midlife adults examined the association between the BMI and risk of hypertension (Tsujimoto et al. 2012). A total of 68,205 non-hypertensive adults (18,336 men and 49,869 women) aged 40–79 years were followed from 1993 to 2006. A large proportion ($n=21,651$) of women developed hypertension during an average follow-up period of 3.9 years. Compared to women with a BMI <19 , women with a BMI ≥ 25 had a hazard ratio for hypertension of 1.47 (1.33–1.62) (40-59 years) and 1.29 (1.18–1.41) (60-79 years) (Tsujimoto et al. 2012).

Among the cross-sectional studies, a randomized cross-sectional analysis, 754 middle-aged women were categorized as premenopausal, late menopausal and postmenopausal (Cifkova, Pithab, Lejskovac, Lanskad & Zecova 2008). BMI was significantly correlated ($p<0.001$) with blood pressure among women in all three categories. Weight gain with age increased risk of pre-hypertension as seen in a cross-sectional analysis of data collected from 36,075 non-hypertensive women between 40-70 years (Yang et al. 2007). Weight gain throughout adulthood was associated with an increased risk of prehypertension emphasizing the concept that weight control early in life and throughout adulthood is important. Among middle-aged adults who were mainly women (65%), results from a study by Lyra et al. (2012) showed that arterial hypertension was also strongly associated with elevated BMI. Previous studies indicated that change in weight over time has a profound impact on risk of hypertension. However,

use of BMI as a predictor may have inflated the strength of this relationship given that BMI does not account for body composition changes such as changes in fat mass or lean mass.

Aging is associated with increased risk of mortality from coronary heart disease (CHD) (Owens et al. 1993). Risk factors for CHD associated with aging include high blood pressure, excess weight and unhealthy blood lipid levels (Feinleib & Kovar 1987). Several studies that showed a prospective relationship between CHD and weight among midlife women were based on the Nurses' Health Study (Willett et al. 1995; Manson et al. 1995; Li et al. 2006). A large cohort of about 120,000 U.S. women were enrolled in 1976 in the Nurses' Health Study conducted by Harvard University. Women were 30-55 years of age when first enrolled and free of heart disease and cancer. Willett et al. (1995) showed that high BMI was associated with an increased incidence of nonfatal MI and fatal CHD based on 14 years of follow up among 15,818 middle-aged women (30-55 years). Weight gain was also associated with increased risk of CHD. Compared to women with weight change of less than 5 kg, the relative risk for those who gained 20 kg or more was 2.65 (95% CI: 2.17-3.22), while the relative risk for those who gained 5 to 7.9 kg was 1.25 (95% CI: 1.01-1.55). With higher BMI (<21 kg/m² compared to 29 kg/m²), relative risk was also higher (1.19 compared to 3.56) indicating that a significant increase in risk of CHD was observed with an increase in BMI over 14 years (Willett et al. 1995). In another study involving 88,393 middle-aged women as part of the Nurses' Health Study, obesity and physical inactivity were independent contributors to development of CHD in women (Li et al. 2006). These findings confirmed those of

Manson et al. (1995) who examined the association between BMI and overall mortality and mortality due to specific causes like CHD, cancer and other diseases in middle-aged women as part of the Nurses' Health Study. The authors concluded that weight was directly associated with mortality due to all causes in women (Manson et al. 1995).

Cross-sectional study results among middle-aged adults in Poland showed a strong association between BMI and prevalence of cardiovascular disease (Islami et al. 2011). Similarly, serum ischemia-modified albumin levels were higher in overweight and obese postmenopausal women compared to women with BMI between 21-25 (Kazanis et al. 2011). In a population-based investigation involving older adults (65-100 years), BMI at midlife was shown to be an important risk factor of CHD in later life (Kizer et al. 2011). While some studies only examined prevalence and cross-sectional associations, others examined effects of change in BMI/weight on risk of disease over an extended time, providing evidence that an increase in weight and or BMI during midlife is a significant predictor of heart disease in later life. Mortality due to heart disease is a leading cause of death in women compared to men (Lindquist et al. 2012). Therefore addressing predictors of weight gain during midlife is an important public health issue especially for women.

In the US, ~40% of the population >50 years are at risk of metabolic syndrome and >50% are women (Ford, Giles & Dietz 2002; Ford, Giles & Mokdad 2004). Studies have shown that weight gain and increases in BMI and age were associated with prevalence of metabolic syndrome in women. Data from the Third National Health and Nutrition Examination Survey (follow up through 2000) suggested that metabolic syndrome was associated with a significantly higher all-cause, cardiovascular, and even

non-cardiac mortality in postmenopausal women over an observation period as long as 12 years (Lin, Caffrey, Chang & Lin 2010). Another study that assessed the prevalence of individual risk factors and metabolic syndrome in a sample of 3,423 adults showed that women between the ages of 40 to 59 years compared to 20-39 years were three times more likely to meet The National Cholesterol Education Program's Adult Treatment Panel III guidelines as criteria for metabolic syndrome (Ervin 2009). Overweight women were > five times and obese women were > seventeen times more likely than normal weight women to meet criteria for metabolic syndrome. In a prospective controlled study among overweight and obese postmenopausal women by Joseph, Prigeon, Blumenthal, Ryan and Goldberg (2011), the effects of a 6-month intervention including diet-induced weight loss and exercise were examined on cardiovascular disease (CVD) risk factors such as body composition and biochemical parameters. Moderate weight loss and low-intensity exercise effectively reduced both CVD risk factors and the prevalence of metabolic syndrome by 45% (Joseph et al. 2011). Obesity and weight gain are also associated with increased risk of stroke in middle-aged women. In a prospective cohort study by Rexrode et al. (1997), both obesity and weight gain in women were identified as important risk factors for stroke. Identifying and addressing specific risk factors such as weight gain or changes in BMI and body composition associated with age in midlife women is necessary to reduce risk of metabolic syndrome and stroke.

Type 2 diabetes has become an important concern in the U.S. as prevalence rates in midlife adults have risen along with the obesity epidemic (Colditz, Willet, Ronitzky & Manson 1995; Carey et al. 1997). Many prospective studies have evaluated the associations between weight gain, BMI, overweight or obesity and risk of diabetes. For

example, as part of the Nurses' Health study, 114,281 women (30-55 years) were followed to determine risk of type 2 diabetes over time (14 years) (Colditz et al. 1995). Women of average weight (BMI 24 to 24.9 kg/m²) had a relative risk of 5.0 (95% CI, 3.6 to 6.6) compared to women with a BMI < 22 kg/m². Women with a BMI of 31.0 kg/m² or more had an age-adjusted relative risk of ≥ 40.0 compared to reference women of normal weight. Aging also appeared to be a risk factor as women aged 60 to 64 years had a relative risk of 3.4 (CI, 2.5 to 4.6) compared to women aged 40 to 44 years. Compared to women who gained or lost 5 kg (reference group), women who had a weight gain of 5.0 to 7.9 kg had a relative risk of 1.9 (95% CI, 1.5 to 2.3) while women who gained 8.0 to 10.9 kg had a relative risk of 2.7 (CI, 2.1 to 3.3).

High BMI was identified as an important risk factor for type 2 diabetes in middle-aged women in another study based on data from the Nurses' Health Study (Carey et al. 1997). The magnitude of type 2 diabetes risk over 8 years was a function of measures of obesity including BMI with high BMI associated with increased risk. In a prospective cohort study involving overweight men and women, Resnick, Valsania, Halter and Lin (2000) evaluated the association between weight gain and risk of diabetes. The results showed that overweight women and men had higher risk of diabetes compared to non-overweight adults. Similar results were observed in a previous study by Ford, Williamson and Liu (1997) where long term patterns of weight change including an increase in BMI were shown to increase the incidence of type 2 diabetes in women. A population-based prospective cohort study examined combinations of lifestyle risk factors related to the 11-year risk for incident diabetes in a large cohort including 114,996 men and 92,483

women, aged 50 to 71 years from 1995 to 1996 at baseline to 2004-2006 at follow up (Ries et al. 2011). Findings showed that 6,969 women (7.5%) developed new-onset diabetes and that being overweight or obese increased risk of diabetes. Villegas et al. (2009) examined components of energy balance and the incidence of type 2 diabetes in a large cohort of 74,943 women aged 40–70 years as part of a population-based prospective study. A high BMI and weight gain indicating positive energy balance were associated with a higher risk of type 2 diabetes.

Components of energy balance including energy intake and physical activity had an interactive effect on the incidence of diabetes. Sasai et al. (2010) investigated the age-specific relationship between BMI and risk of diabetes in a cohort of Japanese men (n=19,926) and women (n=41,489) (40-79 years). Participants underwent community-based health checkups in 1993 and were free of diabetes. They attended follow up annual examinations with measurement of blood glucose concentrations until the end of 2006. A total of 2,364 women developed diabetes during a mean follow-up of 5.5 years. Compared to those with a BMI <25.0, the multivariate hazard ratios for diabetes were 2.50 (95% CI, 2.01-3.11) for women aged 40 to 59 years and 1.80 (95% CI, 1.41-2.30) for women aged 60 to 79 years. The effect of BMI on type 2 diabetes was significantly greater among middle-aged adults than among older adults and among women than men (Sasai et al. 2010).

In another Japanese population-based prospective study, Nanri et al. (2011) examined the associations between weight change since age 20 and weight change during middle-to-late adulthood and incidence of type 2 diabetes in middle-aged adults. Long-

term weight gain from early adulthood to middle-age increased risk in women and that risk was further enhanced by weight gain in later life (Nanri et al. 2011). A prospective analysis in an adult population of 2,457 women and 1,736 men showed that weight gain during midlife was an important risk factor for diabetes in later life (Biggs et al. 2010). In addition to prospective analyses, cross-sectional studies have contributed to the evidence that an association exists between overweight and risk of diabetes. For example, National Health Interview Survey data (1997-2004) were used to estimate age, race, sex and BMI-specific prevalence and incidence of diabetes in 2004 (Narayan, Boyle, Thompson, Gregg & Williamson 2007). Compared to women in the midlife category of 45 years with BMI $<18 \text{ kg/m}^2$, women with BMI $>35 \text{ kg/m}^2$ had higher risk of diabetes (62.2% versus 10.6%). Previous studies have clearly shown that weight gain and increases in BMI elevate risk of diabetes among midlife women. While some studies were conducted fifteen years ago (Colditz, Willet, Ronitzky, & Manson, 1995; Carey et al. 1997), other more recent studies (Biggs et al. 2010; Nanri et al. 2011) have also provided consistent results.

Arthritis is the leading cause of physical disability in the U.S. and is more prevalent among women than men (Steven-Lapsley & Kohrt 2010; Szoeki Cicuttini, Guthrie, Clark & Dennerstein 2006). Weight appears to be an important factor associated with osteoarthritis (OA) in women. As part of the Melbourne Women's midlife health project, 438 women were observed prospectively for 11 years (Szoeki et al. 2005). Results showed that 56%, 27%, and 45% had evidence of radiological OA, knee OA, and hand OA, respectively. Women reporting arthritis had higher BMIs than those not reporting

arthritis. Along with arthritis, obesity contributes to impaired bone and muscular health. As women aged, significantly more obese women >40 years reported impaired bone and muscular health (Kostova & Koleva 2001).

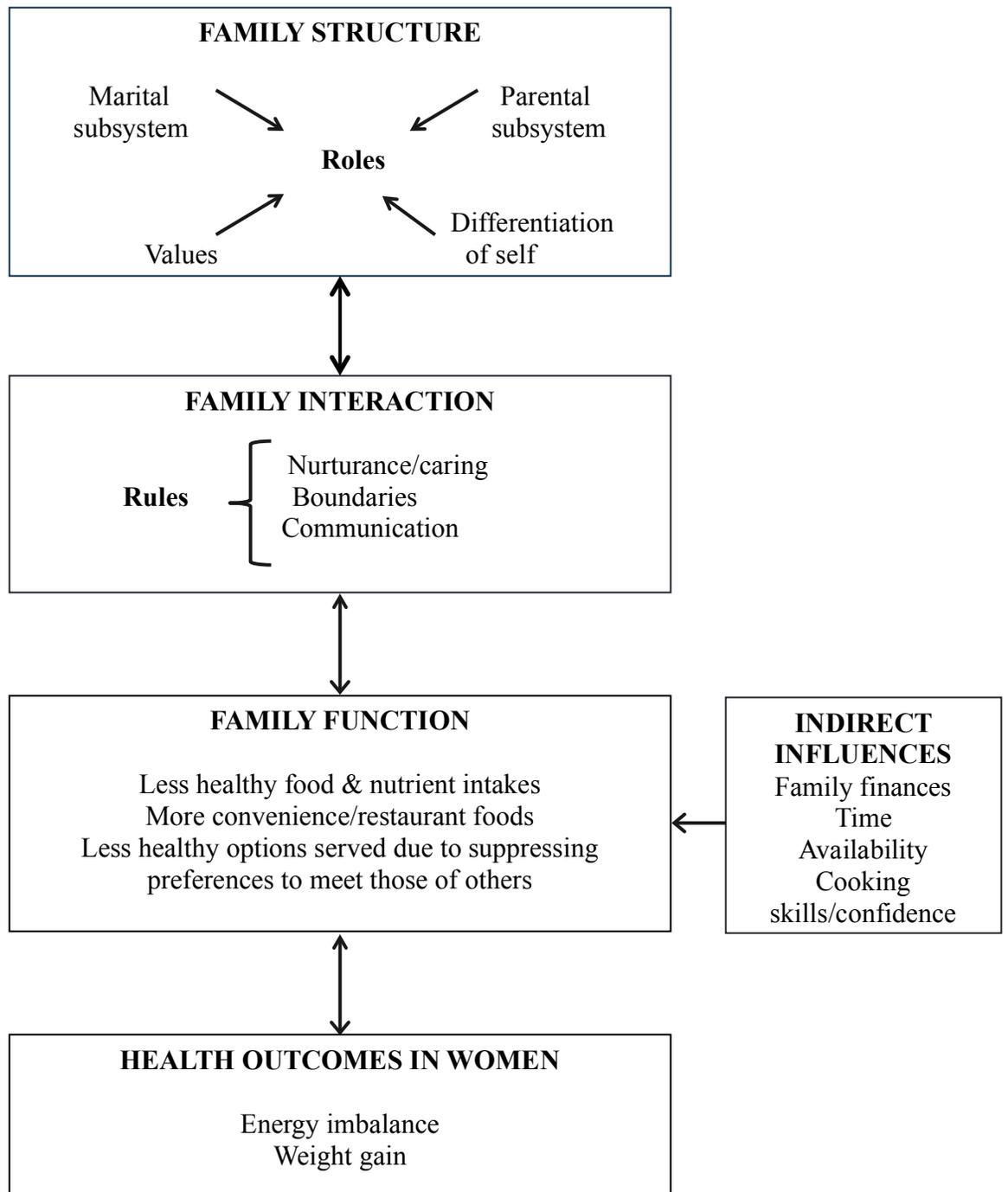
In summary, weight gain, overweight and obesity in midlife women have been shown to contribute to both risk of chronic disease and physical debilitation with age. Efforts to address weight gain can therefore be of benefit to reduce risk of chronic disease and maintain healthful physical functioning in later years.

Relationship between obesity, eating behavior and familial factors among midlife women

‘Food provisioning’ has been defined as activities involved in feeding oneself and others including purchasing, preparing and serving foods (Neysmith & Reitsma-Street 2005). Women typically play an important role in food provisioning for their families (DeVault 1991) while other members are involved in food decision-making by communicating their preferences and priorities (Gillespie & Johnson-Askew 2009). DeVault (1991) indicated that while women are expected to feed their family, they also go beyond the practical tasks of food provisioning by meeting emotional needs for love and security through food and mealtime interactions.

The family systems approach can be applied to better understand the influences of family members on eating behavior and health outcomes among midlife women (Figure 2.1). Application of this approach would indicate that family structure and interactions may influence the functional outcomes of food choice and behaviors. No single family-based theory as defined in the literature adequately addressed important aspects of the relationship between family influences and women’s food choice and behaviors. Therefore findings from several studies and reviews have been used as the basis for this approach along with descriptions of Family Systems Theory (FST) (Bowen 1966; Broderick 1993), family food and nutrition management systems (Ahye et al. 2006), and the family food decision-making system (Gillespie & Johnson-Askew 2009).

Figure 2.1. Factors influencing eating behavior of midlife women – A family systems approach



Bowen first described Family Systems Theory (FST) in 1966 as the basis for family systems therapy with respect to emotional dysfunction within the family (Bowen 1966). FST as outlined by Bowen is currently a central influence in family therapy in North America with a focus on emotional systems within families and interactions with other family members (Brown 1999). Only one study was found which applied the FST to eating behavior (Kitman-Ulrich et al. 2010). This was a systematic review evaluating family-level variables involved in studies of youth health behaviors including diet, physical activity and weight. Family systems variables included family competence, satisfaction, warmth and cohesion.

One important tenet of Bowen's FST that can be applied to the area of food choice and behavior of women was described as 'differentiation of self' (Bowen 1966). According to this tenet, individual choices of women may be set aside to achieve harmony within the family because the woman has a sense of responsibility for reactions of other family members (Brown 1999). Women with low differentiation of self may be more likely than women with high differentiation to be influenced by preferences and needs of others instead of their own needs. Foods that are provided at family meals may therefore be dependent on preferences of others resulting in feelings of approval and acceptance for the woman.

Slater, Sevenhuysen, Edginton and O'Neil (2011) identified several values and beliefs held by women thought to influence food choice/provisioning through interviews with Canadian working women. These findings indicated that food choice and eating behavior of women were reflected in her values and beliefs with respect to

accommodating family, eating together and eating for health. At different times and in different situations, women may make decisions about foods to serve family members that fit preferences of others but are not healthful for her.

Others have reviewed systems as applied to families (Cox & Paley 1997) for the purpose of understanding child development and how adults adapt and form close relationships. A general principle based on this review that may be useful in understanding influences on food choice and behavior is that family structure is organized hierarchically and is comprised of parental and marital subsystems (Figure 2.1). Family members are “necessarily interdependent and exert a continuous and reciprocal influence” within these subsystems (Cox & Paley 1997 p. 246). They learn rules for relating with each other based on interactions that occur within subsystems defined by boundaries (Cox & Paley 1997). Within the parental and marital subsystems, women may feel responsible for providing food or meals to children and spouses. Findings from a qualitative study examining family food and nutrition management systems among African American women showed that in addition to feeling responsible for providing food, they also felt they had a caretaking role in that they “watched over the health and nutrition of someone else in the family” (Ahye et al. 2006).

Application of the family systems approach suggests that all family members exert an influence on decisions with respect to foods that women serve at family meals. This influence is via interactions that may include making requests for specific foods, providing approval when certain foods are served or complaining/refusing to eat when disliked foods are served. An unspoken rule may be that women respond by meeting

expectations in order to nurture others. This was evident in the qualitative results reported by Slater et al. (2011) where women wanted to be ‘good mothers’ and frequently reported putting their own preferences aside at mealtimes. These interactions may influence family functioning with respect to food choice and eating behavior of women, resulting in overconsumption of preferred foods, which may be convenience foods or restaurant foods, or other less healthful selections. Based on qualitative interviews with women, Gillespie and Johnson-Askew (2009) found that family interactions guided the family food decision making system. Family food practices were shaped by roles and interaction patterns, and situation-based needs influenced thoughtful food decisions.

In addition to suppressing preferences to meet needs of other family members, mothers nurture family members in another way. In food-insecure households, mothers used several strategies to feed others at the expense of their own nutritional needs. These included skipping meals, eating later in the day and eating less to prioritize their children’s needs for food above their own (DeVault 1991; McIntyre et al. 2003). These practices may be related to weight gain, as nationally representative, U.S. income panel data showed that when women in a food-insecure household had children present, their levels of obesity and weight gain over 4 years were greater than women who did not have children present (Martin & Lippert 2012). Individual semi-structured interviews among low-income Midwestern overweight and obese women showed that the commitment as caregivers of families was one of many barriers keeping them from eating healthy (Buchholz, Huffman & McKenna 2012). In this role, women described family support for eating healthy as ranging from no help with preparation to direct obstruction.

Negative functional outcomes of family structure and family interactions were supported by findings from several studies. After participation in a cooking intervention, a follow up interview study showed that family played a crucial role in determining whether women made healthful dietary changes (Abbott, Davidson, Moore & Rubenstein 2011). Results of this qualitative study suggested that family members may have a positive influence by encouraging healthful dietary change or a negative influence by showing resistance to and lack of support for change (Abbott et al. 2010). In this study, some women in large households reportedly “bowed to the wishes of the majority” (Abbott et al. 2010 p. 35), lacking power within the household to make changes.

Focus group study results among low-income women with respect to their feelings and emotions about family meals suggested that some felt guilty if they were unable to serve a family meal. For them, family meals were a time of interaction and enjoyment with family members (Kling, Cotugna, Snider & Peterson 2009). When family members complained about the foods served, meals were less enjoyable. Similarly, findings from another focus group study indicated that low-income women considered child or partner preferences to be barriers to intake of fruits and vegetables (Dharod, Drewette-Card & Crawford 2011). Focus group findings also showed that children tended to have specific food preferences that limited food choice and frustrated parents (Fulkerson et al. 2011). This could result in parents offering a smaller variety of healthy foods and thus impact parents’ intakes as well as children. In a qualitative study by Beagan and Chapman (2004), women were individually interviewed about their perception regarding their health, eating habits and food choice. Results showed that

women believed in catering to the food preferences of family members even if it was at the expense of their own health. The women also suggested that family played an important role in their food–decision-making process (Beagan & Chapman 2004).

Results from a quantitative cross-sectional survey based on NHANES III data (1988-1994) provided support for previous qualitative studies. This report showed that when adults ate with others, especially children, they consumed more total and saturated fat (4.9 g/24 hours [95% CI: 0.8, 9.1]) and (1.7 g/24 hours [95% CI: 0.3, 3.3]) respectively, compared to adults without children (Laroche, Hoffer & Davis 2007). Adults eating with children ate high-fat foods more frequently than adults without children, including salty snacks, pizza, cheese, beef, ice cream, cakes/cookies, bacon/sausage/processed meats, and peanuts (Laroche et al. 2007). These findings may be explained by parents perceiving that these are foods children like and are likely to eat. A more recent longitudinal study based on the Coronary Artery Risk Development in Young Adults showed that over a 7 year period, adults who became parents did not decrease saturated fat intake as much as adults who did not become parents (Laroche, Wallace, Snetselaar, Hillis & Steffen 2012).

Several studies have assessed the similarity of eating habits within parental subsystems (parents and children) from the perspective of maternal influence on the child's diet (Oliveria et al. 1992). However the child may also reciprocally influence the maternal diet through interactions such as requesting certain foods (O'Dougherty, Story & Stang 2006), or indirectly through effects on time and financial resources available (Devine et al. 2006, Jabs et al. 2007). Cross-sectional survey data from midlife women as

part of the Australian Longitudinal Study of Women's Health were used to evaluate the influence of children and others on women's dietary compliance with national recommendations (Ball, Mishra, Thane & Hodge 2004). Results showed that in households with a partner and children, more women met guidelines for vegetable, meat, calcium and iron intakes and fewer met guidelines for fat, sugar and sodium compared to women living alone. In another study with mother/primary school aged child pairs, when mothers and children were organized according to eating and physical activity clusters related to obesity behaviors, a strong concordance was found for those in low activity, high energy dense food/beverage intake clusters (Cameron et al. 2011). This suggests that mothers may create household environments based on child preferences for foods that are obesogenic for both mother and child.

Several studies have also evaluated the concordance between marital subsystems (woman and spouse). Socio-demographic data from the Framingham Heart Study (1991-2001) related to eating behavior of adult men and women were used to evaluate the influence of relationships on eating patterns (Pachucki, Jacques & Christackis 2011). Among all the relationships examined including those between friends, spouses and siblings, the relationship between spouses resulted in the highest concordance in eating patterns. A systematic review and meta-analysis evaluating spousal concordance in risk factors for cardiovascular disease showed that BMI was one of the most highly correlated factors (Di Castelnuovo, Quacquareccio, Donati, Gaetano & Iacoviello 2009), suggesting that dietary factors may also be correlated between spouses.

The family systems approach outlined here suggests that food decisions made by women are based on her role within parental and marital subsystems and on interactions with family members. These decisions reflect goals and values of both the woman and her family members, but may differ depending on the situation-specific assessment of these goals/needs and values. Women may make food decisions based on goals/needs that vary with eating occasion context. Eating occasion context may include the rational and emotional influences on food decisions, such as who is present, the meal type, time available to prepare or how she is feeling. Combinations of situation-based needs/goals within specific eating occasions have been characterized for midlife women in a feasibility study with respect to segmentation of eating occasions by situation-based needs (Sudo et al. 2009) and in a larger study by Perry (2011), which replicated these findings in a larger sample of midlife women.

The dissertation study by Perry (2011) identified six clusters of eating occasions categorized by combinations of situation-based needs experienced by a national sample of midlife women. According to results of this study, situation-based needs within specific eating occasions influenced intakes of food groups, nutrients and energy. In this cross-sectional study, ~1800 midlife women (40-60 years) completed eating occasion questionnaires and 24-hour food records. The six distinct sets of situation-based needs within specific eating occasions were named healthy express, comforting interludes, indulgent escapes, nurturing family meals, sensible meals and fast fueling. According to descriptions of the situation-based needs, the combination named 'nurturing family meals' focused on nurturing family by providing a meal for the family, serving the needs

of the family as a unit, and as a means of expressing love. This set of situation-based needs was consistent with the family systems approach where the meal serves as an opportunity for family bonding, and must be enjoyable with minimal complaints from family members. This means appealing to the taste preferences of children or others present. Other needs in this combination included a need for balance from a nutritional standpoint, and to stay within the family budget.

Eating occasions based on ‘nurturing family meals’ accounted for 1,017 occasions or 18% of the total occasions occurring on both weekdays and weekends (Perry 2011). They were most often dinner meals (60%), with at least one adult present during the eating occasion (~50%) and at least one child (54%) present compared to other situation-based needs. As ‘nurturing family meals’ were more often a dinner meal, they were highest in energy content (mean of 645 kcal) compared to other situation-based needs ($p < 0.0001$). ‘Nurturing family meals’ eating occasions also had a high total fat content (41.5 g) and the highest cholesterol and sodium content compared to other sets of situation-based needs (173 mg and 2028 mg, respectively, $p < 0.0001$) (Perry 2011).

The second most common set of situation-based needs that were experienced at the dinner meal (35%) was ‘sensible meals’ (Perry 2011). The description for ‘sensible meals’ included needs/goals to eat healthy and responsibly, control weight, and control overall caloric intake, fat, cholesterol and carbohydrate intakes. These meals were more likely to be eaten alone and at home. Overall, the situation-based needs were focused on the woman making healthy choices for herself without focusing on interactions with family.

A body of literature establishes a protective relationship between family meal (family members eating meals together) frequency and child weight and nutrient intakes (Hammons & Fiese 2011). However, less is known about family meal frequency and health benefits for adults (Berge, MacLehose, Loth, Eisenberg, Fulkerson & Neumark-Sztainer 2012). As a part of the F-EAT (Families and Eating and Activities in Teens) project, data from parents of adolescents were used to assess the association between frequency of family meals and BMI and eating behavior of parents. Results suggested that significant positive associations existed between frequency of family meals and fruit and vegetable intakes but not BMI among mothers and fathers. Family meal frequency was also associated with less frequent fast food intake among fathers and less binge eating among mothers. In contrast, Sobal and Hanson (2011) showed an inverse relationship between the frequency of eating family meals and BMI of adults with children in the home based on interaction term analysis. Differential relationships between family meal frequency and BMI were observed in another cross-sectional study depending on whether the meals were eaten at home or away from home, and whether the BMIs of the family unit, mother or father were considered (Chan & Sobal 2011). These results indicate that the relationship with BMI depends on the foods consumed during family meals which may differ based on where they are consumed, who prepares the meal, and who is present at the meal.

Within the family systems approach, indirect influences on family functions of food choice and eating behavior of women include environmental barriers, financial considerations and time management issues, and personal characteristics such as cooking

skills (Story, Kaphingst, Robinson-O'Brien & Glanz 2008). Women are considered food gatekeepers of the family, playing an important nurturing role in food provisioning (planning, shopping and preparing family meals) (Wild, Taylor, Knehans & Cleaver 1994; Devault 1991; Neysmith & Reitsma-Street 2005). Being gatekeepers, they may have greater exposure and susceptibility to an obesogenic food environment compared to other family members. Some women may also encounter environmental barriers to healthy food choices such as living in neighborhoods with fewer supermarkets (Morland & Wing 2002) and more fast food restaurants (Block & Scribner 2004). The environmental setting may influence which foods are available to eat and impact barriers and opportunities that may hinder or facilitate healthy eating.

The barriers of limited time and budget were identified by women in focus group interviews as influencing healthy eating and food choices (Rolnick et al. 2009; Folta et al. 2008). Several reviews of the relationship between socioeconomic status and health indicate that women with low socio-economic status may consume a less healthy diet which increases risk of diet-related chronic diseases and health inequalities (Kaplan & Keil 1993; Turrell & Mathers 2000). Cross-sectional population-based surveys have shown that women with higher education and employment levels are more likely to follow dietary guidelines, consume more fruits, vegetables, and fiber and less fat compared to their socio-economically disadvantaged counterparts (Hulshof, Brussaard, Kruizinga, Telman & Lowik 2003; Galobardes, Morabia & Bernstein 2001; Dynesen, Haraldsdo, Holm & Astrup 2003; Johansson et al. 1999). Results of interviews with low-income Midwestern overweight and obese women provided insight into why being low-

income was a major barrier to eating healthy (Buchholz, Huffman & McKenna 2012).

Women suggested that lack of money kept them from purchasing healthier foods, which they perceived as expensive, and that they juggled multiple caregiving responsibilities leaving little time and resources to take adequate care of themselves.

Personal characteristics such as perceived cooking skills may affect the frequency of meals prepared at home and inclusion of healthy foods such as fruits and vegetables in home-prepared meals. Lack of cooking skills was associated with overweight and eating more fast food and unhealthy ready-to-eat meals among women (der Horst et al. 2011; Dave et al. 2009). Perceiving a high value of food preparation and planning meals in advance was associated with greater fruit and vegetable intakes among women (Crawford et al. 2007). When the main chef was confident to prepare vegetables, households bought a greater variety of vegetables (Winkler & Turrell 2010).

Women face many challenges to healthy eating specific to the role of caregiver and nurturer for their family. A better understanding of how responsibilities as a food provisioner affect eating behaviors and potential for weight gain may facilitate better management of weight issues among midlife women.

Weight management or prevention of weight gain

Women control weight by modifying food intake across a spectrum of practices or behaviors. Weight gain results from an imbalance between energy intake and expenditure, but the degree to which various dietary factors contribute to weight gain remains unclear. Dietary nutrients are likely to be interactive or synergistic, which make

it difficult to examine their separate effects, some of which might be very small (Lassele et al. 2011). Studies in women have focused on the general concepts of restraint versus disinhibition and also on specific practices such as eating less food or eating more fruits and vegetables. Research on dietary restraint tends to involve clinical samples with an emphasis on disordered eating based on excessive restraint. However, some studies have been conducted in a general population of women.

Dietary patterns/food intake.

Various dietary practices are commonly used to maintain or reduce weight, including reducing calories, following low carbohydrate or low fat diets or replacing certain foods with others. Several randomized, controlled trials have evaluated the effects of these practices on weight status. A randomized, controlled trial carried out among middle-aged adults over 8 weeks to evaluate the effects of low carbohydrate and low fat diets on weight status showed that both dietary practices produced successful weight loss (Bradley et al. 2009). Similarly a randomized, controlled trial conducted over 2 years in a sample consisting of mostly middle-aged women evaluated the effects of long-term treatment with either a low-carbohydrate or low-fat, calorie-restricted diet on body weight. An 11 kg weight loss was observed over 2 years with both low fat and low carbohydrate diets being successful in producing weight loss (Foster et al. 2010). A preliminary cross-sectional study examined the differences in dietary energy density between three groups of middle-aged adults who were mostly women (overweight, normal weight and weight loss maintainers) (Raynor et al. 2011). Weight loss maintainers consumed diets with the lowest dietary energy density compared to the other groups with

more low fat, high fiber foods, and higher amounts of whole grains, vegetables and lower amounts of refined grains than the other two groups.

Data from large cohort studies have also been used to evaluate the relationship between eating patterns and weight status. Healthier dietary patterns may result in reduction of weight gain over time. In a large prospective study among African American women, two dietary patterns and their effect on weight were assessed over time (Boggs et al. 2011). A vegetables/fruit pattern was associated with significantly less weight gain over 14 years, whereas a meat/fried foods pattern was associated with significantly greater weight gain. Adhering to a healthy diet or meeting dietary recommendations was shown to influence weight status in a prospective cohort study carried out among French middle-aged adults (Lassale et al. 2011). Subjects who adhered to the recommended dietary guidelines had a lower weight gain over 13 years compared to those who did not.

Replacing unhealthy options such as fried foods and increasing intake of healthier options such as fruits and vegetables was shown to influence weight status (Schulze, Fung, Manson, Willett & Hu 2006). As part of the Nurses' Health Study II involving a large cohort of middle-aged women followed between 1991-1999, dietary patterns including high intakes of red and processed meats, refined grains, sweets and desserts, and potatoes were shown to contribute to long-term weight gain, whereas a dietary pattern characterized by high intakes of fruits, vegetables, whole grains, fish, poultry, and salad dressing was associated with weight maintenance (Schulze, Fung, Manson, Willett & Hu 2006). Similarly, another cohort study assessed food patterns based on dietary composition information to predict subsequent annual weight change over a 4-year

follow-up period in 24,958 middle-aged men and women of the European Prospective Investigation into Cancer and Nutrition–Potsdam study (Schulz, Nothlings, Hoffmann, Bergmann & Boeing 2005). Two food patterns were identified, one characterized by high-fiber and high-carbohydrate food choices, such as whole-grain bread, fresh fruit, fruit juices, grains and cereals, raw vegetables, and the other by high-fat food choices, such as processed meat, butter, high-fat cheese, margarine and meat. Subjects with higher intakes of the high- fiber and high-carbohydrate foods and lower intakes of the high-fat foods were found to be weight stable or had substantially lower weight gains than subjects with the opposite food pattern (Schulz et al. 2005). Another prospective analysis of the European Prospective Investigation into Cancer and Nutrition–Physical Activity, Nutrition, Alcohol Consumption, Cessation of Smoking, Eating Out of Home, and Obesity (EPIC-PANACEA) project examined associations between adherence to the Mediterranean dietary pattern (MDP), prospective weight change and the incidence of overweight or obesity (Romaguara et al. 2010). Results of this prospective study indicated that a high adherence to the MDP reduced the likelihood of gaining weight and becoming overweight or obese after 5 years of follow-up.

Increased energy intake may be an important factor associated with weight gain especially in women. Data from a Dietary and Nutritional Survey of British Adults, and the National Diet and Nutrition Survey were used to identify factors related to weight gain among adults (Scarborough et al. 2011). The results suggested that the increase in body weight in the UK between the mid-1980s and early 2000s had different causal factors for men and women. For women, increases in energy intake explained all of the

increase in body weight, suggesting that this was the dominant causal factor for increases in body weight over this time period. Consuming more or less of any one food or beverage may affect the total amount of energy consumed. A prospective investigation by Mozafarrián et al. (2011) involving three large cohorts showed an association between specific dietary factors and long-term weight gain. There were strong positive associations between weight status and intakes of certain foods such as starches, refined grains and processed foods. Increasing consumption of foods such as vegetables, nuts, fruits, and whole grains was associated with less weight gain (Mozafarrián et al. 2011).

Overall, diet and eating patterns have a strong influence on weight status. Calorie reduction and reductions in specific nutrients such as fat and carbohydrate and changes in overall eating behavior involving replacing unhealthy foods with healthier high fiber foods may help women better manage weight over time.

Weight control practices.

Weight gain prevention or weight loss is an important issue of national concern given the high level of overweight and obesity (Flegal et al. 2012) and the prevalence of dieting to control weight (Krueger et al. 2004). An analysis using NHANES data (2001-2002) (n = 5,027 adults), showed that adults who tried to control their weight used four primary practices including eating less food, exercising, eating less fat and switching to foods with fewer calories. Less than one fourth combined calorie restriction with higher levels of physical activity (300 or more minutes per week) recommended in the 2005 Dietary Guidelines by the U.S. Department of Health and Human Services and U.S. Department of Agriculture (Weiss, Galuska, Khan & Serdula 2006). In an Australian

population of adults (n=2,500) where 58% were women, watching the type of food eaten, reducing dietary fat intake, and engaging in physical activity or exercise were the most common weight control strategies used (Timperio, Cameron-Smith, Burns & Crawford 2000). A telephone survey was administered in another study involving 1,431 adults (71% women) to identify common weight loss practices (Levy & Heaten 1993). Self-reported weight loss practices included self-weighing (71% reported using this practice), walking (58%), using diet soft drinks (52%), taking vitamins and minerals (33%), counting calories (25%), skipping meals (21%), using commercial meal replacements (15%), taking diet pills (14%) and participating in organized weight loss programs.

The association between the reported use of weight loss strategies on weight status was assessed by Savage and Birch (2010) among 176 women at three time intervals in a span of 4 years (baseline and every 2 years). After data were collected, women were categorized into three groups, those not using any strategy, those using healthy strategies and those using a combination of healthy and unhealthy strategies. The healthy weight control strategies included reducing calories and amount of food (76% reported using this practice), eliminating sweets, junk food and snacks (76%), increasing exercise (74%), eating more fruits and vegetables (72%), eating less fat (71%), changing type of foods eaten (59%), eating fewer high carbohydrate foods (43%), and eating less meat (28%). The unhealthy strategies included skipping meals (51%), use of diet pills, liquid diets and appetite suppressants (21%), fasting (19%), and use of laxatives, enemas and diuretics (3.4%). The results showed that women who used both healthy and unhealthy practices gained the most weight over 4 years (4.6 kg) compared to women

who used no strategies (1.5 kg) and women who used only healthy weight control strategies (1.0 kg). Women using the unhealthy weight control strategies had significantly greater weight concerns, restraint and disinhibition scores compared to women in the groups not using any strategies or only using healthy strategies. Overall, women gained weight over the 4 years, however, the amount gained was dependent on the type and extent of weight control strategy used (Savage & Birch 2010). Similar results were observed in an earlier study by Savage, Hoffman and Birch (2009), which assessed weight change in women over 6 years. The authors concluded that restraint attenuated the association between disinhibition and weight gain, however the effect of this attenuation was dependent on the women's current dieting status and the type of restraint practice used (Savage et al. 2009).

Dietary restraint.

Consciously limiting food intake to achieve or maintain a desired body weight is described as dietary restraint (McClean, Barr & Prior 2001). Disinhibition, on the other hand, usually occurs when a restrained eater is tempted to disrupt a restrained approach toward food. This may result in eating more than a non-restrained eater as normal boundaries of satiety are distorted (Dykes et al. 2004).

A randomized, controlled trial evaluated strategies for weight gain prevention among women (25-44 years) (Levine et al. 2007). Women were randomized to one of three intervention conditions including a clinic-based group, a correspondence course group, or an information-only control group. Intervention was provided over 2 years, with follow-up at year 3 and annual assessment of BMI and factors related to eating and

weight. No significant differences in weight and BMI at baseline were observed or in changes in weight and BMI at post intervention and follow-up. At least 40% of the women did not gain weight over the study period. For these women, weight maintenance was associated with increasing dietary restraint (conscious thoughts and purposeful behaviors to control calorie intake) and decreasing dietary disinhibition (the tendency to lose control over eating) over time (Levine et al. 2007). In a prospective cohort study, baseline and follow-up data from 192 middle-aged women were used to determine the effect of restrained eating and change in restrained eating on weight status over 36 months (Tucker & Bates 2009). Women who did not increase dietary restraint over the 3 years were at higher risk of weight gain than women who did increase dietary restraint. The risk of weight gain (> 1 kg) over the 36 months was 69% greater in women who did not increase dietary restraint compared with those who did (relative risk = 1.69, 95% confidence interval ~ 1.12-2.32) (Tucker & Bates 2009).

A study involving a cross-sectional analysis of self-reported and clinical data from 1,470 women (45-68 years) examined the associations between three psychological eating behavior variables, restraint, hunger and disinhibition, and body weight and size using the Three Factor Eating Questionnaire (TFEQ) (Dykes et al. 2004). Data were analyzed by categorizing women by high and low disinhibition and further sub-categorized by low and high restraint. Results showed that restraint and disinhibition were positively correlated ($r = 0.13$) and hunger and disinhibition were positively correlated ($r = 0.60$). Hunger and disinhibition scores had strong direct associations with body size/weight measures. Women in the low-restraint high-disinhibition group were the

heaviest (BMI 28.5 kg/m²) and largest (waist circumference 85.8 cm), while women in the low-restraint, low-disinhibition group were the lightest (BMI 24.2 kg/m²) and smallest (waist circumference 76.3cm). Therefore, eating beyond satiety may be associated with obesity and greater weight. Restraint was not directly related to body size and weight but related through its association with disinhibition.

Dietary restraint may predict weight loss, whereas disinhibition may be a major determinant of weight gain or weight regain after weight loss (Hays et al. 2002). The associations between three variables, disinhibition, hunger and restraint, and weight gain and BMI were examined in 638 middle-aged women (55-65 years). Results showed that disinhibition predicted weight gain and current BMI ($r = 0.27$ and 0.34), respectively, ($P < 0.001$). Restraint and hunger attenuated the association between disinhibition and weight gain and BMI ($P = 0.016$ and 0.010 , respectively). In the subpopulation of women who reported a stable level of voluntary dietary energy restriction, disinhibition also predicted weight gain and higher BMI, and restraint was negatively associated with weight gain ($r = -0.17$, $P = 0.019$) (Hays et al. 2002).

In addition to restraint, self-weighing has been examined as an influence on weight gain among adults. A recent review of self-monitoring approaches based on six studies, several which were randomized, controlled or prospective designs, showed that self-weighing was a positive practice supported by favorable findings regarding weight gain prevention (Burke, Wang & Sevick 2011). Another prospective study showed that BMI is an important consideration regarding the efficacy of frequent self-weighing. Daily frequency was associated with prevention of weight gain among obese adults compared

to monthly frequency among normal weight adults (Vanwormer, Linde, Harnack, Stovitz, & Jeffery 2011).

While studies have tended to focus on how the use of specific weight control practices affected weight status, fewer studies have examined how the use of these practices influenced energy, food and nutrient intakes over time. These studies are important in terms of informing education regarding effective weight control practices.

Summary and purpose

NHANES data (2007-2008) showed that 66% of midlife women were overweight or obese and 36% were obese (Flegal et al. 2012). Women tend to gain weight during midlife (Mozaffarian et al. 2011; Norberg et al. 2011) which increases risk of chronic diseases/conditions including cardiovascular disease, hypertension, type 2 diabetes and osteoarthritis (Kulie et al. 2011; Brown et al. 2010).

Application of the family systems approach indicates that familial factors may influence eating behavior among women who acquire, prepare and serve food to family members. Women may consider the needs and taste preferences of other family members before their own (Slater et al. 2011). Within the responsibilities of food provisioning, women also focus on meeting emotional needs for love and security through food and mealtime interactions (De Vault 1999).

Segmentation analysis has been used to identify distinct sets of situation-based needs for eating occasions (Sudo et al. 2009; Perry 2011) which influence energy, nutrient and food group intakes among midlife women. One set of situation-based needs was named ‘nurturing family meals’ and was the most common dinner meal eating

occasion (Perry 2011). Overall, needs for these eating occasions were based on nurturing others by providing a meal for the family, serving the needs of the family as a unit, and as a means of expressing love. These eating occasions provided more fat and energy compared to other eating occasions characterized by different situation-based needs. Another set of situation-based needs was described as ‘sensible meals’ and was also commonly experienced at dinner meals. Needs for ‘sensible meals’ eating occasions were based on the woman caring for herself and eating foods healthy for her. Application of the family systems approach to understand eating behavior is complementary to further study of the effects of experiencing ‘nurturing family meals’ eating occasions among midlife women.

A body of literature has examined the relationships between various dietary, exercise, restraint and monitoring practices and weight status or change among midlife women. In general, caloric reduction, low fat or low carbohydrate diets, meeting dietary recommendations or guidelines and replacing unhealthy foods with healthier options have been positively associated with favorable weight profiles for women (Lassale et al. 2011, Scarborough et al. 2011; Romaguera et al. 2010, Mozaffarian et al. 2011). Results suggest that women experience body dissatisfaction, disordered eating and dietary restraint during midlife (Dykes et al. 2004; Hays et al. 2002). To control weight, midlife women may practice dietary restraint and healthy and unhealthy weight control practices (Savage & Birch 2010; Levine et al. 2007; Tucker & Bates 2010). Barriers that influence eating behavior among midlife women in general include budget issues (Vue et al. 2008; Rolnick et al. 2009), time constraints and based on their nurturing role, preferences of

other family members, including children (Laroche et al. 2007; Rolnick et al. 2009; Welch et al. 2009).

Rationale.

Midlife women are a population of concern with respect to improving eating behavior and preventing weight gain and associated health risks. Limited studies have examined the manner in which the need to nurture family affects eating behavior among midlife women. The available studies are mostly qualitative or cross-sectional. Therefore, three studies were conducted with women who indicated they commonly experienced eating occasions characterized by the set of situation-based needs described as ‘nurturing family meals’ (Perry 2011). The first study examined barriers to healthy eating using a nominal group technique to identify and prioritize barriers in order of importance (Chapter III). The second study evaluated eating behavior at a dinner meal among women with eating occasion situation-based needs focused on ‘nurturing family meals’ compared to those focused on ‘sensible meals’ (Chapter IV). The third study compared eating behavior between women who gained weight versus those who maintained or lost weight over a two-year period of time. All women had indicated they experienced ‘nurturing family meals’ eating occasions on a routine basis (Chapter V). The following are the objectives for each of these three studies:

Objectives.

1. To identify and prioritize barriers to healthy eating in order of importance among midlife women during eating occasions focused on nurturing family members.
2. To determine differences in dinner meal food and nutrient intake among midlife women experiencing dinner eating occasions with situation-based needs focused on ‘nurturing family meals’ or on ‘sensible meals’ controlling for demographic characteristics that differ by the situation-based needs experienced.
3. To determine whether dietary intake and weight maintenance strategies were associated with weight gain over 2 years among a sample of midlife women reporting situation-based needs within eating occasions focused on nurturing family.

The findings from these studies have implications for tailoring nutrition guidance for midlife women based on the need to nurture family members by acquiring, preparing and serving meals. Tailoring refers to making information relevant to the individual and may involve important aspects such as matching content to an individual’s information needs and interests, framing information in a context that is meaningful to the person and designing information in a way to gain the individual’s attention (Matthew & Ricardo 2006; Rimer & Kreuter 2003). An interdisciplinary review including 23 studies, most of them being randomized, controlled trials, suggested that tailoring nutrition intervention was effective in improving eating behaviors such as increasing fruit and vegetable intakes (Wanner & Ware 2010). An evaluation done as a part of a review including 15 studies as a meta-analysis and 5 as a narrative review showed that tailored nutrition interventions

were more effective than non-tailored interventions in improving eating behaviors in adults (Eyles & Mhurchu 2009). Tailoring nutrition intervention for different segments of the population may therefore be more effective than providing generic nutrition information.

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**Chapter III : Barriers to healthy eating among midlife women
experiencing eating occasions focused on nurturing family**

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This study prioritized barriers to healthy eating by level of importance among midlife women (40-60 years) during eating occasions focused on nurturing family. A convenience sample (n=37) of women in Minnesota and North Dakota met in 7 group sessions (3-10/session) using a nominal group technique to identify and rank barriers. The majority were white, fairly well-educated, and employed full time. Thematic analysis methods were used and rankings were summed. The most important barriers were time and budgetary constraints, where healthier options were perceived to be more expensive, and lack of time limited planning and pre-preparation. Work and family schedules and activities played a role by influencing time available for planning and preparation. The need to consider family food preferences was also ranked highly as a barrier, but secondary to time and budgetary constraints. Information from this study can be used to tailor nutrition education for midlife women providing family meals.

Keywords: midlife women, situation-based needs, barriers to healthy eating, family systems theory

Introduction

Adult weight gain is a major risk factor among women for pre-hypertension (Yang et al. 2007), stroke (Saito et al. 2011), type 2 diabetes (Morimoto et al. 2011), and cardiovascular disease mortality (Nanri et al. 2010). Studies have shown that women are likely to experience a gradual increase in weight with age (Mozaffarian et al. 2011; Williams, Germov & Young 2011; Wang et al. 2010; Kawai et al. 2010). Modifications in eating habits are necessary to prevent weight gain with age, thereby reducing risk of associated chronic disease.

Women typically play an important role in food provisioning (acquisition, preparation and serving) for their family (DeVault 1991) while other members are involved in food decision-making by communicating their preferences and priorities (Gillespie & Johnson-Askew 2009). A family systems approach can be used to understand how eating habits of midlife women may be positively or negatively influenced by family members. Several researchers have described this approach from the perspective of the theoretical underpinnings of family therapy (Broderick 1993), family food and nutrition management systems (Ahye et al. 2006) and the family food decision-making system (Gillespie & Johnson-Askew 2009). The approach is based on family structure including interdependent marital and parental subsystems. Within these subsystems, family members learn rules for interactions that influence family functions such as food choice and eating behaviors.

Results from several qualitative studies suggest that women may learn to consider family food needs and preferences before their own diet and health needs based on

interactions with family members. Women expressed feelings of frustration when they were unable to fulfill an expected nurturing role because their children had strong food preferences (Vue, Degeneffe & Reicks 2008). Focus group findings have indicated that low-income women considered child or partner preferences to be barriers to intake of fruits and vegetables (Dharod, Drewette-Card & Crawford 2011). Henry et al. (2003) identified a strong influence of family preferences in the purchase and preparation of vegetables using a think aloud approach while low-income women shopped and prepared foods. Interviews with women conducted by Beagan & Chapman (2004) suggested that they were willing to change their diets to accommodate less healthy preferences of children and partners. Similarly, individual interviews with women who had completed cooking lessons indicated that the major factor keeping them from making changes were negative reactions of family members (Abbott et al. 2012). Interview results indicated that women reported taking on the identity of 'good mothers' and frequently put their own preferences aside at mealtimes resulting in overconsumption of less healthy foods including convenience foods or restaurant foods (Slater, Stevenhuysen, Edginton & O'Neil 2011). A previous study using nationally representative dietary intake data showed that when adults ate with children, their diets were higher in total and saturated fat compared to adults not eating with children (Laroche, Hofer & Davis 2007).

Other barriers to healthful eating among women included limited time (Rolnick et al. 2009; Welch et al. 2009) and money (Rolnick et al. 2009; Folta et al. 2008; Marcy, Britton & Harrison 2011). Perceptions of the high cost of healthy foods such as fruits and vegetables were associated with lower intakes of these foods by women (Williams, Ball

& Crawford 2010). Important barriers also included concerns about wasting food (Folta et al. 2008) and availability of healthy foods (Rolnick et al. 2009). Lack of knowledge, control and time were associated with a compromised ability to maintain energy restriction during a weight-loss trial among women and men (Welsh et al. 2011).

Limited studies have prioritized the importance of barriers to having healthy meals when women are focused on nurturing family members and may therefore compromise their own nutritional needs to accomplish this goal. General constraints involving lack of time and money have previously been identified as important but the significance of barriers regarding family influences is not well established. Therefore, the purpose of this study was to identify and prioritize barriers to healthy eating in order of importance among midlife women during eating occasions focused on nurturing family members. The resulting information will facilitate the development of nutrition education programs to address the most meaningful impediments to healthy eating and weight maintenance.

Methods

Women were recruited based on reporting that they experienced eating occasions focused on nurturing family members. Food decisions are based on goals/needs that vary with eating occasion context. Eating occasion context may include the rational and emotional influences on food decisions, such as who is present, meal type, money and time available to purchase and prepare foods and feeling hungry, tired or stressed. Combinations of situation-based needs/goals within specific eating occasions have been characterized for midlife women in a feasibility study (Sudo et al. 2009) and in a larger study, which replicated these findings (Perry 2011). Six clusters of eating occasions were identified by various combinations of situation-based needs experienced among a national sample of midlife women. One combination focused on nurturing family by providing a meal for the family, serving the needs of the family as a unit, and as a means of expressing love. This set of situation-based needs is consistent with the family systems approach where the meal serves as an opportunity for family bonding, and must be enjoyable with minimal complaints from family members which means appealing to the taste preferences of children or others present. Other needs in this set include balance from a nutritional standpoint, and staying within the family budget. Eating occasions characterized by this set of situation-based needs were named ‘nurturing family meals’ and were most often dinner meals, with at least one adult or child present. They were high in energy, total fat, cholesterol and sodium compared to eating occasions characterized by different sets of situation-based needs (Perry 2011). Among a national sample of women (n~1800), about one third experienced ‘nurturing family meals’ occasions as a dinner meal on a daily basis.

Participants.

A convenience sample of women (n=37) (in groups of 3-10) from urban areas in two Midwestern states (Minnesota and North Dakota) participated in a structured group discussion at local community centers based on the nominal group technique (NGT) (Van de Ven & Delbecq 1972) lasting approximately 60-90 minutes. Women were recruited through fliers distributed via email to University Extension programs including 4-H and food assistance program education, or posted at community sites such as food pantries, community centers, or low-income housing, and via snowball sampling techniques. Women were screened over the phone according to the following inclusion criteria: 40-60 years of age, not currently pregnant or breastfeeding, free of major chronic disease such as heart disease, diabetes, cancer, pulmonary and renal disease, able to read and speak English, and indicating that they experienced eating occasions with 'nurturing family meals' situation-based needs three to four times a week after having a brief description of this type of eating occasion read to them (Perry 2011) as follows:

For some family meals, women focus on providing a meal for their family and serving the needs of the family as a unit. The meal they provide is a means of nurturing the family and an expression of love. The meal serves as an opportunity for family bonding, so it must be enjoyable with minimal complaints from family members. This usually means appealing to the taste preferences of children or others, and it also must be balanced from a nutritional standpoint and within the family budget.

The study was approved by the University of Minnesota Institutional Review Board with informed consent obtained prior to data collection. Women were compensated with a \$30 gift card.

Picture activity.

At the beginning of each session, an activity was used to explore emotions and imagery (Bystedt, Lynn & Potts 2003) related to ‘nurturing family meals’ eating occasions. The moderator read the brief description of the ‘nurturing family meals’ eating occasions and asked participants to review a group of about 30 individual pictures and select one that best represented ‘nurturing family meals’ eating occasions for them. The pictures were expected to evoke various feelings and images; for example, pictures of a rainbow or footsteps in the sand might suggest peaceful or calm feelings, whereas pictures of a traffic jam or a snowstorm might call to mind feelings of frustration or concern. After selecting a picture, each participant was asked to tell the group about associations made between the pictures selected and ‘nurturing family meals’ eating occasions.

NGT process.

The NGT sessions were conducted in four steps that combined individual reflection and creativity, information sharing, and group prioritization (Van de Ven & Delbecq 1972). The sessions were moderated by two researchers who had previously attended training regarding focus group methodology (Krueger & Casey 2009) and conducted several practice NGT sessions with graduate students who were also parents.

One researcher served as an assistant moderator to take notes during the discussion. All sessions were audiotaped and transcribed verbatim for analysis.

The four steps were based on the central question that followed reading the brief description of the ‘nurturing family meals’ eating occasions: “What keeps this type of family meal from being healthy for you?” The first step involved brainstorming where each participant was asked to silently think of as many reasons as possible to answer the central question on an individual basis and list them on an empty sheet of paper. The next consisted of a round-robin presentation of individual responses with the moderator recording each on a white board or flip chart. The third step allowed for clarification of each response among all participants. The moderator asked participants to indicate if there were comments or questions about each response to make sure everyone understood each response in the same way. Lastly, the top three responses were ranked according to level of importance for what keeps ‘nurturing family meals’ from being healthy for the participant where 3=most important, 2=second and 1=least important. Additional open-ended questions were asked to further explore ideas that women had regarding intervention strategies that could address important barriers identified in each group (e.g., What type of information or activities would help you overcome this problem?). No barriers were identified in the seventh session that had not already been identified in previous sessions indicating data saturation.

Data analysis.

Descriptive statistics were used to characterize the sample regarding demographic characteristics (SAS, version 9.2, The SAS Institute, Inc., Cary, NC, copyright 2002-

2007). All barriers to healthful eating among women during ‘nurturing family meals’ eating occasions resulting from the clarification step were sorted into similar categories independently by two investigators. In case of divergence of opinion, agreement was reached through open discussion. Sums of ranks were calculated within each group and across groups based on the number of women per session identifying a barrier as important (3=most important, 2=second and 1=least important). The total sum of ranks was used to classify barriers into three logical tiers by level of importance. The first tier (sum of ranks >20) was based on having about half of the women in five or more groups rank the barrier as most, second or least important. For the second tier (sum of ranks >10 and ≤ 20), at least one women in four or more groups ranked the barrier as most, second or least important. For the third tier (sum of ranks ≤ 10), at least one women in at least one group ranked the barrier as most, second or least important. For the remainder of the discussion transcripts, coding categories were created according to the questions regarding intervention strategies and others based on the icebreaker activity (Krueger & Casey 2009). Codes were applied to a transcript from one session independently by two researchers and modified upon discussion prior to application to the remaining transcripts. Transcript segments were sorted according to coding categories and read for common themes independently by two researchers (Miles & Huberman 1994). Discrepancies in themes were reconciled upon discussion.

Results

A total of 37 women participated in the seven NGT sessions with a range of three to ten women per session. Four sessions were conducted in Minnesota and three in North Dakota. The majority of women were White (87 percent), with more than half having a 4-year college degree (65 percent) and employed full-time (60 percent). The remaining women were employed part-time (16 percent) or not employed (24 percent). Most women had at least one child under the age of 18 in the household (84 percent) and two or more adults (84 percent). Mean BMI based on self-reported height and weight was in the overweight range ($28.6 \pm 6.0 \text{ kg/m}^2$). Mean age was 48.8 ± 5.4 years.

Picture responses.

Women chose pictures that described three primary characteristics when asked to select a picture associated with feelings or images regarding ‘nurturing family meals’ eating occasions. These included a physical description, feelings the meal evoked, and the situational context surrounding the meal. Several women across most sessions chose a picture that depicted physical characteristics based on color, nutritional properties such as balance, and aspects of food quality such as being natural or wholesome. The most common descriptor involved color. For example, one participant selected a picture of a colorful dress flowing during a dance and said, “It’s colorful, lively and [has] lots going on.” In all groups, several women spoke of feelings of calmness or peacefulness based on pictures of footprints in the sand, a rainbow, or a farm field. Several women also mentioned combining feelings of peace with contrasting feelings of strife. One woman selected a picture of rushing water and said “Could be peaceful and calm, but could also

be chaotic.” In all groups, several women chose pictures that represented feeling tense based on the need to manage food preferences of family members. For one woman a picture of a traffic jam was selected with the accompanying comment: “. . . when cooking for 3 or 4 people, everyone has different likes and dislikes, and I am the one to make the final decision.” Another chose a picture of two bison engaged in conflict with the following explanation, “My daughter doesn’t like eating vegetables and my husband likes them, and when we eat all together, it’s like a fight as in the picture. And I am kind of in the middle.”

The context in which the meal took place was commonly based on families spending time with each other enjoying the meal. For example, one woman chose a picture of six jets flying in formation and indicated, “When I eat together with family its unity, all together.” Another situation was related to busy family schedules as described by one woman who chose a picture of a chessboard, “Reminds me of thinking ahead and planning the day. Planning the day with the different meetings and activities in the deal.”

Barriers to healthy eating.

Table 3.1 shows the common barriers to healthy eating among women during ‘nurturing family meals’ eating occasions prioritized in order of importance. Three barriers were identified as being the most important and pervasive based on the sum of ranks across all seven sessions (≥ 20) with many women in five or more sessions identifying these barriers as important. Lack of time to plan and prepare foods and lack of money to buy more expensive, healthier foods were the most important barriers followed by the need to cater to preferences/expectations of family members. Examples of

comments that explained how lack of time affected intake include: “Something that is easy and quick to cook is not always healthy.” and “I usually buy fresh produce but because of lack of time we end up getting fast-food and the fresh produce gets spoiled.” Responses related to how lack of money affected intake include: “. . . fruits and vegetables which are supposed to be healthy choices are costly,” and “I don’t like making things out of a can. But the healthier stuff seems more expensive.” Comments indicating that the need to cater to preferences of family members affected intake include: “Too much salt, fat or calories, dinner guilt, this means that what I am trying to cook may not be healthy for me, due to the family.” “Me and my daughter can have something simple but my husband wants a complete meal like meat and potatoes,” “Making something everyone likes but me. Just easier.” and “I am actually thinking about what others need rather than thinking about my meal. I look at my plate saying ‘Did I really eat that?’ Not focusing on [me].”

A second tier of barriers had a sum of ranks in an intermediate range (>10 and ≤ 20), with these suggested as important barriers by women in four to five groups. These barriers included work and family schedules and activities which were usually in the context of limiting time for planning and preparation, lack of planning or preparation, and lack of creative ideas/recipes. Comments regarding work and family schedules included: “If I am late at work I would tend to pick up something on the way which may not be healthy.” Lack of planning was thought to inhibit healthy eating as follows “. . . if you’re not organized you end up eating something which may not be healthy.”

A third group of barriers had a sum of ranks ≤ 10 and were only ranked as one of the top three barriers by women in one to three sessions. These included the need to use convenience foods which were considered less healthy, and physical considerations such as being stressed, too tired to cook, having food allergies, eating too much, not having ingredients on hand, and feeling that fast food was an easier and quicker option. Several of these barriers are directly related to lack of time to prepare foods from scratch or to prepare foods at home, reinforcing the importance of lack of time as the most significant barrier. Other barriers cited in the NGT process but were not ranked as important by any women in the voting process included snacking while preparing the meal, baking too much, eating away from home and lack of adequate space/equipment for food preparation.

Suggested intervention strategies.

In general, women in all groups suggested that efforts to manage time to allow for pre-planning and/or preparing food were important and that organization and motivation were necessary for the best management of time. As one woman suggested, “We have over scheduled our lives, so we lack the motivation for cooking a healthy meal for the family. It comes down to how motivated you are . . . to sit down and plan with your family.” The most common ideas for managing time were to plan menus on the weekends for the rest of the week and to make food ahead of time and freeze or portion out for later meals. Across most groups, women focused on strategies that involved family members in planning efforts to address food preferences. For example, “My kids are at that age where they can help me. Maybe everyone together could plan.” “. . . selecting a day of

the week and having something pre-planned for that day. Sundays, for example, everyone could come together and decide on the menu for the week.” and “delegating [planning] to family members.” Women also agreed that an optimum way to address the need to cater to family preferences involved “making family friendly recipes, making what everyone likes and is healthy too.”

Common cost-saving strategies were discussed, such as using coupons, buying products when on sale, or through a buying club. In several sessions, women spoke of using an online website to inform them of foods that were currently the most inexpensive in particular stores, along with potential recipes and meal plans to include the cheapest foods, “Could there be a magic cheat sheet?” Other ideas included assistance with planning to help food last over the month and ideas for healthy recipes to make with inexpensive foods such as “buy cheaper foods and convert them into healthier stuff” or “get cheap recipes online, with ingredients.”

Many women addressed the importance of cooking skills with some women indicating they liked to cook whereas others either did not like to cook or mentioned they could use further information on procedures such as defrosting meat or stir-frying vegetables. Women in most groups also indicated a need for quick, easy, and healthy recipes, as one woman mentioned “Master the basics, keep it simple and then master it over time. The recipe needs to be easy and quick and also nutritious.”

Discussion

Results from the current study showed that barriers related to accommodating preferences of family members were in the first tier of barriers but were not ranked as more important than the common barriers of limited time and money identified in other studies (Rolnick et al. 2009; Folta et al. 2008). On a national level, lack of time plays a major role in the increasing percentage of total household food dollars spent on food eaten away from home. From 1970 to 2010, this percentage increased from 33 percent to 47 percent (Clausen 2011). Mancino & Newman (2011) showed that time spent preparing food decreased as time spent working outside the home increased and that more children in a household increased the time women spend preparing food. Given that the majority of participants in this study indicated they worked full- or part-time and had children or another adult in the household, lack of time may have superseded other needs in importance. Devine et al. (2009) found that food choice-coping strategies among employed mothers often involved family meals that were quick to prepare and the use of convenience entrées with implications for the healthfulness of the meals. However, among mothers of school-aged children, perceived time pressure was negatively associated with confidence in the ability to prepare a healthy meal (Beshara, Hutchinson & Wilson 2010). Survey results with mothers of early adolescent and adolescent children showed that mothers' perception of time pressures resulted in less meal planning (McIntosh et al. 2010).

Recruitment for this study was done through University Extension programs including education for food assistance participants, food pantries, and low-income

housing resulting in a sample including women who represented lower education (35 percent with less than a 4-year degree) and employment levels (40 percent with part-time employment or not employed). Therefore, the sample makeup and the fact that the data were collected when many Americans were facing financial hardships due to the recession (2010) would indicate that budgetary considerations should have been ranked highly as an important barrier. These findings are consistent with the commonly held perception that healthy food is more expensive among low-income adults as well as adults from a wider range of income/education levels (Marcy, Britton & Harrison 2012; Williams, Thornton & Crawford 2012). The Economic Research Service of the US Department of Agriculture recently reported that some healthier foods were more expensive than less healthy alternatives, and in other cases, healthier foods were less expensive with prices varying across regions of the US (Todd, Leibtag & Penberthy 2011). These findings indicate that the ranking of cost as an important barrier in the current study is in line with prices for healthy foods, especially for women in the sample who may have had lower incomes.

Because women indicated that they experienced ‘nurturing family meals’ eating occasions fairly often as inclusion criteria for the study, it was also expected that important barriers would reflect the reciprocal influence of family members on behaviors of women providing the meal. The need to cater to family preferences/expectations regarding foods served was ranked highly as an important barrier to healthy eating consistent with family systems theory. Reciprocal influences based on interactions across parental and marital subsystems predict that women will suppress their own healthier

food behavior to serve foods according to preferences and expectations of family members. This concept was also supported by results obtained from the picture activity. Women indicated that while they were hoping that family meals could be peaceful and a time to enjoy the company of family members, often times this was not possible due to the need to consider preferences of family members. Similar to results from the current study, focus groups findings from parents of school-aged children regarding family meals indicated that parents were frustrated with the small number of food items preferred by children and their attempts to get their children to eat a wider variety of foods (Fulkerson et al. 2011). Parents indicated that they would like to have greater involvement of their children in meal planning and food preparation activities. In the current study, women also indicated that involvement of spouses and children in meal planning and preparation would be beneficial in addressing the need to consider taste preferences of family members.

Lack of creative ideas and healthy recipes was identified as a barrier to healthy ‘nurturing family meals’ along with the notion that fast food was an easier or convenient option. In addition, a range of cooking skills was described among women indicating that some may have lacked skills to prepare meals at home. This could contribute to being overly dependent on pre-prepared convenience or fast foods. Among adults, ready-meal consumption (defined as complete meals requiring few or no extra ingredients, prepared externally, and replacing homemade main dishes) was negatively associated with cooking skills (van der Horst, Brunner & Seigrist 2011). Similarly, fast food consumption was associated with dislike toward cooking and perceived convenience of fast foods among

adults (Dave et al. 2009) while healthful snack consumption was correlated with being able to overcome barriers related to preparation, convenience and availability among midlife women (Schunk, McArthur & Maahs-Fladung 2009). An inability to overcome the barriers identified in the current study on a routine basis could be responsible for excessive energy intakes and a less healthy nutrient intake profile. Concerns were raised that the use of less healthy convenience foods to save time and the lack of money to purchase healthier, more expensive options, limited the availability of healthy foods in the physical environment which could also cause women to compromise on the nutritional quality of family meals.

The strengths of the study include the use of in-depth qualitative data from midlife women who specifically indicate they experience ‘nurturing family meals’ eating occasions. In two of the sessions, only three and four women participated which may have limited the number of barriers identified due to limited group dynamics. A simple subjective assessment was used to screen women according to whether they experienced ‘nurturing family meals’ three to four times a week. A more rigorous quantitative assessment may have been better able to determine whether women commonly experienced ‘nurturing family meal’ occasions. The majority of the convenience sample was fairly well educated and reported working either full time or part-time, which limited the ability to determine barriers that existed for less educated women who did not work. The study was completed in two neighboring states in the Midwest, women in other regions may experience different barriers based on variability in food access and cost.

The findings from this study have implications for tailoring nutrition guidance for midlife women based on the need to nurture family members through family meals. While the issues of time and money management should be addressed as the most important topics, information on protecting their own nutritional needs should also be included. Many current nutrition education programs and resources are available which consider the issues of time and budget management. However fewer resources are available to help women maintain the healthfulness of meals for themselves while managing family food preferences and expectations when experiencing ‘nurturing family meal’ eating occasions. Since women feel a strong moral obligation for family health (Nettleton 1991), program objectives could be focused on providing foods that are healthy and still meet family food preferences as suggested by women in the current study. Program objectives could also focus on allowing women to reflect on the underlying reasons for placing family preferences above their own nutritional needs based on family systems theory. In addition, motivation to provide healthier foods for all family members needs to be in place before time management and food resource reallocation can be accomplished. Program objectives should include motivational materials or activities that allow women to simplify preplanning and encourage family involvement.

Further research should involve quantitative studies to more closely determine how the barriers to ‘nurturing family meals’ influence diet quality, weight and health of midlife women. Studies should also be conducted to determine how food preparation time may be influenced by nutrition education to improve cooking and food budgeting

skills, and to increase the availability of quick, tasty recipes as suggested by women in the current study.

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Table 3.1. Ranking of barriers to healthy ‘nurturing family meals’ by women

	Group Number (number/group)							Sum of ranks across groups
	1 (n=5)	2 (n=5)	3 (n=6)	4 (n=10)	5 (n=5)	6 (n=4)	7 (n=3)	
Responses generated in the NGT process	Number of women selecting response 1, 2, or 3 (sum of ranks for each topic)							
Lack of time to plan and/or prepare foods for healthy meals	3 (7)	3 (6)	4 (7)	2 (5)	4 (7)	2 (2)	3 (7)	41
Lack of money to buy more expensive healthier options	2 (3)	3 (5)	4 (8)	3 (5)	1 (3)	4 (10)	2 (6)	40
Need to cater to different taste preferences and expectations of family members	1 (3)	1 (3)	2 (6)	7 (12)	2 (4)			28
Work and family schedules/activities	4 (7)		2 (3)	1 (3)	1 (2)	2 (4)		19
Lack of planning/pre-preparation to have healthy food available for a meal	3 (6)	3 (7)	1 (3)		1 (1)		1 (1)	18
Lack of creative ideas, healthy recipes, ways to use leftovers	1 (1)	2 (5)		4 (6)	1 (2)			14

Sum of ranks across groups was calculated by summing the rankings where 3=most important, 2=second and 1=least important.

**Chapter IV : Situation-based needs for the dinner meal affect food and
nutrient intakes among midlife women**

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The purpose of this study was to determine how food and nutrient intakes differed among a national sample of midlife women (40-60 years) grouped according to situation-based needs underlying food choice at dinner meals. Cross-sectional survey data from mailed questionnaires were used to segment eating occasions by situation-based needs. Dietary intake data from one-day food records were compared for women grouped by those who experienced eating occasions according to situation-based needs that primarily involved nurturing others (n=594) or caring for oneself by eating sensibly (n=298). ANCOVA was used to determine differences in demographic characteristics, situational context, and dinner meal food and nutrient intakes by group controlling for marital status, number of children (<18 years) at home and employment. Women in the group experiencing situation-based needs centered on nurturing others were more likely to be younger, married and employed part-time, and have children at home compared to the group experiencing needs to eat sensibly. The nurturing needs group consumed more refined grains, non low-fat foods (meat, dairy and fats), sugar-sweetened beverages, energy, fat, cholesterol, saturated fat, sucrose and sodium compared to the sensible eating needs group. Experiencing situation-based needs to nurture others was associated with less healthy dinner meal intakes compared to experiencing needs for sensible eating which may have implications for weight gain over time.

Introduction

Prospective studies have shown that during midlife women gained a mean of 3.8 lb over a 4 year period (Mozaffarian, Hao, Rimm, Willett & Hu 2011) or experienced a 5.5% increase in weight over 10 years (Norberg et al. 2011). Women who gain weight are at increased risk of obesity-related chronic diseases at midlife and in later life (Biggs et al. 2010; Yang et al. 2007, Strandberg et al. 2003; Huang et al. 1998). Efforts to address weight gain in midlife can therefore help reduce risk of chronic disease and maintain general health.

Eating behavior among women is influenced by familial factors. Women typically play an important role in food provisioning activities such as feeding themselves and others (purchasing, preparing and serving foods) (DeVault 1991; Neysmith & Reitsma-Street 2005). A family systems approach can be used to describe the influence of familial factors on how a woman purchases, prepares and serves foods for herself and her family. This approach can be explained based on findings from several studies and reports (Bowen 1966; Brown 1999; Broderick 1993; Ahye et al. 2006; Gillespie & Johnson-Askew 2009). As defined here, the family systems approach includes the concepts of family structure, which is the existence of parental and marital subsystems that define roles, and family interactions, which allow family members to learn rules about relating to one another. Family structure and interactions influence the functional outcomes of food choice and behaviors for the woman and her family.

Application of this approach would suggest that all family members exert an influence on decisions with respect to the foods that are served at family meals, possibly

by making requests for specific foods, providing approval when certain foods are served or complaining/refusing to eat when disliked foods are served. Results from several qualitative studies have shown that women as the food provisioner for the household may consider other family members' needs as more important than her own needs, which could lead to compromising personal diet and health needs (Slater, Sevenhuysen, Edginton & O'Neil 2011; Buchholz, Huffman & McKenna 2012; Dharod, Drewette-Card & Crawford 2011). Other studies have shown that women may be inhibited in making healthy dietary changes for themselves by family members who are resistant or not supportive of changes (Abbott, Davidson, Moore & Rubenstein 2011; Beagan & Chapman 2004). Results from a quantitative study also suggested that when adults eat with children, they are more likely to eat unhealthy foods and foods high in total fat and saturated fat (Laroche, Hofer & Davis 2007).

Food decisions made by women for the household and for herself reflect goals and values of both the woman and her family, but may differ depending on the situation-specific assessment of these goals or needs. Six combinations of situation-based needs/goals within specific eating occasions were identified for midlife women in a segmentation study to establish feasibility (Sudo et al. 2009) and confirmed in a larger study involving a national sample of women (Perry 2011). Results showed that the combinations of situation-based needs within specific eating occasions influenced intakes of food groups, nutrients and energy. Eating occasions characterized by two combinations of situation-based needs were most commonly experienced at dinner meals compared to the others. One was named 'nurturing family meals' and was described as

focusing on nurturing family by providing a meal for the family, serving the needs of the family as a unit, and as a means expressing love. This set of situation-based needs is consistent with the family systems approach where the meal serves as an opportunity for family bonding, and must be enjoyable with minimal complaints from family members which means appealing to the taste preferences of children or others present. Another type of eating occasion based on a different set of situation-based needs was named ‘sensible meals’ and was described as focusing on the woman eating healthfully and responsibly, controlling weight, and controlling her overall caloric intake, fat, cholesterol and carbohydrate intakes. Given the different needs that underlie these two types of eating occasions, the food group and nutrient intakes of women experiencing these situation-based needs may differ during the dinner meal.

While food group and nutrient intakes have been compared by the six situation-based needs identified within all eating occasions (Perry 2011), demographic characteristics of women and meal-type differences were not considered. Examining dietary intakes from the perspective of situation-based needs within a particular meal is a novel approach to obtain greater insight into motivations underlying food choice. Therefore, the purpose of this study was to determine differences in food and nutrient intakes among midlife women experiencing dinner eating occasions with situation-based needs focused on ‘nurturing family meals’ or on ‘sensible meals’ controlling for demographic characteristics that differed by the situation-based needs they experienced. This information has implications for tailoring nutrition guidance for midlife women based on their situation-based needs.

Methods

Overview.

Data for this study were from a larger study of midlife women, which included a mailed one-day food record and four identical eating occasion questionnaires which women were asked to complete after eating breakfast, lunch, dinner and a snack. Eating occasion questionnaire responses to 88 need statements (which served as segmentation variables) were used to segment eating occasions by situation-based needs (Appendix A). These statements were developed and tested with midlife women in a previous feasibility study (Vue, Degeneffe & Reicks 2008; Sudo et al. 2009). An initial battery of need statements (n=129) was developed based on focus group results and administered to 200 women in a questionnaire with an agree-disagree response format. Using principle component analysis, these need statements were reduced from 129 to 88 based on nine components including health, convenience, price, portability, nurturance, reward, enjoyment, tradition, and weight concerns, all with Cronbach α coefficients >0.70 . Six combinations of needs were identified and described as ‘nurturing family meals’, ‘sensible meals’, ‘healthy express’, ‘comforting interludes’, ‘fast fueling’ and ‘indulgent escapes’ (Perry 2011). The current study used data from the dinner meal questionnaire only for women experiencing one of two of the six combinations of situation-based needs (‘nurturing family meals’ and ‘sensible meals’) and food record data for foods reportedly consumed at the dinner meal.

Participants.

For the larger study, survey packets were mailed to a cross-sectional sample of midlife women (40-60 years) members of a national mail panel maintained by TNS™ Global, a commercial marketing company. The mail panel included 500,000 households with 1.3 million individuals in the United States who were recruited via subscription and registration card lists. The sample was selected from this panel in such a way that it was balanced according to US census demographic profiles (United States Department of Commerce, 2006) based on the nine geographic regions of US metropolitan and micropolitan statistical areas (Office of Management and Budget, 2000), and characteristics including age, income, household size and composition, and race/ethnicity.

An initial recruitment letter and consent form were sent to 8,000 households. Survey packets were sent to the 2,713 (33.9%) women who returned a signed consent form. Of these, 1,634 women returned completed survey packets (60.2%). Additionally, 1,200 households from the same mail panel were sent the recruitment letter, consent forms and survey packets at the same time. Of these, 292 women returned completed survey packets (24.3%). Based on both recruitment methods, responses were obtained from a total of 1,926 women, representing 7,630 eating occasions. In return for completing the survey packet, participants received monetary compensation (\$6) from TNS™ Global.

For this study, meal times recorded on the dinner meal questionnaires were matched with those on the food record booklets. After exclusions based on non-matching

meal times, missing and incomplete intake data, food group and nutrient intake data were available for 1,474 dinner meal occasions. Of these, the majority (60%) were categorized according to two sets of situation-based needs “nurturing family meals” (n=594) and “sensible meals” (n=298) (Table 4.1). Dinner meal occasions were divided among the other sets of situation-based needs as follows: ‘healthy express’ (n=151), ‘comforting interludes’ (n=113), ‘fast fueling’ (n=162) and ‘indulgent escapes’ (n=156). The protocol was approved by the University of Minnesota Institutional Review Board: Human Subjects Protection Committee prior to data collection.

Procedures.

The dinner meal questionnaire included the 88 need statements and questions about the length of time taken to prepare, eat and clean up after the meal, presence of others, location, day of the week, and when the menu for the meal was determined (Appendix A). A general questionnaire was included in the survey packet as part of the larger study with questions to assess self-reported height and weight, menopausal status (Hislop et al. 2006) and use of vitamin and mineral supplements.

Data from the one-day food record booklet included a description of all foods, beverages, and amounts consumed according to time eaten and type of occasion (for this study, only dinner meal data were used) (Appendix B). These data were based on a set of comprehensive written instructions, examples and an accompanying DVD demonstration. Instructions to complete the packet on a weekday (M-Th) or weekend (F-Su) were included in 57% and 43% of survey packets, respectively. Data from the food record booklet were analyzed using Nutrition Data System for Research software (NDSR)

(version 2008, Nutrition Coordinating Center, University of Minnesota, Minneapolis, MN, USA). Foods were grouped under common categories including regular meat (non lean beef, pork, veal, lamb, game, fried chicken, cold cuts and sausage, organ meats, fish), regular dairy (non-reduced fat milk, yogurt and cheese), regular fat (non-reduced fat oil, margarine, cream, salad dressing), fruit (citrus fruit and juice, non-citrus fruit and juice), vegetable (dark green, deep yellow, other, and other starchy vegetables; tomato, white potatoes; legumes; vegetable juice), whole grain (whole grain flour, rolls, other breads, crackers, pasta, ready-to-eat cereal, cakes, snack bars, snack chips, popcorn, flavored popcorn), refined grain (refined grain versions of the same food types as the whole grain category excluding popcorn), sugar sweetened beverages (soft drinks, fruit drinks, sweetened tea, sweetened coffee, sweetened water), diet beverages (artificially sweetened -soft drinks, fruit drinks, tea, coffee, water).

Data analysis.

Data were analyzed using SAS software (SAS Institute Inc., 2002-2008, Cary, NC, USA). Data were tested for normality and transformed using square root transformation when necessary prior to data analysis. Independent t-tests were used to examine differences in continuous demographic variables. Chi-square tests were used to examine difference in categorical demographic and contextual factors. ANCOVA was used to determine differences in food and nutrient intakes between women experiencing ‘nurturing family meal’ and ‘sensible meal’ needs controlling for three demographic characteristics shown to differ by group including presence of children (<18 years) in the home, marital status and employment (Table 4.2). Other demographic variables including

age and menopausal status also differed by group but were not included as controlling variables because they were correlated with presence of children ($r=.287$, and $.229$, respectively) according to Spearman correlation analysis. The three demographic variables were modeled in a dichotomous manner including presence of children (<18 years) in the home (yes or no), marital status (married or not married) and employment (full-time or part-time/not employed).

Results

Table 4.2 presents results with respect to the demographic characteristics of all women and by situation-based need groups ($n=892$). The mean age was 49.4 years with a mean BMI of 28.3 kg/m^2 . The participants were mostly white (82.2%). The majority (64.7%) had children in the household under the age of 18 years and were employed full or part time (71.3%). Most women were married (79.6%), had an annual income of > \$35,000 (79.6%), and had attended some college or had a 4-year degree (80.2%). About half were post-menopausal and reported taking a vitamin/mineral supplement on the survey day. Women experiencing the set of needs based on ‘nurturing family’ were somewhat younger and pre-menopausal, less likely to be employed full time and to take a vitamin/mineral supplement, and more likely to have children in the home and be married compared to those experiencing the set of needs based on ‘sensible meals’ (Table 4.2).

Table 4.3 shows the differences in meal context factors between women experiencing ‘nurturing family meals’ compared to ‘sensible meals’ situation-based needs. There was a significant difference in time spent in meal preparation ($p < 0.0001$) where women experiencing ‘nurturing family meals’ needs spent more time in meal

preparation compared to women experiencing 'sensible meals' needs. Women in the 'nurturing family meals' needs group were more likely to have an adult and/or children present at the meal compared to women in the 'sensible meals' needs group ($p < 0.0001$).

Table 4.4 shows differences in food group intakes between women by situation-based needs. Women in the 'nurturing family meals' needs group had greater intakes of refined grain, regular (non low-fat) meat, regular dairy, regular added fats, and sugar sweetened beverages than women in the 'sensible meals' needs group. Women in the 'sensible meals' needs group had a significantly greater intake of unsweetened beverages compared to women in the 'nurturing family meals' needs group. Both groups consumed more than two cups of vegetables and some dairy foods for dinner.

Table 4.5 shows the differences in nutrient intakes between women by situation-based needs. Women in the 'nurturing family meals' needs group had higher intakes of energy and nutrients that are typically associated with less healthy diets including total fat, cholesterol, saturated fat, sucrose and sodium compared to women in the 'sensible meals' needs group. Women in the 'nurturing family meals' needs group also had higher intakes of nutrients associated with healthier diets such as protein, calcium and iron. While women in the 'sensible meals' needs group had lower intakes of 'negative' nutrients, they also had higher intakes of beta-carotene and vitamin C compared to the 'nurturing family meals' needs group.

Discussion

Overall the results showed that midlife women who focused on their own health needs ('sensible meal' needs) were more likely to eat healthy compared to women who focused on attending to the needs of other family members ('nurturing family meal' needs). These findings are consistent with application of the family systems approach and have implications for tailored interventions to address prevention of weight gain among midlife women.

Midlife women tend to gain weight with age (Mozaffarian et al. 2011; Norberg et al. 2011). The amount and type of foods and nutrients consumed may be an important factor contributing to this tendency. Women who experienced 'nurturing family meals' situation-based needs at dinner consumed higher amounts of foods and nutrients with a negative health orientation such as refined grains, high fat foods and sugar-sweetened beverages compared to those experiencing 'sensible meals' needs. The type of eating pattern that may be present among women experiencing 'nurturing family meals' may increase risk of weight gain as shown in previous studies where intakes of refined grains, starches, sugar-sweetened beverages and high fat meats and dairy contributed to weight gain (Mozaffarian et al. 2011). Dietary pattern research has also shown that a pattern including high fat foods, processed meats, refined grains and sweet foods was more likely to result in weight gain compared to a pattern including fruits, vegetables and whole grain (Schulze, Fung, Manson, Willett & Hu 2006; Schulz et al. 2005).

An interesting finding of the current study was that even though women experiencing 'nurturing family meals' situation-based needs had higher intakes of less

healthy nutrients and foods than those experiencing ‘sensible meals’ needs; there were no significant differences in the fruit and vegetable intakes between groups. This may be explained in part because of the likelihood that dinner meals are eaten with others (Perry 2011) and have a substantial number of foods included in the meal. Others have shown that the more foods offered at a meal, the greater the total food intake (Levitsky, Iver & Pacanowski 2012). The finding that fruit and vegetable intakes did not differ by group in the current study also suggests that while ‘nurturing family meals’ eating occasions have a less healthy profile overall than ‘sensible meals’ eating occasions, they have some positive qualities. Previous studies have also shown that adults with children ate more fruits and vegetables than those without children and that those engaging in family meals more often had greater fruit and vegetable intakes (Berge et al. 2012; Devine, Wolfe, Frongillo, Bisogni 1999). ‘Nurturing family meals’ eating occasions were likely to provide more protein, calcium and iron than ‘sensible meals’ eating occasions consistent with the concept that these occasions have a mixed nutrition profile, offering more of some positive and negative nutrients than the ‘sensible meals’ occasions.

The findings that ‘nurturing family meals’ eating occasions result in intakes of some less healthy nutrients compared to ‘sensible meals’ occasions are consistent with the application of the family systems approach. This approach allows for a possible explanation for these findings by suggesting that women may tend to suppress their own needs to meet expectations of nurturing others. Nurturing others may mean purchasing and serving foods that women perceive as meeting taste preferences of others (Maubach, Hoek & McCreanor 2009) but may not necessarily be healthy. Le Bigot Macaux (2001)

found that mothers viewed food primarily as a pleasure for their child, with necessity and nutrition given a lower importance. Other studies have shown that taste is an important factor affecting food consumption among adults (Glanz, Basil, Maibach, Goldberg & Synder 1998) and that consumers perceive that healthy foods taste bad (Wood et al. 2010). Slater et al. (2011) showed that women's values and beliefs included a desire to be 'good mothers' which meant putting aside their own preferences at meal times to focus on preferences of other family members. This tendency is also consistent with a tenet of the family systems approach known as 'differentiation of self' (Bowen 1966). Women with low differentiation of self may be more likely than women with high differentiation to be influenced by preferences and needs of others instead of their own needs. Individual choices of women may be suppressed to achieve harmony within the family because the woman has a sense of responsibility for reactions of other family members (Brown 1999). In the current study, women with 'nurturing family meals' situation-based needs may have provided family meals that were dependent on preferences of others to garner feelings of approval and acceptance.

A recent review indicated that lack of time is a primary contributor to the observed decrease in food preparation at home and frequency of family meals (Jabs & Devine 2006). This review suggested that women who were employed experienced time scarcity as they had busy schedules and relied on quick, convenience foods, which may not be healthy. This was consistent with findings from the current study where women with 'nurturing family meal' needs were less likely to be employed full time and thus may have been able to spend more time on dinner meal food preparation than women

with 'sensible meal' needs. However, a longer time spent on food preparation was not consistent with healthier foods consumed at the meal as has been observed in other studies (Bauer, Hearst, Escoto, Berge & Neumark-Stzainer 2012; Crawford, Ball, Mishra, Salmon & Timperio 2007). This inconsistency could be explained in part by the notion that women with 'sensible meal' needs may be more likely to focus on their own needs in a healthy manner even though time is scarce due to employment. When time is limited it may still be possible to prepare and consume healthy meals if women have a strong underlying motivation to eat healthfully or a sense that they are a 'healthy eater'. In a previous study, those university students and staff who identified as a 'healthy eater' were more likely to consume fruits and vegetables and less likely to consume foods of low nutritional value (Strachan & Brawley 2009).

A limitation of the current study is the use of a mail panel to obtain data from a national sample. While the sample that received the invitation to participate was balanced with respect to US census demographic profiles, the ending sample was more educated and affluent, indicating selection bias and limiting generalizability of results to a broader group of midlife women. Another limitation is the use of a one-day food record to assess usual dietary intake. While dietary records are thought to be subject to less error than food recall methods, diary or record methods are also imperfect with the potential for forgetting to record intake immediately after eating and fatigue from the burden of recording intake details throughout the day. While comprehensive instructions and examples were provided with respect to recording food intake, self-reported intake could have been over or underestimated for several reasons, thus limiting accuracy. A previous

study based on the mailed one-day food record indicated that while weight status affected adequacy of records, education level did not (Sudo, Perry & Reicks 2010). Adequacy was defined as the ability to record intake so that intake could be entered into the NDSR software program without missing data. More extensive food records (3-7 days instead of one-day) may have provided a more reliable estimate of intake (Payette & Gray-Donald 1991), however this was less feasible given that the survey packets were distributed and returned via the mail.

Midlife women are at risk of weight gain and previous low-intensity interventions focused on preventing weight gain in this population and adults in general have not been able to produce significant results (Levine et al. 2007; Jeffrey & French 1999). This suggests the need for more intensive and well-structured intervention programs tailored to the needs of midlife women to improve weight outcomes. Based on the findings of this study, tailored nutrition intervention programs should address values and beliefs as a food provisioner, differentiation of self within parental and marital subsystems, and emphasize family involvement in planning healthful meals that include foods that all members like.

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Table 4.1. Situation-based needs within dinner meal eating occasions

Situation-based needs	% (n)	Description
Nurturing family meals	40 (594)	Provide a meal for family Show love Family time Forsake personal nutritional needs
Sensible meals	20 (298)	Have a responsible meal Care for self Stay in control of weight Feel good about self
Indulgent escapes	11 (156)	Indulgent treat/ reward Enjoy something rich Focus on taste experience
Fast fueling	11 (162)	Catch quick bite Grab on the run Eat quickly
Healthy express	10 (151)	Eat healthy/quickly Control calories Balance food Minimize time/effort
Comforting interludes	8 (113)	Comforting personal moment Easy Enjoy light meal or snack Somewhat healthy
Total occasions = 1,474		

Table 4.2. Demographic characteristics for all women and for women experiencing ‘nurturing family meals’ vs. ‘sensible meals’ situation-based needs

Demographic variables	All women Mean (SD) (n=892)	Nurturing family meals Mean (SD) (n=594)	Sensible meals Mean (SD) (n=298)	Overall p-value¹
Age (yrs)	49.4 (5.7)	48.5 (5.4)	51.1 (5.8)	<0.0001
BMI on survey day (kg/m ²)	28.3 (7.6)	28.3 (7.9)	28.4 (6.8)	0.753
BMI 2 yrs ago(kg/m ²)	28.6 (8.2)	28.3 (8.5)	29.2 (7.8)	0.132
BMI 5 yrs ago(kg/m ²)	27.9 (8.5)	27.6 (8.7)	27.6 (8.7)	0.161
	n (%)²	n (%)	n (%)	Overall p-value³
Race				0.037
White	733 (82.2)	492 (82.8)	241 (80.9)	
Black or African-America	112 (12.6)	66 (11.1)	46 (15.4)	
Asian or Pacific Islander	35 (3.9)	30(5.1)	5 (1.7)	
American Indian	8 (0.9)	4 (0.7)	4 (1.3)	
Other	4 (0.5)	2 (0.3)	2 (0.7)	
Hispanic ethnicity				0.724
Yes	103 (11.6)	67 (11.3)	36 (12.1)	
No	789 (88.5)	527 (88.7)	262 (87.9)	
Children <18 yrs in household				<0.0001
Yes	577 (64.7)	443 (74.6)	134 (45.0)	
No	315 (35.3)	151 (25.4)	164 (55.0)	
Marital status				<0.0001
Married	710 (79.6)	497 (83.7)	213 (71.5)	
Never married	66 (7.4)	29 (4.9)	37 (12.4)	
Widowed/separated/divorced	116 (13)	68 (11.5)	48 (16.1)	

Table 4.2. Continued

Demographic variables	All women Mean (SD) (n=892) n (%)	Nurturing family meals Mean (SD) (n=594) n (%)	Sensible meals Mean (SD) (n=298) n (%)	Overall p-value³
Annual household income				0.822
<\$19,999	65 (8.4)	44 (8.5)	21 (8.3)	
\$20,000-\$34,999	93 (12.0)	59 (11.4)	34 (13.4)	
\$35,000-\$74,999	283 (37.9)	196 (37.7)	97 (38.3)	
>\$75,000	322 (41.7)	221 (42.5)	101 (39.9)	
Education				0.064
≤ High school	176 (19.9)	130 (22.0)	46 (15.7)	
Some college/associate degree	313 (35.4)	208 (35.2)	105 (35.7)	
≥ College graduate	386 (44.8)	253 (42.8)	143 (48.7)	
Employment				0.0002
Fulltime	439 (49.2)	189 (31.8)	176 (59.1)	
Part-time	197 (22.1)	263 (44.3)	55 (18.5)	
Retired/other	256 (28.7)	142 (23.9)	67 (22.5)	
Menopausal status				<0.0001
Pre-menopausal	443 (50.3)	334 (57.1)	109 (36.9)	
Post-menopausal	437 (49.7)	251 (42.9)	186 (63.1)	
Took vitamin/mineral supplement on survey day				0.0007
Yes	514 (58.1)	319 (54.2)	195 (66.1)	
No	370 (41.9)	270 (45.8)	100 (33.9)	

¹T-test for significant differences at p<0.05 level.

²Where frequencies ≠ 892, 594, 298 within each demographic category for ‘all women’, women experiencing ‘nurturing family meals’ eating occasions and women experiencing ‘sensible meals’ eating occasions respectively, data are missing.

³Chi square testing for significant differences at p<0.05 level.

Table 4.3. Differences in dinner meal contextual factors for women experiencing ‘nurturing family meals’ vs. ‘sensible meals’ situation-based needs

Contextual variables	Nurturing family meals n (%) ² (n=594)	Sensible meals n (%) ² (n=298)	p-value ¹
Day of the week			0.375
Weekday	373 (62.8)	178 (59.7)	
Weekend	221 (37.2)	120 (40.3)	
Meal preparation time			<0.0001
≤ 20 minutes	168 (28.7)	134 (46.4)	
21-30 minutes	1570 (25.6)	67 (23.2)	
≥ 31 minutes	267 (45.6)	88 (30.5)	
Meal consumption time			0.450
≤ 30 minutes	499 (84.6)	256 (86.5)	
>30 minutes	91 (15.4)	40 (13.5)	
Clean-up time			0.001
≤ 30 minutes	533 (90.3)	286 (96.9)	
>30 minutes	57 (9.7)	9 (3.1)	
When decided what to eat			0.374
Someone else decided	53 (9.0)	28 (9.5)	
Same day	376 (63.8)	199 (67.7)	
The day before	160 (27.2)	67 (22.8)	
Eating location			0.850
At home	546 (91.9)	275 (92.3)	
Away from home	48 (8.1)	23 (7.7)	
No. adults (living in household) present at the meal (not including self)			<0.0001
0	50 (8.7)	70 (24.5)	
1	345 (59.8)	174 (60.8)	
2 or more	182 (31.5)	42 (14.7)	
No. children (living in the household) present at the meal			<0.0001
0	206 (38.4)	200 (79.4)	
1	149 (27.8)	28 (11.1)	
2 or more	181 (33.8)	24 (9.5)	

¹Chi square test (P<0.05)

²Where frequencies ≠ 594 or 298 within each contextual category for women experiencing ‘nurturing family meals’ eating occasions and women experiencing ‘sensible meals’ eating occasions respectively, data are missing.

Table 4.4. Differences in food group intake by women experiencing ‘nurturing family meals’ and ‘sensible meals’ situation-based needs at dinner

Intake variables	Nurturing family meals	Sensible meals	P-value ¹
	Mean ± SD (n=594)	Mean ± SD (n=298)	
Fruit (cup)	0.33 ± 1.10	0.22 ± 0.55	0.845
Vegetable (cup)	2.22 ± 1.78	2.49 ± 1.93	0.070
Whole grain (cup)	0.14 ± 0.61	0.17 ± 0.71	0.447
Refined grain (cup)	1.57 ± 1.85	1.01 ± 1.60	<0.0001
Regular meat ² (oz)	1.81 ± 2.25	1.26 ± 1.93	<0.0001
Lean meat (oz)	0.98 ± 1.76	1.15 ± 1.72	0.218
Regular dairy ³ (oz)	0.24 ± 0.58	0.15 ± 0.35	0.032
Reduced-fat dairy (oz)	0.23 ± 0.54	0.20 ± 0.48	0.472
Regular fats ⁴ (tsp/tbsp/g)	2.16 ± 2.60	1.77 ± 2.27	0.012
Reduced-fat fats (tsp/tbsp/g)	0.27 ± 1.30	0.28 ± 0.95	0.650
Sugar-sweetened beverages (oz)	0.21 ± 0.59	0.11 ± 0.59	0.003
Unsweetened beverages (oz)	0.75 ± 1.05	0.96 ± 1.41	0.014

¹ANCOVA, p<0.05 significance level

²Regular meat = non lean beef, pork, veal, lamb, game, fried chicken, cold cuts and sausage, organ meats and fish

³Regular dairy = non-reduced fat milk, yogurt and cheese

⁴Regular fat = non-reduced fat oil, margarine, cream, salad dressing. All measured as teaspoon (tsp) except salad dressing (g) and cream (tablespoon – tbsp.)

Table 4.5. Differences in nutrient intake among midlife women experiencing ‘nurturing family meals’ and ‘sensible meals’ situation-based needs at dinner

Intake variables	Nurturing family meals Mean ± SD (n=594)	Sensible meals Mean ± SD (n=298)	Overall p-value¹
Energy (kcal)	737 ± 387	581 ± 305	<0.0001
Fat (g)	33 ± 22	25 ± 18	<0.0001
Carbohydrate (g)	75 ± 51	56 ± 42	<0.0001
Protein (g)	34 ± 18	30 ± 16	<0.0001
Cholesterol (mg)	105 ± 79	92 ± 104	0.001
Saturated fatty acids (mg)	11.2 ± 9.0	7.7 ± 6.1	<0.0001
Sucrose (g)	8.8 ± 18.0	6.8 ± 14.7	0.010
Dietary fiber (g)	6.7 ± 5.2	6.6 ± 4.8	0.712
Vitamin D (mcg)	1.57 ± 2.89	1.66 ± 3.22	0.689
Vitamin C (mg)	32 ± 34	38 ± 42	0.018
Folate (mcg)	139 ± 108	134 ± 102	0.316
Calcium (mg)	244 ± 226	210 ± 181	0.030
Iron (mg)	5.0 ± 4.5	4.0 ± 2.5	<0.0001
Sodium (mg)	1449 ± 905	1294 ± 1578	0.0003
Potassium (mg)	1013 ± 600	923 ± 445	0.057
Beta carotene	1828 ± 3511	2287 ± 3392	0.006

¹ANCOVA, p<0.05 significance level

**Chapter V : Dietary factors affecting weight gain in midlife women
reporting situation-based needs to nurture family**

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The purpose of this study was to determine whether dietary intake and weight maintenance strategies were associated with weight gain over 2 years among a sample of midlife women (40-60 years) reporting situation-based needs within eating occasions focused on nurturing family. Baseline and 24-month weight and dietary intake data were used from women in an untreated control group (n=104) as part of a larger study. Women were divided into 2 groups according to weight change over two years (loss/maintain ≤ 0 kg (n=45) and gain >0 kg) (n=59). Mean baseline BMI was 27.3 ± 5.5 with the gain group having significantly higher BMI at 2 years ($p < 0.0001$). The gain group significantly increased intake of energy, total fat, saturated fat and unsaturated fat over 2 years compared to the loss/maintain group. However, no significant differences were observed in change in most other nutrients or food group intakes between groups. Dietary restraint and use of various weight maintenance strategies also did not differ between groups. While energy and fat intakes differed between groups, differences in these dietary factors were not reflected in changes in food group intakes or reported use of weight maintenance strategies.

Introduction

Weight gain at midlife increases risk of chronic diseases at midlife and later in life (Biggs et al. 2010; Yang et al. 2007, Stranberg et al. 2003; Huang et al. 1998). Several recent studies have documented the tendency for weight gain at midlife among women (Mozaffarian, Hao, Rimm, Willett & Hu 2011; Koskava, Petrusek, Vondra & Skibova 2007; Choi, Guiterrez, Gilliss & Lee 2011; Norberg et al. 2011). Prevention of weight gain should be a priority to reduce risk of obesity-related chronic diseases and to avoid the need for weight loss.

As food provisioners, women are involved in activities such as purchasing, preparing and serving food for themselves and family members (Neysmith & Reitsma-Street 2005). Application of the family systems approach (Bowen 1966; Broderick 1993) would indicate that family structure (roles within subsystems) and interactions (based on learned rules) may influence the functional outcomes of food choice and eating behaviors. All family members may exert an influence on decisions with respect to foods that women serve at family meals by requesting specific foods, providing approval when certain foods are served or complaining/refusing to eat when disliked foods are served (Slater, Sevenhuysen, Edginton & O'Neil 2011; Gillespie & Johnson-Askew 2009; Kling, Cotugna, Snider & Peterson 2009). These interactions can result in overconsumption of preferred foods, such as convenience foods or restaurant foods, or less healthful selections, which may contribute to weight gain over time. Therefore, it is important to consider the effects of familial factors on food and nutrient intakes and ultimately, weight gain.

To examine effects of a woman's tendency to alter her intake based on familial factors, it may be useful to first classify women by situation-based needs with respect to nurturing family members during eating occasions. In a previous study, eating occasions of midlife women were categorized through segmentation analysis resulting in six combinations of situation-based needs within eating occasions (Perry 2011). These included healthy express, sensible meals, comforting interludes, fast fueling, indulgent escapes and nurturing family meals. The 'nurturing family meals' situation-based needs were based on a combination of needs described as providing a meal for family as a way to nurture family. Also, the meal is a time for family bonding; therefore the meal needs to appeal to taste preferences of children or others so that everyone enjoys the meal with minimal complaints. When dietary intakes were compared across all six situation-based needs eating occasions, 'nurturing family meals' occasions provided more energy, added fats, full-fat dairy products, and refined grain than several other types (Perry 2011). This eating pattern may be associated with weight gain as others have shown that intakes of foods such as starches, refined grains and processed foods were associated with weight gain in midlife women in contrast to intakes of vegetables, nuts, fruits, and whole grains (Mozafarriani et al. 2011). An increase in overall energy intake has been identified as an important contributing factor for weight gain over time among women (Scarborough et al. 2011) while diets high in high-fiber and whole grain foods, fruits, vegetables and low fat foods have been associated with lower weight gain or weight maintenance over time (Schulz, Nothlings, Hoffmann, Bergmann & Boeing 2005; Schulze, Fung, Manson, Willett & Hu 2006).

Weight loss or maintenance strategies among women have typically involved practices that address healthful eating patterns. For example, national data showed that the top four practices included eating less food, exercising, switching to lower calorie foods and eating less fat (Weiss, Galuska, Khan & Serdula 2006). Limited studies have reported associations between reported use of these strategies and weight change among women (Williams, Germov & Young 2011; Savage, Hoffman & Birch 2009; Savage & Birch, 2010). Results of one study showed that women who used healthy and unhealthy strategies to lose weight gained more weight over time compared to women who used only healthy strategies (Savage & Birch 2010). Some of these practices involve consciously restricting intake of specific foods or all foods (dietary restraint). This practice was associated with weight gain prevention and weight maintenance in longitudinal studies among women (Levine et al. 2007; Tucker & Bates 2009; Savage, Hoffman & Birch 2009).

Several intervention studies have focused on prevention of weight gain in women based on lifestyle education sessions to encourage behavioral changes involving diet with mixed results (Levine et al. 2007; ter Bogt et al. 2011; Lombard, Deeks, Jolley, Ball & Teede 2010; Simkin-Silverman, Wing, Boraz & Kuller 2003). Successful intervention studies to prevent weight gain documented that women ate less fat and fewer calories over time (Simkin-Silverman et al. 2003; Lombard et al. 2010), while another showed prevention but did not report dietary changes (ter Bogt et al. 2011). Future interventions that focus on prevention of weight gain by addressing a woman's tendency to alter her intake based on familial factors should consider the effectiveness of dietary weight loss

or maintenance practices. The purpose of this study was to determine whether dietary intake and weight maintenance strategies were associated with weight gain over 2 years among a sample of midlife women (40-60 years) reporting situation-based needs within eating occasions focused on nurturing family.

Methods

Participants.

Data for this study were based on a control group of midlife women (40-60 years) participating in a larger weight gain prevention study (Perry 2011). Women were randomly selected for recruitment from a database maintained by a market research firm based on race/ethnicity distributions for the Twin Cities, MN metropolitan area (US Department of Commerce, Bureau of the Census 2006). Women were included if they were between 40-60 years of age; able to speak/write English; had no history of diabetes, heart disease, cancer, chronic pulmonary disease, or renal disease; were not following a physician-prescribed diet; were not pregnant or breastfeeding; and were able to stand during anthropometric measurements. The protocol was approved by the University of Minnesota Institutional Review Board: Human Subjects Protection Committee prior to data collection. Women received compensation for their participation 5 times over a two year period.

Women in the treatment group attended 10 intervention sessions over the first 6 months, while women in the control group did not attend any sessions. All women had height and weight measured and completed 3-day food records and a physical activity

assessment every 6 months over a two year period. Data used for this study was from women assigned to the untreated control group only (n=169).

At baseline, women completed a questionnaire to determine which situation-based needs within specific eating occasions they experienced most often. Six types of needs had previously been identified and described in a segmentation analysis based on data collected by TNS™ Global from a national sample of 1,926 women (Perry 2011). The questionnaire included 20 need statements with respect to usual breakfasts, lunches, dinners, and snacks (weekdays and weekends) (Appendix C). Response options were on a 6-point scale where 1 = strongly disagree and 6 = strongly agree. Responses were entered into a situation-based needs classification tool developed by TNS™ Global. Baseline and 24-month data from women who reported experiencing ‘nurturing family meals’ eating occasions as either their first or second most common situation-based need were used in this study (n=104).

Height and weight were measured in triplicate using a standardized protocol (Lohman 1991). Height was measured barefoot using a stadiometer (Seca 202, Hanover, MD) to the nearest 0.1 cm. Weight was measured barefoot and in light clothing on a digital scale to the nearest 0.1 kg (Tanita BWB-800P Digital Medical Scale, Arlington Heights, IL). A mean for height and weight values were calculated for analysis. Body mass index (BMI) was calculated by dividing weight (kg) by height (m) squared. Women were divided into 2 groups according to weight change over two years (loss/maintain ≤ 0 kg (n=45) and gain >0 kg) (n=59).

Dietary intake data.

Women were given food record booklets and instructed to describe and record all foods and beverages immediately after eating all meals and snacks for three days including 2 weekdays and one weekend day (Appendix B). They were asked to record the time the food was consumed, type of meal, amounts eaten, location, with whom the meal or snack was consumed, and to provide recipes and information about preparation methods. The food record booklet included examples and photographs illustrating amounts and serving sizes (Kolar et al. 2003) and an accompanying DVD demonstration was also provided. Data were entered into the Nutrition Data System for Research software program (NDS-R) (version 2008 and 2009, Nutrition Coordinating Center, University of Minnesota, Minneapolis, MN). Foods were grouped under common categories including regular meat (non lean beef, pork, veal, lamb, game, fried chicken, cold cuts and sausage, organ meats, fish), regular dairy (non-reduced fat milk, yogurt, cheese), regular fat (non-reduced fat oil, margarine, cream, salad dressing), fruit (citrus fruit and juice, non-citrus fruit and juice), vegetable (dark green, deep yellow, other, and other starchy vegetables; tomato, white potatoes; legumes; vegetable juice), whole grain (whole grain flour, rolls, other breads, crackers, pasta, ready-to-eat cereal, cakes, snack bars, snack chips, popcorn, flavored popcorn), refined grain (refined grain versions of the same food types as the whole grain category excluding popcorn), sugar sweetened beverages (soft drinks, fruit drinks, sweetened tea, sweetened coffee, sweetened water), diet beverages (artificially sweetened -soft drinks, fruit drinks, tea, coffee, water).

Other questionnaire data.

A physical activity questionnaire developed by Godin and Shephard (1985) was used to collect data about usual strenuous, moderate, and mild exercise, and leisure time physical activity. A leisure time exercise score was calculated in arbitrary units using the formula $(9 \times \text{strenuous activity rating}) + (5 \times \text{moderate activity rating}) + (3 \times \text{light activity rating})$ (Godin & Shephard 1985).

At the end of the two-year period, women completed a questionnaire (Appendix D) regarding use of 21 common weight loss practices (Savage & Birch 2010). Women were asked to mark all methods they had used over the past 2 years to lose or maintain weight. The questionnaire also measured level of dietary restraint using the Three Factor Eating Questionnaire (Stunkard & Messick 1985) at one time point (24 months). Frequency of self-weighing was measured by asking women to indicate how often they weighed themselves over the past 2 years with the following response options: never, less than once a month, less than once a week, once a week, several times a week, once a day, and several times a day. The occurrence of major life events was measured by asking women to report all major life events they experienced over the past 24 months including change in marital status, major illness or injury, death of an immediate family member, change in household size, change in employment status, change in residence and change in financial situation (Ogden, Stavrinaki & Stubbs 2009).

Data analysis.

Descriptive statistics (means, standard deviations, and frequencies) were used to describe the demographic characteristics of participants. Calculations were completed to

determine that the sample size (n=104) was adequate to detect significant differences in change in energy and fat intakes based on data from the larger study (Perry 2011). Data were tested for normality and if skewed or non-normally distributed, the analysis was done on transformed values (square root transformation). Independent t-tests were used to determine differences in baseline, 24 months, and changes over 24 months in weight, BMI, energy, food group and nutrient intakes. Chi-square tests were used to determine differences in socio-demographic characteristics, frequency of use of weight loss strategies and self-weighing between the two groups.

Results

Table 5.1 shows demographic and household characteristics of women. No significant differences were observed between groups in any characteristics with the exception of weight change and Hispanic ethnicity (p=0.048). The mean age of all women was 49.8 ± 4.9 years. Most women were married (87%) and white (83%). The majority had a 4-year or advanced degree (61%) and household incomes >\$60K (62%). Most women were employed either full-time or part-time (86%). Consistent with the report of experiencing 'nurturing family meals' situation-based needs during specific eating occasions, most women were married (87%). Women had a mean of 0.6, 0.4 and 0.06 children in the home, 13-18 years, 6-12 years, and <6 years, respectively.

The mean BMI at baseline was 27.3 ± 5.5 . At 2 years the gain group had a significantly higher BMI than the lose/maintain group (p<0.0001), however, no differences were observed in leisure time exercise scores at baseline or 24 months or in

the change over time. The lose/maintain group lost a mean of 2.8 kg while the gain group gained 3.2 kg over the 24 month period.

Table 5.2 shows the baseline, 24-month and change in nutrient intakes over the 24 month period. At baseline, the gain group reported lower intakes of energy, saturated fat, carbohydrate, sucrose, calcium and potassium compared to the lose/maintain group. Over the 24-month period, the lose/maintain group consumed 133 fewer calories/day compared to the gain group which increased caloric intake by 74 calories/day. Similar directional changes were observed in total, saturated and unsaturated fat intakes and dietary fiber and potassium intakes among groups. Increases in intakes of energy, total, saturated and unsaturated fat, and dietary fiber and potassium over the 24-month period were significantly greater for the gain group compared to the lose/maintain group.

Table 5.3 provides data with respect to baseline, 24-month and change over 24 months in food group intakes. Both groups increased intakes of vegetables and diet beverages with no differences observed between groups for the increases. Both groups decreased intakes of refined grain, regular fats, sugar-sweetened and unsweetened beverages with no differences observed between groups for the decreases. For whole grain, regular meat, reduced-fat dairy and sugars, the lose/maintain group decreased intakes while the gain group increased intakes, with no differences observed between groups for the changes. The lose/maintain group made positive dietary changes including increased daily intake of vegetables (0.78 cups) and decreased daily intakes of regular fats (0.7 servings) and sugars (0.4 servings) that may have contributed to weight loss or

maintenance, but these changes were not significantly different compared to changes made by the gain group.

Table 5.4 shows the reported frequency of methods or strategies used over the 24-month period to lose or maintain weight. Overall the most common strategies used by >30% of women in both groups were healthy strategies including increasing exercise, eating more fruits and vegetables, reducing calories, reducing amounts of foods eaten, changing types of foods and eating less fat. No significant differences were observed between groups with respect to the frequency of reported use of these healthy weight loss or maintenance strategies. Less than 25% of women in either group reported using strategies including eating less high-carbohydrate foods, eliminating snacks or sweets, eating less meat, eating low calorie foods, skipping meals, and attending a weight loss group. The strategy of eliminating sweets, while frequency was fairly low for both groups, was reportedly practiced less often by the lose/maintain group compared to the gain group ($p=0.048$). None or almost no women in either group reported engaging in unhealthy strategies including fasting, using appetite suppressants, smoking, vomiting, using laxatives, diuretics or diet pills. More women in the lose/maintain group reported weighing themselves less than weekly or less often than women in the gain group (89% vs. 80%) and fewer women in the lose/maintain group reported weighing themselves weekly or more often than women in the gain group (11% vs. 20%). While these frequencies were in the expected direction based on weight change, they were not significantly different between groups ($p=0.225$).

Dietary restraint measured at one point in time (at the end of the 24 month period) was not significantly different between groups (data not shown). Reports of major life events that have sometimes been associated with weight change (Ogden, Stavrinaki & Stubbs 2009), during the 24-month period were also not different between groups (data not shown).

Discussion

The primary findings of this study indicate that energy and fat intakes were significantly decreased in the lose/maintain group compared to the gain group, however these changes were not reflected in changes in food group intakes or reported use of weight loss or maintenance strategies. Reported frequency of self-weighing in the past two years and dietary restraint did not differ between groups.

Energy and fat reductions in the lose/maintain group were consistent with data from a national British nutrition survey showing that increased energy intake was an important etiological factor associated with weight gain especially in women (Scarborough et al. 2011). Low overall energy density involving low fat and caloric intakes was associated with weight loss and maintenance in other studies (Raynor et al. 2011; Bradley et al. 2009; Foster et al. 2010). Intervention studies to prevent weight gain have also been successful with reduction in energy and fat intakes (Simkin-Silverman et al. 2003; Lombard et al. 2010).

The increases in energy and fat intakes in the gain group may have been related to how women responded to situation-based needs of ‘nurturing family meals’ eating

occasions. However, since women in the lose/maintain group also experienced the same situation-based needs, they may have responded differently to these needs in a manner that did not increase energy and fat intakes. For example, they may have involved family members in meal planning to address family preferences in a healthy manner; however it was not possible to determine how the responses to needs differed from the data collected for the current study. Future studies could examine this issue in more depth. Other studies have advocated for stronger family involvement to address ways to incorporate healthy but possibly less preferred foods into family meals (Fulkerson et al. 2011; Chopra, Gold & Reicks Submitted for publication-Chapter 3).

Food group intake changes were not different between the lose/maintain and gain groups in the current study. This is in contrast to previous studies where healthy eating patterns were associated with less weight gain. For example, one of the studies assessed two dietary patterns and their effects on weight over time. Findings showed that an eating pattern involving vegetables/fruit was associated with less weight gain over 14 years, compared to a meat/fried foods pattern (Boggs et al. 2011). It would be expected that changes in food group intakes such as lean vs. regular meat, reduced-fat dairy vs. regular dairy and reduced-fat fats vs. regular fats may have been different based on the differences observed in changes in total, saturated and unsaturated fat intakes between groups. Changes in food groups were small with a lower likelihood of detecting differences between the weight status groups. However collectively they could contribute to larger overall changes in fat and energy intakes that were detectable as significantly different between weight status groups.

For many weight loss/maintenance strategies, the reported frequencies were slightly higher among the gain group compared to the lose/maintain group, although not significantly higher. This may indicate that women in the gain group were actively trying to lose weight over the past two years and were not successful. This was supported by the reported frequency of women in the gain group attending a weight loss group (14%). Continued unsuccessful attempts at weight loss may result in disillusionment and therefore higher calorie intake (Penny & Carryer 2011; Kensinger, Murtaugh, Reichmann & Tangney 1998). Too much dieting or intentional caloric restriction has resulted in binge eating and regaining weight in a previous study (Venditti, Wing, Jakicic, Butler & Marcus 1996). There were no significant differences with respect to self-weighing between the groups, however women in the gain group reported self-weighing more often than women in the lose/maintain group. Previous studies suggest that self-weighing was a positive practice supported by favorable findings regarding weight gain prevention (Burke, Wang & Sevick 2011; Vanwormer, Linde, Harnack, Stovitz & Jeffery 2011).

Overall, most women in both groups in the current study reported using healthy weight loss strategies such as increasing exercise, eating more fruits and vegetables, reducing calories, reducing amounts of foods eaten, changing types of foods eaten and eating less fat. This was consistent with previous studies showing that women use different weight control strategies to lose weight or avoid weight gain including four of the most common strategies of eating less food, exercising, switching to lower calorie foods and eating less fat (Savage & Birch 2010; Weiss, Galuska, Khan, & Serdula 2006; Kruger, Galuska, Serdula & Jones 2004).

The mean BMI for all women in the current study at baseline was in the overweight category. In general, overweight and obese women are more likely to use weight loss strategies compared to normal weight women (Kruger et al. 2004). Previous studies have shown positive associations between dietary restraint and weight loss/maintenance (Savage, Hoffman & Birch 2009; Hays et al. 2002). Increasing dietary restraint was associated with weight maintenance in one 3-year intervention study (Levine et al. 2007). In the current study, there were no significant differences with respect to dietary restraint between the lose/maintain group and gain group. However, this measure was only assessed at 24-months and not from a pre/post perspective or retrospectively.

There were several limitations to this study. Most women were white, well educated and affluent, thus limiting generalizability of results to a broader group of midlife women. This study used self-reported dietary intake data based on a series of 3-day food records. Even though women were given in-person instructions regarding the use of the food record booklets, there may have some errors related to self-reporting such as forgetting to record intake immediately after eating, estimation bias for portion size, or error due to fatigue from completing several days of records. The assessment of self-reported frequency of use of weight loss strategies and restraint was only done at 24 months from a retrospective or one time point basis. Collection of this information at baseline and at 24 months may have provided more accurate information that could have been associated with weight change.

The results of this study provide insight into eating patterns and weight loss strategies used by women engaged in nurturing family with situation-based needs that may differ from other situations. The effects of these needs as motivators of food choice on weight status in the long term have not been addressed in previous studies. Future research involving randomized, controlled studies with a larger sample size is needed to replicate these findings. This study provides information that may be used to plan and develop comprehensive, tailored intervention programs to produce positive health outcomes with respect to eating behavior and weight status of women in a nurturing role as a family food provisioner.

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Table 5.1. Demographic and household characteristics by weight change group¹ for midlife women with situation-based needs to nurture others

	All women	Lose/maintain group ² (n=45)	Gain group ² (n=59)	p-value ³
Mean ± SD				
Age	49.8 ± 4.9	49.8 ± 4.9	49.9 ± 5.0	0.913
BMI at baseline	27.3 ± 5.5	27.6 ± 6.5	26.9 ± 4.7	0.547
BMI at 24 months	27.4 ± 5.6	26.2 ± 5.5	28.2 ± 5.6	0.078
Change in weight (kg)	0.60 ± 0.44	-2.84 ± 0.47	3.16 ± 0.46	<0.0001
Adults in home	2.2 ± 0.5	2.3 ± 0.4	2.2 ± 0.6	0.653
Children <6 yrs	0.06 ± 0.2	0.05 ± 0.2	0.07 ± 0.3	0.636
Children 6-12 yrs	0.4 ± 0.8	0.3 ± 0.6	0.5 ± 0.8	0.328
Children 13-18 yrs	0.6 ± 0.9	0.6 ± 0.8	0.7 ± 0.8	0.625
LTE ⁴ score at baseline	36.0 ± 27.4	31.1 ± 18.7	39.7 ± 32.1	0.117
LTE score at 24 months	33.8 ± 30.6	31.1 ± 23.5	35.7 ± 35.0	0.455
Change LTE score	-2.3 ± 25.9	0.03 ± 20.9	-4.0 ± 29.1	0.419
n (%)				p-value⁵
Marital status				0.948
Married, living with spouse	90 (87.4)	38 (86.4)	52 (88.1)	
Divorced, widowed	8 (8.7)	4 (9.1)	5 (8.5)	
Never married	4 (3.9)	2 (4.6)	2 (3.4)	
Education				0.317
High school	6 (5.8)	2 (4.6)	4 (6.8)	
Some college	22 (21.4)	11 (25.0)	11 (18.6)	
2 yr degree	12 (11.7)	8 (18.2)	4 (6.8)	
4 yr degree	50 (48.5)	19 (43.2)	31 (52.5)	
Post graduate	13 (12.6)	4 (9.1)	9 (15.3)	
Hispanic ethnicity				0.048
Hispanic	5 (4.9)	0.0 (0)	5 (8.5)	
Non-Hispanic	98 (95.2)	44 (100.0)	54 (91.5)	
Race				0.103
White	85 (82.5)	41 (93.2)	44 (74.6)	
Black	7 (6.8)	1 (2.3)	6 (10.2)	
Asian	4 (3.9)	1 (2.3)	3 (5.1)	
Other/NA	7 (6.8)	1 (2.3)	6 (10.2)	
Employment				0.491
Employed full-time	52 (50.5)	20 (45.5)	32 (54.2)	
Employed part-time	36 (35.0)	19 (43.2)	17 (28.8)	
Not-employed	9 (8.7)	3 (6.8)	6 (10.2)	
Retired	6 (5.8)	2 (4.6)	4 (6.8)	
Household Income				0.162
≤ \$19,999	2 (1.9)	0.0 (0)	2 (3.4)	
\$20,000 - \$39,999	8 (7.8)	2 (4.6)	6 (10.2)	
\$40,000 - \$59,999	20 (19.4)	8 (18.2)	12 (20.3)	
\$60,000 - \$79,999	10 (9.7)	4 (9.1)	6 (10.8)	
\$80,000 - \$99,999	17 (16.5)	4 (9.1)	13 (22.0)	
≥\$100,000	37 (35.9)	20 (45.5)	17 (28.8)	
Refused	9 (8.7)	6 (13.6)	3 (5.1)	

¹Lose/maintain group = ≤ 0 kg weight change/24 months, Gain group = >0 kg weight change/24 months

²Where n ≠ 45 for the Lose/maintain group and n ≠ 59 for the Gain group for each variable, data are missing

³p-value based on independent t-test

⁴LTE = Leisure time exercise score = (9 x strenuous activity rating) + (5 x moderate activity rating) + (3 x light activity rating)

⁵p-value based on chi-square testing

Table 5.2. Change in nutrient intake¹ over 24 months by weight change²

Food groups	Lose/maintain group (n=45)			Gain group (n=59)		
	Baseline	24 months	Change	Baseline	24 months	Change
	Mean ± SE					
Energy (kcal)	1844 ± 68	1714 ± 75	-133 ± 66	1648 ± 56*	1694 ± 68	74 ± 65*
Fat (g)	73.9 ± 4.1	62.1 ± 3.6	-9.7 ± 3.7	64.8 ± 3.2	67.7 ± 4.1	4.3 ± 3.9*
Cholesterol (mg)	213 ± 16	228 ± 20	19 ± 22	195 ± 12	221 ± 16	24 ± 18
Saturated fat (mg)	25.9 ± 1.6	21.4 ± 1.4	-4.1 ± 1.5	21.9 ± 1.2*	22.5 ± 1.6	1.0 ± 1.3*
Unsaturated fat (mg)	41.3 ± 2.5	35.5 ± 2.1	-5.1 ± 2.3	37.8 ± 2.1	39.6 ± 2.6	2.6 ± 2.8*
Trans fat (g)	3.2 ± 0.3	2.6 ± 0.3	-0.6 ± 0.3	2.8 ± 0.2	2.3 ± 0.2	-0.4 ± 0.2
Carbohydrate (g)	231 ± 10	221 ± 11	-14 ± 10	199 ± 8*	201 ± 9	5 ± 9
Protein (g)	68 ± 2	67 ± 3	0 ± 3	66 ± 2	70 ± 3	4 ± 2
Sucrose (g)	46.2 ± 3.2	42.4 ± 3.6	-4.4 ± 3.9	34.2 ± 2.5**	36.2 ± 3.1	3.0 ± 3.9
Dietary fiber (g)	22.0 ± 2.3	19.5 ± 1.2	-2.6 ± 2.0	17.7 ± 0.9	19.7 ± 0.9	2.3 ± 0.9*
Vitamin D (mcg)	4.5 ± 0.4	4.7 ± 0.5	0.4 ± 0.51	3.9 ± 0.5	4.5 ± 0.4	0.5 ± 0.5
Vitamin C (mg)	80.1 ± 8.6	88.4 ± 9.0	7.2 ± 8.0	73.8 ± 5.8	75.9 ± 5.9	4.1 ± 6.8
Folate (mcg)	391 ± 25	400 ± 26	5 ± 25	370 ± 21	367 ± 18	3 ± 20
Calcium (mg)	906 ± 47	880 ± 56	-27 ± 62	760 ± 43*	859 ± 43	107 ± 42
Iron (mg)	14.1 ± 0.8	14.2 ± 0.9	0.0 ± 1.0	12.1 ± 0.5	12.6 ± 0.6	0.7 ± 0.6
Sodium (mg)	2901 ± 107	2924 ± 151	28 ± 142	2741 ± 93	2767 ± 98	66 ± 100
Potassium (mg)	2557 ± 114	2470 ± 118	-101 ± 126	2253 ± 97*	2477 ± 96	242 ± 93*
Total Vitamin A (IU)	6835 ± 646	8776 ± 1199	1897 ± 1255	6624 ± 613	7543 ± 620	1137 ± 822

¹Change in energy/nutrient intakes = kcal/amount consumed at 24 months – kcal/amount consumed at baseline

²Lose/maintain group = ≤ 0 kg weight change/24 months, Gain group = >0 kg weight change/24 months

³p-value based on independent t-test. *=<0.05, **=<0.01

Table 5.3. Change in food group intake¹ over 24 months in women by weight change²

Food groups	Lose/maintain group (n=45)			Gain group (n=59)		
	Baseline	24 months	Change	Baseline	24 months	Change
	Mean ± SE					
Fruit (cup)	1.70 ± 0.28	1.42 ± 0.15	-0.31 ± 0.26	1.52 ± 0.15	1.46 ± 0.13	-0.04 ± 0.15
Vegetable (cup)	5.72 ± 0.59	6.45 ± 0.71	0.78 ± 0.82	5.50 ± 0.32	6.00 ± 0.38	0.53 ± 0.40
Whole grain (cup)	2.32 ± 0.28	2.22 ± 0.19	-0.14 ± 0.26	1.69 ± 0.15	1.95 ± 0.20	0.32 ± 0.23
Refined grain (cup)	3.65 ± 0.31	3.55 ± 0.28	-0.16 ± 0.33	3.69 ± 0.23	3.09 ± 0.25	-0.57 ± 0.27
Regular meat ⁴ (oz)	2.20 ± 0.25	2.00 ± 0.24	-0.11 ± 0.31	2.10 ± 0.18	2.29 ± 0.21	0.23 ± -0.19
Lean meat (oz)	0.89 ± 0.15	1.24 ± 0.18	0.33 ± 0.25	1.38 ± 0.15*	1.25 ± 0.15	-0.11 ± 0.21
Regular dairy ⁵ (oz)	0.45 ± 0.06	0.38 ± 0.06	-0.04 ± 0.06	0.38 ± 0.04	0.41 ± 0.05	0.03 ± 0.05
Reduced-fat dairy (oz)	1.15 ± 0.13	1.05 ± 0.13	-0.12 ± 0.13	0.96 ± 0.10	1.12 ± 0.10	0.13 ± 0.09
Regular fats ⁶ (tsp/tbsp/g)	2.77 ± 0.27	1.96 ± 0.20	-0.70 ± 0.28	2.31 ± 0.20	2.14 ± 0.23	-0.13 ± 0.27
Reduced-fat fats (tsp/tbsp/g)	0.52 ± 0.13	0.60 ± 0.11	0.08 ± 0.15	0.32 ± 0.07	0.48 ± 0.06	0.15 ± 0.28
Sugars (tsp)	1.41 ± 0.28	1.01 ± 0.15	-0.42 ± 0.29	0.85 ± 0.14	1.17 ± 0.21	0.36 ± 0.21
Sugar-sweetened beverages (oz)	0.83 ± 0.19	0.79 ± 0.22	-0.05 ± 0.19	0.43 ± 0.12	0.30 ± 0.11	-0.11 ± 0.11
Unsweetened beverages (oz)	4.76 ± 0.39	4.38 ± 0.45+	-0.43 ± 0.33	3.99 ± 0.35	3.28 ± 0.33*	-0.59 ± 0.32
Diet beverages (oz)	1.01 ± 0.30	1.20 ± 0.34	0.25 ± 0.26	1.04 ± 0.22	1.33 ± 0.30	0.26 ± 0.23

¹Change in food group intakes = amount consumed at 24 months – amount consumed at baseline

²Lose/maintain group = ≤ 0 kg weight change/24 months, Gain group = >0 kg weight change/24 months

³Regular meat = non lean beef, pork, veal, lamb, game, fried chicken, cold cuts and sausage, organ meats and fish

⁴Regular dairy = non-reduced fat milk, yogurt and cheese

⁵Regular fat = non-reduced fat salad dressing, margarine, butter, oil

* denotes p-value<0.05 based on independent t-test between the gain and lose/maintain groups at the same time point

Table 5.4. Use of methods to lose or maintain weight over past 24 months¹

	Lose/maintain group (n=45)	Gain group (n=59)	p-value²
	n (%)		
Frequency of self-weighing ³			0.225
<Once a week or less often	39 (88.6)	47 (79.7)	
Once a week or more often	5 (11.4)	12 (20.3)	
	n (%)		
Practices to prevent weight gain			
Increasing exercise	25 (55.6)	32 (54.2)	0.894
Eating more fruits and vegetables	25 (55.6)	41 (69.5)	0.144
Reducing calories	21 (46.7)	26 (44.1)	0.792
Reducing amounts of food eaten	19 (42.2)	32 (54.2)	0.225
Changing types of foods eaten	17 (37.8)	28 (47.5)	0.324
Eating less fat	14 (31.1)	28 (47.5)	0.092
Eating less high-carb food	11 (24.4)	15 (25.4)	0.909
Eliminating snacks	8 (17.8)	13 (22.0)	0.592
Eating less meat	8 (17.8)	9 (15.3)	0.730
Eating low-calorie foods	8 (17.8)	19 (32.2)	0.096
Skipping meals	6 (13.3)	2 (5.1)	0.138
Eliminating sweets	4 (8.9)	14 (23.7)	0.048
Attending a weight loss group (food not provided)	4 (8.9)	8 (13.6)	0.460
Fasting	1 (2.2)	2 (3.4)	0.745
Using appetite suppressants	0 (0.0)	3 (5.1)	0.125
Increasing number of cigarettes smoked	0 (0.0)	1 (1.7)	0.380
Vomiting	0 (0.0)	1 (1.7)	0.380
Attending diet center where food was provided	0 (0.0)	1 (1.7)	0.380
Using laxatives	0 (0.0)	0 (0.0)	
Using diuretics	0 (0.0)	0 (0.0)	
Using diet pills	0 (0.0)	0 (0.0)	

¹Percentage = those indicating they used the method to lose or maintain weight over the past 2 years (mark all that apply).

²p values based on chi square test

³Over the past 2 years, how often did you weigh yourself? (Response options = Never, less than once a month, less than once a week, once a week, several times a week, once a day, several times a day).

Chapter VI : Discussion and Conclusion

Discussion

The findings from this dissertation project were based on three studies with an overall focus on the manner in which the need to nurture family through food impacts eating behaviors and weight gain among midlife women. Application of the family systems approach as defined for use in these studies would indicate that family structure (roles within parental and marital subsystems) and family interactions (learned rules for relating with one another) may influence the functional outcomes of food choice and behaviors. The three studies that make up this dissertation project focused on factors influencing eating behavior among midlife women who experience a combination of situation-based needs related to nurturing others within specific eating occasions. Such eating occasions may contribute to less healthy food choices and result in excessive energy intake and weight gain over time.

While many previous studies have identified general barriers to healthy eating among women, the first study in this dissertation project identified and prioritized barriers by order of importance within specific eating occasions focused on nurturing family. It was expected that barriers to healthy eating would differ based on the overall goals women were trying to achieve within specific eating occasions such as nurturing family. However, while the need to consider family food preferences was ranked highly, it was secondary to time and budgetary constraints. The demographic makeup of the sample may have influenced these results since about one third of the sample did not have a 4-year degree and 40% were not employed full time. If the sample had been more educated and more women had been employed full time, the need to consider family food

preferences may have been ranked as more important than cost/budgetary constraints.

Also, given that 40% were not employed full time, it could be expected that time would not be rated as one of the most important barriers. On the other hand, time scarcity may be a very pervasive factor based on the fast-paced lifestyles of most families in the US.

To ensure that barriers to healthy eating were indeed identified for women who commonly nurture family through meals, future studies should involve screening women more rigorously rather than simply reading a description and asking whether they experience this type of occasion. For example, the original battery of 88 need statements could be completed at several dinner meal occasions along with questions regarding meal contextual factors. Strong agreement with items regarding the need to nurture family may provide a more accurate assessment of whether women commonly experience dinner eating occasions involving the need to nurture family. These items include serving others what is expected, making children happy, feeling like a good mom, feeling appreciated by others, having a pleasant meal with others and showing love for others.

While the first study did not show that the need to consider preferences of others was the most important barrier, results confirmed that this need is important for some women and should be addressed in intervention programs. This study also provided valuable ideas for intervention programs from the perspective of women who actually experienced this need as a barrier to healthy eating. Lastly, the results provided an indication that future studies should be conducted to determine the impact of having to consider preferences of other family members on energy, food group and nutrient intakes of nurturing women, which was accomplished in part by the second study.

The second study involved a quantitative analysis using mailed one-day food records to compare dietary intake between two groups of midlife women from a national sample. The primary findings of this study were that compared to women experiencing ‘sensible meals’, women who experienced ‘nurturing family meals’ eating occasions generally had higher intakes of many less healthy nutrients and foods (e.g., fat and refined grain); higher intakes of several positive nutrients (e.g., calcium and iron) and no significant differences in fruit and vegetable intakes. Therefore, while the overall nutritional profile was less healthy for women with nurturing needs, some positive aspects were observed. These findings may be explained in part, because while nurturing may involve meeting tastes and preferences of others at an emotional level, the food provisioner may also feel the need to make sure that everyone eats healthy. This explanation is related to the values and beliefs that women experiencing situation-based needs focused on nurturing others have about being responsible for eating behavior of other family members. Women with nurturing needs may also have low ‘differentiation of self’ (as described by the family systems approach), where their eating behavior during dinner meals is primarily influenced by what they serve other family members. ‘Differentiation of self’ may be an important aspect to consider while addressing eating behavior for women who are food provisioners as it along with certain beliefs and values could be the main explanatory factors for their overall less healthy intakes.

Intervention programs could promote the concept that women need to stay strong and healthy by meeting their own nutritional needs in order to continue nurturing others. Another motivation for providing healthy foods would be that serving healthier foods to

family members within family preference constraints may be an optimum way to nurture others.

In the present study, women completed an eating occasion questionnaire for one dinner meal. In the future, this study could be replicated using a 3-day food record and three dinner meal eating occasion questionnaires to gain a better understanding of dinner eating behavior and needs across weekday and weekend days. Three days of observations would confirm whether women habitually nurtured others at their dinner meal and would serve as a better way to classify women as nurturers compared to a single meal measurement.

The third study examined factors affecting weight change over two years among women experiencing situation-based needs focused on nurturing others. The subgroup that gained weight had significant increases in fat and total energy intakes compared to the subgroup that lost or maintained weight. One group may have addressed their nurturing needs differently from the other. For example women in the lose/maintain group may have involved family members in meal planning to address family preferences in a healthy manner; however it was not possible to determine how the responses to needs differed based on the data collected for the current study. Previous studies have suggested family involvement as a way to gain acceptance for incorporating healthy but possibly less preferred foods into family meals (Fulkerson et al. 2011).

In the second study, participants completed an eating occasion questionnaire for one dinner meal. The responses were used to determine if they would be included in a group characterized by having ‘nurturing family meal’ eating occasion needs. In the third

study, women completed a classification tool (condensed version of the 88-need statements) based on usual breakfasts, lunches, dinners and snacks over weekday and weekend days. This approach provided a more general indication of whether women often experienced situation-based needs to nurture others through meals. However comparing the utility of both approaches would be of interest to determine whether women often experience different eating occasion situation-based needs.

Future research should involve replicating the findings from the third study in a larger sample. While a sample size calculation showed that the current sample size was adequate to detect significant differences in fat and energy intakes between groups, future studies with larger sample sizes across women with varying demographic characteristics could improve generalizability to a wider group of midlife women. The use of weight loss strategies and restraint was measured in a retrospective manner in the third study, which could have been resulted in errors based on faulty memory. Replication of the study measuring frequency of weight loss strategies and restraint at baseline and at the end of the study (pre/post) could confirm findings from the current study.

Weight gain during midlife years is a critical issue. The studies reported in this dissertation support the notion that nurturing and food provisioning for families by midlife women may increase risk of poor eating behaviors and weight gain. These three studies represent findings based on a combination of qualitative and quantitative research methods. From a qualitative perspective, the first study produced insight into the reasons why nurturing occasions may not be healthy for midlife women. The quantitative studies then extended this work to better understand the effects of nurturing on food group and

nutrient intakes. The use of a family systems approach served as a unifying basis for all three studies to improve the understanding of how a nurturing role may affect intake and weight. Findings from these studies justify further research with respect to intervention strategies that can improve the healthfulness of family meals from the food provisioner's prospective.

Limitations

This research project has several limitations that need to be considered while interpreting the findings. With respect to the sample used in the three studies, the majority of women participants were White, affluent and well educated, limiting generalizability to a broader group of midlife women. Another important limitation was the use of self-reported food intake in the second and third studies which is traditionally associated with errors such as forgetting to record the foods eaten, estimation bias and limited accuracy due to fatigue.

Implications for Practice

Studies that address eating behavior and weight gain specifically in a segment of midlife women who focus on nurturing family within selected eating occasions are limited. Findings from the three studies in this dissertation project provide information that can be used to inform interventions tailored to the need to nurture family members through family meals. Since women who experience 'nurturing family meals' occasions may feel responsible for family health and wellbeing, intervention programs could focus on providing foods that are healthy and still meet family food preferences. Keeping in mind the values and beliefs that underlie a nurturing role, the program should help

motivate women to maintain a balance between their own nutritional needs and their perception of their moral obligation to nurture family. ‘Differentiation of self’ may be included as an important aspect of the intervention program. Women may be educated about the importance of their personal health and wellbeing without neglecting the need to be responsible for eating behaviors of family members. This could be accomplished by reviewing daily recommendations for food group and nutrient intakes and comparing to reported intake during occasions characterized by nurturing family meal needs. Role-playing exercises could be used to help women practice having conversations with family members involving them in menu planning and meal preparation tasks and empowering women to make their own nutrition needs a priority. The family systems approach proposes that family interaction influences eating behavior and that it is important to involve family members in food provisioning. Therefore, a family-based intervention may be useful to address the tendency for women to suppress their own needs in favor of others, resulting in less healthy intakes for women. To address the barriers of time and budget, the intervention should focus on planning and preparing low-cost, quick and healthful recipes. Overall such intervention programs may help women improve eating behavior without compromising their nurturing role as a family food provisioner.

Implications for Future Research

Future research may involve quantitative studies that determine how barriers to healthy ‘nurturing family meals’ influence diet quality, weight and health of midlife women. This may include further cross-sectional studies where data are collected regarding barriers to healthy eating, food intake, situation-based needs and BMI to

evaluate relationships between variables. Future research may also involve randomized, controlled studies with a larger sample size to replicate findings with respect to determination of effects of diet, weight loss strategies and restraint on weight status within the context of ‘nurturing family meals’ eating occasions. Associations should be evaluated between change in diet and weight over time and use of restraint and weight-loss strategies measured from baseline to the end of the time period.

Previous studies evaluating adult eating behavior have shown that adults were likely to eat less healthy foods in the presence of children than in the absence of children (Laroche et al. 2007). Data from other studies show a substantial spousal and parental concordance in eating behaviors and/or BMI (Pachucki et al. 2011; Cameron et al. 2011). However research that examines the degree that eating behavior of women is affected by a need to nurture children versus adults is limited. Therefore future studies should also assess differences with respect to eating behavior between women nurturing only adults, only children and both. These findings may also inform the development of interventions to improve eating behavior of women in a nurturing role depending on the social context (who is present at the eating occasion).

Conclusion

The studies in this dissertation address issues related to eating behavior of midlife women based on eating occasion situation-based needs related to ‘nurturing family meals’. Nurturing and food provisioning are important roles that women play within family systems. Data from these studies suggest that familial interactions influence eating behavior of women and may have a negative impact on their diet and weight.

Intervention programs should involve family members, consider underlying values and beliefs, differentiation of self, and attempt to help women balance their nurturing role with healthy eating behaviors.

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Appendices

Appendix A: Dinner Questionnaire



P.O. Box 474 Toledo, OH 43654
 Toll-Free Number: 1-800-537-4097
 Mon – Fri, 8:00 AM to 11:00 PM EST
 Sat, 10:00 AM to 6:00 PM EST
 Contact Us: <http://mysurvey.com/contactus.cfm>
 Privacy: <http://mysurvey.com/privacy.cfm>

174075-2

[Please read the General Instructions before completing this form.]

Dinner Questionnaire

(blue booklet)

Instructions: Record everything you ate and drank for dinner on your Food Record Form in the Food Record Booklet, then fill out this Dinner Questionnaire.

If you don't eat Dinner, do not fill out this Dinner Questionnaire.

Please answer the following questions as they apply to you personally, and not for other members of your household. Thank you for taking the time to answer these important questions.

1. Which day of the week was this meal?(**X ONE Box**)

- 1 Friday
 2 Saturday
 3 Sunday

2. What time of day did this meal occur? (**Write the hour and minute and circle AM or PM**)

For example if you ate at 6:00 PM, write:
 Hour 6 Minute 00

AM

PM

Hour _____ Minute _____

AM

PM

4. Which of the following statements describe your **needs** surrounding **this meal**? What did you want to accomplish by eating at this particular meal? Check how much you disagree or agree with each statement. If the statement does not apply to you, please select Strongly Disagree. (**X ONE Box For EACH Statement**)

I wanted to ...	Strongly Disagree ← → Strongly Agree					
	1	2	3	4	5	6
Avoid/reduce stress.....1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Control/limit my calorie intake.....1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Do other things while eating.....1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Reward myself.....1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Create/maintain a family tradition.....1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Have a fun/festive time.....1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Compensate for other things I have eaten or will eat.....1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Treat myself.....1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Serve others what is expected.....1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Really enjoy the moment.....1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Have a balanced meal.....1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Minimize clean up effort.....1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Not have to think/put forth effort.....1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Teach others.....1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Care for myself.....1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Be thrifty/frugal.....1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Save money.....1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Have some personal time alone.....1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Make children happy.....1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Eat light.....1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Recall pleasant memories.....1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Not feel guilty afterward.....1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Feel like a good mom.....1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Feel appreciated by others/family.....1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Maintain a habit/tradition.....1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Satisfy a craving.....1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Do my own thing.....1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Refresh myself.....1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Have a brief escape from the day.....1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Have something to do to pass the time.....1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Question 4 Continued On Next Page →

Question 4 Continued.

	Strongly Disagree	←-----→				Strongly Agree
I wanted to ...	1	2	3	4	5	6
Eat responsibly.....1	<input type="checkbox"/>					
Eat quickly.....1	<input type="checkbox"/>					
Use willpower to keep from overeating.....1	<input type="checkbox"/>					
Take food along with me to other places.....1	<input type="checkbox"/>					
Eat immediately.....1	<input type="checkbox"/>					
Really enjoy eating.....1	<input type="checkbox"/>					
Re-energize myself.....1	<input type="checkbox"/>					
Stick to a diet.....1	<input type="checkbox"/>					
Take a break during/after a busy day.....1	<input type="checkbox"/>					
Have a pleasant meal with others.....1	<input type="checkbox"/>					
Reconnect myself with the past.....1	<input type="checkbox"/>					
Minimize planning.....1	<input type="checkbox"/>					
Set a tone for the day.....1	<input type="checkbox"/>					
Show my love for others.....1	<input type="checkbox"/>					
Feel better – less sad/stressed/angry.....1	<input type="checkbox"/>					
Maintain my cultural heritage.....1	<input type="checkbox"/>					
Feel good about what I eat.....1	<input type="checkbox"/>					
Spread my calories across the day.....1	<input type="checkbox"/>					
Minimize preparation effort.....1	<input type="checkbox"/>					
Stay on a budget.....1	<input type="checkbox"/>					
Connect with others/family.....1	<input type="checkbox"/>					
Satisfy my hunger.....1	<input type="checkbox"/>					

5. Which of the following statements describe the **benefits** you were seeking in the food and/or beverage you ate and/or drank at **this meal**? What did you want the food to do for you at this particular meal? Check how much you disagree or agree with each statement. If the statement does not apply to you, please select Strongly Disagree. **(X ONE Box For EACH Statement)**

For this meal I wanted something that ...	Strongly Disagree	←-----→				Strongly Agree
	1	2	3	4	5	6
Has fiber.....1	<input type="checkbox"/>					
Tastes fresh.....1	<input type="checkbox"/>					
Is really indulgent.....1	<input type="checkbox"/>					
Is low in fat/cholesterol.....1	<input type="checkbox"/>					
Is really flavorful.....1	<input type="checkbox"/>					

Question 5 Continued On Next Page →

Question 5 Continued.

For this meal I wanted something that ...



	1	2	3	4	5	6
Is not boring.....1	<input type="checkbox"/>					
Is healthy to eat.....1	<input type="checkbox"/>					
Really tastes great.....1	<input type="checkbox"/>					
Is ready to eat, needs no preparation.....1	<input type="checkbox"/>					
I know will be good.....1	<input type="checkbox"/>					
Looks appetizing.....1	<input type="checkbox"/>					
Is rich tasting.....1	<input type="checkbox"/>					
Is easy to prepare.....1	<input type="checkbox"/>					
Children will also eat.....1	<input type="checkbox"/>					
Provides specific vitamins/minerals/nutrients.....1	<input type="checkbox"/>					
Is low in salt.....1	<input type="checkbox"/>					
Isn't messy.....1	<input type="checkbox"/>					
Everyone will eat without complaints.....1	<input type="checkbox"/>					
Can be eaten in a car.....1	<input type="checkbox"/>					
Satisfies a craving.....1	<input type="checkbox"/>					
Is low in carbohydrates.....1	<input type="checkbox"/>					
Was on sale, a good deal.....1	<input type="checkbox"/>					
Reminds me of the past.....1	<input type="checkbox"/>					
Is low in calories.....1	<input type="checkbox"/>					
Is easy to clean up afterward.....1	<input type="checkbox"/>					
Creates family ties.....1	<input type="checkbox"/>					
Is inexpensive.....1	<input type="checkbox"/>					
Has calcium.....1	<input type="checkbox"/>					
Is easy to eat.....1	<input type="checkbox"/>					
Is fun to eat.....1	<input type="checkbox"/>					
Is a favorite of someone in the family.....1	<input type="checkbox"/>					
Is not time consuming to prepare and/or eat/drink.....1	<input type="checkbox"/>					
Is portable.....1	<input type="checkbox"/>					
Won't make me feel sluggish.....1	<input type="checkbox"/>					
Is natural/organic.....1	<input type="checkbox"/>					
Can be eaten with hands.....1	<input type="checkbox"/>					

6. Approximately how long did it take you or someone else to prepare the food and/or beverage for this meal? (X ONE Box)

- 01 No time
- 02 Under 5 minutes
- 03 5-10 minutes
- 04 11-15 minutes
- 05 16-20 minutes
- 06 21-30 minutes
- 07 31-45 minutes
- 08 46 minutes – 1 hour
- 09 1-2 hours
- 10 More than 2 hours
- 11 Don't know

7. Approximately how long did it take to consume the food and/or beverage for this meal? (X ONE Box)

- 1 Under 5 minutes
- 2 5-10 minutes
- 3 11-15 minutes
- 4 16-20 minutes
- 5 21-30 minutes
- 6 31-45 minutes
- 7 46 minutes – 1 hour
- 8 1-2 hours
- 9 More than 2 hours

8. Approximately how long did it take to clean up after consuming the food and/or beverage for this meal? (X ONE Box)

- 1 Under 5 minutes
- 2 5-10 minutes
- 3 11-15 minutes
- 4 16-20 minutes
- 5 21-30 minutes
- 6 31-45 minutes
- 7 46 minutes – 1 hour
- 8 1-2 hours
- 9 More than 2 hours

9. What activities were you engaged in during this meal? (X ALL That Apply)

- 01 Nothing else
- 02 Watching television
- 03 Conversation with others
- 04 Caring for others
- 05 Reading
- 06 Listening to the radio
- 07 Cooking
- 08 Using computer (non work-related)
- 09 Working (including on the computer)
- 10 Talking on phone
- 11 Traveling (driving)
- 12 Getting ready to leave
- 13 Other, please specify: _____

10. When did you decide what to eat and/or drink for this meal? (X ONE Box)

- 1 Someone else decided
- 2 Immediately before
- 3 A few hours before
- 4 Earlier in day
- 5 Yesterday
- 6 Before yesterday

11A. First, rate how satisfied you were with the food and/or beverage you consumed for this meal for each of the dimensions listed below using a 6 point scale where "1" means "Very Dissatisfied" and "6" means "Very Satisfied". (X ONE Box For EACH Under Column "A")

11B. Then in the last 3 columns, rate the importance for this meal. (X ONE Box For EACH Under Column "B")

	"A"						"B"		
	Very Dissatisfied	2	3	4	5	Very Satisfied	Not Important	Important	Very Important
	1	2	3	4	5	6	1	2	3
Tasted good	<input type="checkbox"/>								
Was convenient to obtain, prepare or eat and/or drink	<input type="checkbox"/>								
Was healthful.....	<input type="checkbox"/>								
Helped me maintain a tradition	<input type="checkbox"/>								
Comforted me.....	<input type="checkbox"/>								
Appealed to others present.....	<input type="checkbox"/>								
Was a good value	<input type="checkbox"/>								
Satisfied my hunger	<input type="checkbox"/>								
Helped me care for others present	<input type="checkbox"/>								
Made me feel rewarded or indulged	<input type="checkbox"/>								
Helped control my weight.....	<input type="checkbox"/>								

12. Where did this meal take place? **(X ONE Box)**
- 1 At Home → **(Skip To Qu. 15)**
 - 2 Away From Home → **(Continue)**
13. If this meal occurred away from home, what was the source of the food and/or drink you consumed? **(X ONE Box)**
- 1 Purchased and consumed in a restaurant/cafe/teria → **(Continue)**
 - 2 Purchased in a restaurant/cafe/teria and consumed elsewhere → **(Continue)**
 - 3 Brought/carried from home → **(Skip To Qu. 15)**
 - 4 Purchased in a store → **(Skip To Qu. 16)**
 - 5 Purchased from a vending machine → **(Skip To Qu. 16)**
 - 6 Other, please specify _____ → **(Skip To Qu. 16)**
14. If the food and/or beverage at this meal was purchased in a restaurant, what type of restaurant was it? **(X ONE Box)**
- 1 Fast Food
 - 2 Family
 - 3 Fine Dining
 - 4 Cafeteria
 - 5 Coffee Shop
 - 6 Deli
 - 7 Other, please specify _____
- **(Skip To Qu. 16)**
15. If this meal took place at home, or was carried from home, who prepared the food and/or beverage? **(X ALL That Apply)**
- 1 I did all the preparation
 - 2 I did some of the preparation
 - 3 Other adult(s) did the preparation
 - 4 A child did the preparation
16. Not including yourself, who was present at this meal? **(Write In # or 0. If you ate out, please count only people sitting at the same table with you.)**
- For example, if you ate a meal in your home with your 10 year old child and your spouse:*
- # 1 Adults living in household (not including yourself)
- # 1 Children (Under the age of 18) living in household
- # 0 Adults not living in household
- # 0 Children (Under the age of 18) not living in household
- # _____ Adults living in household (not including yourself)
- # _____ Children (Under the age of 18) living in household
- # _____ Adults not living in household
- # _____ Children (Under the age of 18) not living in household

Thank you for completing this questionnaire.

Appendix B : Food Record Booklet



P.O. Box 474 Toledo, OH 43654
 Toll-Free Number: 1-800-537-4097
 Mon – Fri, 8:00 AM to 11:00 PM EST
 Sat, 10:00 AM to 6:00 PM EST
 Contact Us: <http://mysurvey.com/contactus.cfm>
 Privacy: <http://mysurvey.com/privacy.cfm>

Shaping the Future with Your Opinions

174075

FOOD RECORD BOOKLET FOR ONE DAY

Please keep this booklet with you to record everything you eat and drink for your assigned 24-hour period.

We prepared a 12 minute video to help you describe the foods and beverages and the amounts you consume. Before completing the food record form, please watch the instructional video on the enclosed DVD or access the video on the website <http://courses.cfans.umn.edu/CFANSVideo/FoodRecordManual/>.

Note: The success of this study depends on the accuracy of your food record. We realize that it will be time consuming to keep detailed records and appreciate your help.

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	Page
I. Instructions for recording everything you eat and drink	2-6
General and detailed instructions	2-3
Example food record form for 24 hours	4-5
Example recipe	6
II. Food pictures and guides to estimate amount consumed	7-12
III. Food Record Form	13-15
Recipe Forms	16-17

GENERAL INSTRUCTIONS

- Record everything you eat and drink for your assigned 24-hour period on the Food Record Form (Find the form beginning on page 13 toward the end of this booklet).
- Print clearly with only one food or beverage item on each line.
- Record each meal/snack immediately after it is eaten.
- Leave one blank line between each meal/snack.

DETAILED INSTRUCTIONS BY COLUMN (See examples on pages 4-5)

Column 1 – Type of Occasion

1. Write what type of meal/snack this was (breakfast, lunch, dinner, or snack).

Column 2 – Time Eaten

2. Write the time of day that you ate or drank in the “Time Eaten” column.

Column 3 – Foods and Beverages

3. Fully describe all foods and beverages including water. Include details such as how a food was prepared and whether condiments or spreads were added. For example, if you ate a chicken thigh, write if you ate the skin. If you drank coffee, was it caffeinated or decaffeinated? Was your salad dressing low fat or regular?

INCLUDE	FOR EXAMPLE
How prepared	Fried, broiled, breaded, etc.
Added fats	Fried in butter
Brand name	Stouffer’s Frozen Lasagna

4. Include things that you added to the food or beverage at the table. Example: 1 Tbsp butter to a baked potato; 1 tsp sugar to coffee. Write what you added on separate lines.

Column 4 – Amount Eaten

5. Record exact amounts in the “Amount Eaten” column.
 - The number of pieces or slices
 - Weight: ounces or grams
 - Volume: cup, tsp (teaspoon), Tbsp (tablespoon), fluid ounce (fl oz), liters
 - Dimensions: inches or centimeters
 - Use pictures and guides on pages 7-12 to estimate amounts

Example

⁽³⁾ FOODS AND BEVERAGES (preparation method, added fat, brand name, source of food)	⁽⁴⁾ AMOUNT EATEN
<i>Chicken Caesar Salad</i>	
<i>Romaine lettuce</i>	3 cups
<i>chicken breast, (no skin) grilled</i>	1 medium
<i>Caesar dressing</i>	¼ cup
<i>parmesan cheese</i>	2 Tbsp.
<i>Croutons</i>	6 large
<i>Spaghetti & Meat Balls</i>	
<i>cooked spaghetti</i>	1½ cups
<i>Meatballs</i>	4 (1" diameter)
<i>Ragu meatless spaghetti sauce</i>	½ cup
<i>parmesan cheese</i>	1 Tbsp
<i>Soft Shell Chicken Tacos</i>	
<i>flour tortilla</i>	1 (8" diameter)
<i>Roasted, cubed chicken dark meat (no skin)</i>	½ cup
<i>Chopped lettuce</i>	½ cup
<i>Tomato salsa (chopped tomato, onion, jalapenos)</i>	2 Tbsp.

5. Describe each ingredient in a mixed dish or write recipes on pages 16-17. An example of a completed recipe is on page 6.
6. When you have finished recording what you ate and drank for each meal or snack, go back and review your list to see if you forgot any foods or beverages or anything you added at the table.

Example of Food Record Form for 24-hours

(Remember: Leave one blank line between each meal/snack.)

(1) TYPE OF OCCASION (breakfast, lunch, dinner, snack)	(2) TIME EATEN (Hour: Minute AM/PM)	(3) FOODS AND BEVERAGES (preparation method, added fat, brand name, source of food)	(4) AMOUNT EATEN
Snack	7:30 AM	Werther's original hard candy	1 piece (5 g)
		Amount or size	How many?
Breakfast	8:00 AM	Denny's buttermilk pancakes	2 pieces 5 in. diameter
		Butter, whipped	2 tsp
		Maple syrup	1/4 cup
		Bacon	2 strips 6" long
		Coffee, decaffeinated	2 cups
		Half & half	2 Tbsp
Snack	9:30 AM	Brownie (made at home from a mix with vegetable oil and real eggs)	2 pieces (2 in. wide x 2 in. long Thickness 5)
		How big?	
Snack	11:00 AM	Tall latte made with 2% milk	12 oz.
Snack	11:30 AM	Chips Ahoy chocolate chip Cookies	2 cookies 3 in. diameter

Example of Food Record Form for 24-hours (continued)
(Remember: Leave one blank line between each meal/snack.)

(1) TYPE OF OCCASION (breakfast, lunch, dinner, snack)	(2) TIME EATEN (Hour: Minute AM/PM)	(3) FOODS AND BEVERAGES (preparation method, added fat, brand name, source of food)	(4) AMOUNT EATEN
Lunch	12:00 Noon	Ham sandwich Source of food	
		Rye bread	2 slices
		Ham (from Albertson's deli)	3 slices
		Kraft American cheese slice How thick? See guide on p.12	1 slice Thickness 1
		Best Foods low fat mayonnaise	2 tsp
		Doritos regular tortilla chips	12 chips
		Senor Felix Salsa	¼ cup
		Minute Maid lemonade	10 oz.
Dinner	6:00 PM	Beef Stew	1 cup (1 serving)
		Salad: See recipe on p. 6	
		Romaine lettuce	1 cup
		Tomato	¼ medium
		Kraft Italian fat free salad dressing	1 Tbsp
		French bread	2 slices (1 slice = 3 in. length x 2 in. width x ¾ in. thick)
		Butter, regular stick	2 tsp
		Water	12 oz.
Snack	8:30 PM	Dreyers Grand Chocolate ice cream	1 cup

Recipe 1: (Write In) Beef Stew

Number of servings made: (Write In #) 6 Number of servings you ate: (Write In #) 1

Serving Size 1 cup

INGREDIENTS	AMOUNT
Stew beef, boneless chuck roast, trimmed	2 lbs (pkg weight)
Browned in oil	¼ cup
White flour	1 ½ Tbsp
Onion	1 large
Beef broth, canned	2 cups
Tomato sauce, canned	1 cup
Potatoes, medium sized, white, peeled	6
Carrots, fresh (each about 6 inches long)	6
Celery	1 stalk
Fresh parsley	¼ cup

PREPARATION
Beef browned in oil, not drained
All ingredients added raw to same pan
Simmered 2-3 hours

Beef, Pork, Chicken and Fish



1-1/2 ounces



3 ounces



6 ounces



9 ounces

2

Cereal and Soup

1/2 cup



1 cup



1-1/2 cups



2 cups



3

Vegetables such as Green Beans, Corn and Potatoes



1/4 cup



1/2 cup



1 cup



1-1/2 cups

4

Spaghetti and Casseroles

1/2 cup



1 cup



2 cups

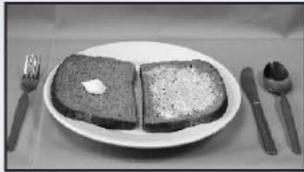


3 cups

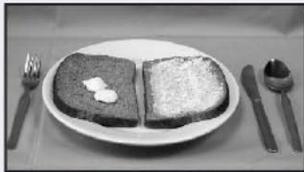


5

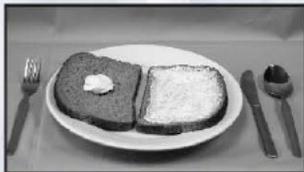
Spreads such as Butter, Margarine, Mayonnaise, or Peanut Butter



1 teaspoon (tsp)



2 teaspoons



3 teaspoons
= 1 Tablespoon



2 Tablespoons

6

Salad Dressing

1 Tablespoon (Tbsp)



2 Tablespoons



3 Tablespoons



4 Tablespoons
= 1/4 cup



7

Salads



1/2 cup



1 cup



1-1/2 cups



2 cups

8

Ice Cream, Mashed Potatoes, or Cottage Cheese

1/2 cup



1 cup



1-1/2 cups



2 cups



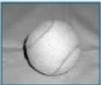
9

Five Ways to Size Up Your Servings

- 1** **3 ounces** of meat is about the size and thickness of a deck of playing cards or an audiotape cassette.

3 oz.  = 
- 2** **1 ounce** of cheese is about the size of 4 stacked dice.

1 oz.  = 
- 3** **1/2 cup** of ice cream is about the size of a racquetball or tennis ball.

1/2 c.  = 
- 4** **1 cup** of mashed potatoes or broccoli is about the size of your fist.

1 c.  = 
- 5** **1 teaspoon** of butter or peanut butter is about the size of the tip of your thumb.

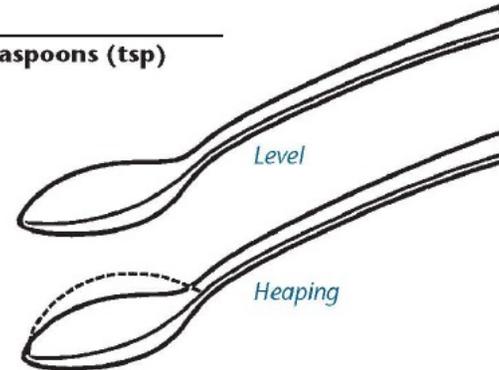
1 tsp.  = 

10

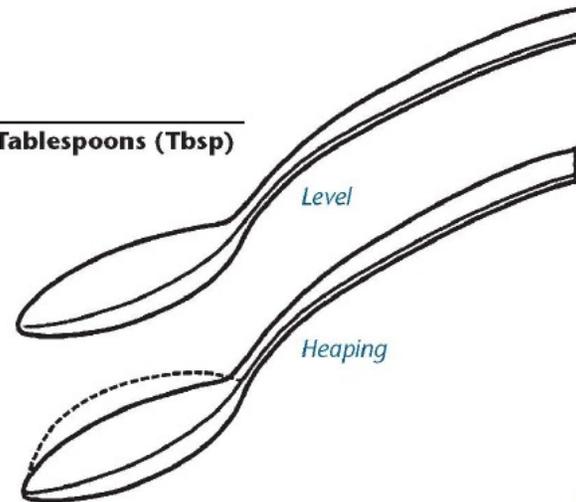
concept ©1996 National Dairy Council

Eating and Serving Spoons

teaspoons (tsp)

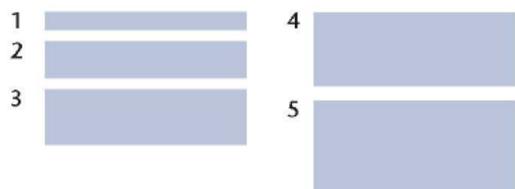


Tablespoons (Tbsp)

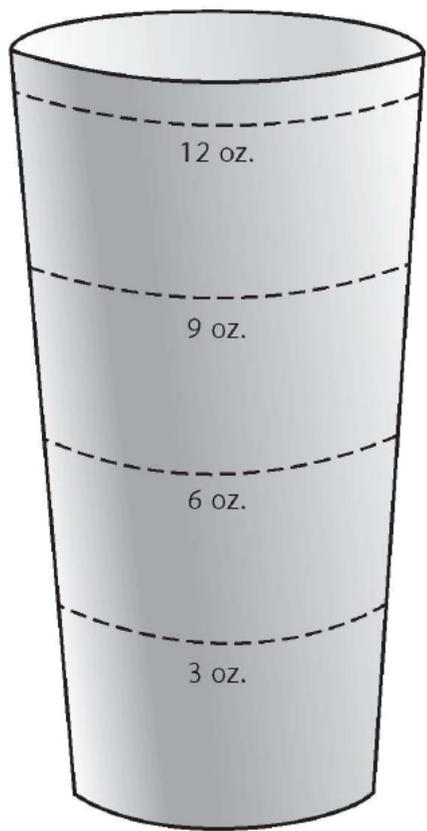


11

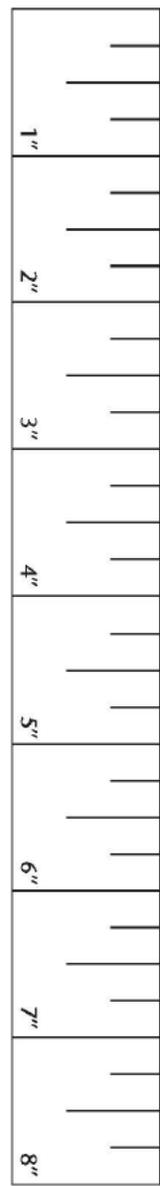
Thickness



12 fluid ounces



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Appendix C: Eating Occasion Questionnaire

EATING OCCASION QUESTIONNAIRE

Usual Weekday Breakfast

Think about your typical weekday breakfast. Which of the following statements describe your **needs or benefits** surrounding this meal? What do you want to accomplish by eating your typical weekday breakfast? What do you want the food to do for you at this meal?

Check how much you disagree or agree with each statement. If the statement does not apply to you, please select Strongly Disagree. (**X ONE BOX FOR EACH Statement**)

If you never eat this meal, go on to the next page.

For this meal I want to ... OR I want something that ...	Strongly Disagree					Strongly Agree
	1	2	3	4	5	6
Connect with others/family	<input type="checkbox"/>					
Is healthy to eat	<input type="checkbox"/>					
Is ready to eat, needs no preparation	<input type="checkbox"/>					
Treat myself	<input type="checkbox"/>					
Children will also eat	<input type="checkbox"/>					
Minimize preparation effort	<input type="checkbox"/>					
Is low in calories	<input type="checkbox"/>					
Creates family ties	<input type="checkbox"/>					
Is easy to clean up afterwards	<input type="checkbox"/>					
Control/limit my calorie intake	<input type="checkbox"/>					
Is portable	<input type="checkbox"/>					
Eat quickly	<input type="checkbox"/>					
Is really indulgent	<input type="checkbox"/>					
Feel appreciated by others/family	<input type="checkbox"/>					
Provides specific vitamins, minerals, nutrients	<input type="checkbox"/>					
Satisfies a craving	<input type="checkbox"/>					
Really enjoy the moment	<input type="checkbox"/>					
Feel good about what I eat	<input type="checkbox"/>					
Not have to think/put forth effort	<input type="checkbox"/>					
Create/maintain a family tradition	<input type="checkbox"/>					

In a normal week, how many weekday breakfasts do you normally have? _____

Of the weekday breakfasts you usually have, how many are similar to the typical weekday breakfast you rated above? _____

Appendix D: Study Completion Questionnaire (Exit Survey)

Study Completion Questionnaire

1. Currently, how often do you weigh yourself? <i>(Mark only one box.)</i>	2. Over the past 2 years, how often did you weigh yourself? <i>(not including the times you were weighed for this study) (Mark only one box.)</i>
<input type="checkbox"/> Never	<input type="checkbox"/> Never
<input type="checkbox"/> About once a year or less	<input type="checkbox"/> Less than once a month
<input type="checkbox"/> Every couple of months	<input type="checkbox"/> Less than once a week
<input type="checkbox"/> Every month	<input type="checkbox"/> Once a week
<input type="checkbox"/> Every week	<input type="checkbox"/> Several times a week
<input type="checkbox"/> Every day	<input type="checkbox"/> Once a day
<input type="checkbox"/> More than once a day	<input type="checkbox"/> Several times a day
3. Have you experienced any of these <u>major</u> events over the past 2 years? <i>(Mark all that apply.)</i>	
<input type="checkbox"/> Change in marital status	
<input type="checkbox"/> Major illness or injury (you or immediate family member)	
<input type="checkbox"/> Death of an immediate family member	
<input type="checkbox"/> Change in number in your household (not including death of an immediate family member)	
<input type="checkbox"/> Change in employment status (you or immediate family member)	
<input type="checkbox"/> Change in residence	
<input type="checkbox"/> Major change in financial situation (for example, bankruptcy, mortgage foreclosure)	
<input type="checkbox"/> Change in educational attainment	
<input type="checkbox"/> None of the above	
4. Have you used any of these methods to lose or maintain weight over the past 2 years? <i>(Mark all that apply.)</i>	
<input type="checkbox"/> Reducing calories	
<input type="checkbox"/> Fasting	
<input type="checkbox"/> Increasing exercise	
<input type="checkbox"/> Skipping meals	
<input type="checkbox"/> Eating more fruit and vegetables	
<input type="checkbox"/> Increasing the number of cigarettes smoked	
<input type="checkbox"/> Eliminating snacks	
<input type="checkbox"/> Using laxatives	
<input type="checkbox"/> Eating less fat	
<input type="checkbox"/> Using diuretics	
<input type="checkbox"/> Eliminating sweets	
<input type="checkbox"/> Using appetite suppressants	
<input type="checkbox"/> Reducing the amount of food eaten	
<input type="checkbox"/> Using diet pills	
<input type="checkbox"/> Changing type of foods eaten	
<input type="checkbox"/> Vomiting	
<input type="checkbox"/> Eating less meat	
<input type="checkbox"/> Attending a diet center where food was provided	
<input type="checkbox"/> Eating less high-carbohydrate food	
<input type="checkbox"/> Attending a weight loss group in which food was not provided	
<input type="checkbox"/> Eating low-calorie foods	
<input type="checkbox"/> None of the above	
5. Over the past 2 years, have you participated in any organized activities that provided nutrition information such as classes, weight loss groups, or counseling by a dietitian? <i>(Do not include any activities related to this study) (Mark only one box.)</i>	
<input type="checkbox"/> Yes <input type="checkbox"/> No If yes, please briefly describe _____	

6. For each of the following statements, mark only one box that is best for you.

	Definitely true	Mostly true	Mostly false
I deliberately take small helpings to control my weight	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I start to eat when I feel anxious	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sometimes when I start eating, I just can't seem to stop.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
When I feel sad, I often eat too much.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I don't eat some foods because they make me fat.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Being with someone who is eating, often makes me also want to eat.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
When I feel tense or "wound up", I often feel I need to eat.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I often get so hungry that my stomach feels like a bottomless pit.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I'm always hungry so it is hard for me to stop eating before I finish the food on my plate.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
When I feel lonely, I console myself by eating.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I consciously hold back on how much I eat at meals to keep from gaining weight.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
When I smell delicious food, I find it very difficult to keep from eating, even if I've just finished a meal.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I'm always hungry enough to eat at any time.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
If I feel nervous, I try to calm down by eating.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
When I see something that looks very delicious, I often get so hungry that I have to eat right away.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
When I feel depressed, I want to eat.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
How often do you avoid "stocking up" on tempting foods?	Almost never <input type="checkbox"/>	Seldom <input type="checkbox"/>	Usually <input type="checkbox"/>
How likely are you to make an effort to eat less than you want?	Unlikely <input type="checkbox"/>	A little likely <input type="checkbox"/>	Somewhat likely <input type="checkbox"/>
Do you go on eating binges even though you're not hungry?	Never <input type="checkbox"/>	Rarely <input type="checkbox"/>	Sometimes <input type="checkbox"/>
How often do you feel hungry?	Only at mealtimes <input type="checkbox"/>	Sometimes between meals <input type="checkbox"/>	Often between meals <input type="checkbox"/>
On a scale from 1 to 8, where 1 means no restraint in eating and 8 means total restraint, what number would you give yourself?	Circle the number that best applies: 1 2 3 4 5 6 7 8		

7. In the future, how likely are you to participate in a self-directed online program to prevent weight gain? (Mark only one box)

Unlikely (if unlikely, skip to question 12) A little likely Somewhat likely Very likely

8. If you were to participate, how many lessons would be best for you? (Mark only one box)

One Two or three Four or five Six or more

9. If you were to participate, how likely would you be to communicate with other participants as the program via Facebook, blogging, Twitter, or texting? (Mark only one box)

Unlikely A little likely Somewhat likely Very likely

10. If you were to participate, how many hours per week would be best for you? (Mark only one box)

One Two or three Four or five Six or more

11. If you were to participate, how likely would you be to pay for it? (Mark only one box)

Unlikely A little likely Somewhat likely Very likely

12. Over the past two years, have you tried to lose weight? (Mark only one box)

Yes No

Thank you for participating in this study!!