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Meal preparation and cleanup time and cardiometabolic risk over 14 years in the Study of Women's Health Across the Nation (SWAN)

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Abstract

Objective—Determine whether baseline levels and longitudinal changes in meal preparation and cleanup time are associated with changes in cardiometabolic risk factors in midlife women.

Methods—Subjects were 2755 midlife women enrolled in the Study of Women's Health Across the Nation, a multi-ethnic, longitudinal cohort study. The five diagnostic components of the metabolic syndrome and meal preparation/cleanup time were assessed repeatedly across 14 years of follow-up (spanning 1996–2011) at seven U.S. sites. Mixed-effects logistic and ordered logistic models tested associations between meal preparation/cleanup time and odds of meeting criteria for metabolic syndrome and its individual diagnostic components.

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CONFLICT OF INTEREST

The authors have no conflict of interest to disclose.

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Results—Women who spent more time preparing and cleaning up meals at baseline, or demonstrated greater increases in this activity, had greater increases over time in their odds of having metabolic syndrome and in the number of metabolic syndrome components for which they met criteria. Adjusted associations were observed between meal preparation/cleanup time and hypertension, impaired fasting glucose, hypertriglyceridemia, and low high-density lipoprotein cholesterol, but not abdominal obesity.

Conclusions—In midlife women, greater meal preparation/cleanup time is associated with the development of an adverse cardiometabolic risk profile. Public health interventions should place greater emphasis on cooking healthfully, not just cooking frequently.

Keywords

Cardiovascular disease risk; Meal preparation; Metabolic syndrome; Midlife women; Type 2 diabetes; Waist circumference

INTRODUCTION

The increase in the prevalence of obesity over the past 40 years (Flegal et al., 2010; Ng et al., 2014) has significant public health implications. The prevalence of type 2 diabetes among U.S. adults has risen from 6.2 to 9.9% over the past 20 years (Selvin et al., 2014), and cardiovascular risk factors such as hypertension and dyslipidemia remain highly prevalent, particularly among individuals with obesity (Saydah et al., 2014).

These trends in cardiometabolic risk have been accompanied by a significant shift away from home-prepared foods in the American diet. Foods prepared and consumed at home constitute a smaller proportion of household food expenditures (U.S. Department of Agriculture Economic Research Service, 2014; U.S. Department of Labor Bureau of Labor Statistics, 2014) and provide a smaller proportion of daily energy (Nielsen et al., 2002; Poti and Popkin, 2011) than in the 1970s. Time spent preparing and cleaning up food by American women decreased from 92 minutes per day in 1975 to 51 minutes per day in 2006, whereas time spent in these activities by men remained stable at less than 20 minutes per day (Zick and Stevens, 2010). Additionally, portion sizes of away-from-home foods have increased dramatically during this period (Piernas and Popkin, 2011). Though preparing meals at home has been associated with improved diet quality (McLaughlin et al., 2003) and lower BMI among women in some studies (Zick et al., 2011), others have observed no association (Sobal and Hanson, 2014) or suggest that longer meal preparation time is associated with higher energy intake and obesity (Chu et al., 2012). Though little research has been conducted on this topic, home meal preparation is already a cornerstone of national initiatives to reduce obesity, heart disease, and diabetes (i.e., cookingmatters.org; letsmove.org). Home meal preparation is also commonly emphasized in behavioral interventions for obesity, diabetes management, and heart disease prevention, and is the primary outcome in an increasing number of intervention studies (Reicks et al., 2014).

Given the need for evidence regarding the potential role of meal preparation in cardiometabolic disease prevention, we explored the cross-sectional and longitudinal associations between time spent preparing and cleaning up meals and cardiometabolic risk

factors among midlife women in the Study of Women's Health Across the Nation (SWAN). This sample is advantageous because women can experience adverse changes in their cardiometabolic profile during the menopausal transition (Matthews et al., 2009; Sowers et al., 2007; Woodard et al., 2011), and because women have primary responsibility for meal preparation in up to three-fourths of U.S. households (Flagg et al., 2013; Harnack et al., 1998). Analyses tested the hypothesis that baseline levels and longitudinal changes in meal preparation/cleanup time are inversely associated with the probability of meeting criteria for metabolic syndrome, a cluster of five co-occurring cardiometabolic risk factors (abdominal obesity, hypertension, hypertriglyceridemia, prediabetes, and low high-density lipoprotein (HDL) cholesterol; (Alberti et al., 2009; National Cholesterol Education Program Expert Panel on Detection and Adults, 2002) that affects one-quarter to one-third of adults (Beltran-Sanchez et al., 2013; Mozumdar and Liguori, 2011) and is associated with cardiovascular disease, type 2 diabetes mellitus, and all-cause mortality (Ford et al., 2008; Malik et al., 2004; Suzuki et al., 2014).

METHODS

Subjects

Subjects were midlife women enrolled in the Study of Women's Health Across the Nation (SWAN), a seven-site, multi-ethnic/racial, longitudinal cohort study of health determinants across the menopausal transition. SWAN's methodology is detailed elsewhere (Sowers et al., 2000). Women were recruited from five ethnic/racial groups: African-American (Boston, Chicago, Detroit area, and Pittsburgh), Chinese (Oakland area), Hispanic (Newark), Japanese (Los Angeles), and non-Hispanic white (all sites). Baseline eligibility criteria included being aged 42–52 years at enrollment (1996–1997), intact uterus and at least one ovary, not pregnant or lactating, not using oral contraceptives or hormone therapy, and at least one menstrual cycle in the prior three months. Procedures conformed to the Declaration of Helsinki and were approved by each site's institutional review board. All subjects provided written informed consent. This report includes data collected at the baseline assessment (1996–1997) and annual follow-up assessments that occurred through 2011. Of 3302 women enrolled in SWAN, 2755 (83%) contributed data on metabolic syndrome diagnostic components, time spent preparing and cleaning up meals, and relevant covariates from at least one assessment. Women who were not included in analyses did not significantly differ from women in the analytic sample on baseline levels or change in meal preparation/cleanup time, or their metabolic syndrome status and number of metabolic syndrome diagnostic components at baseline.

Measures

Waist circumference—WC was measured to the nearest 0.1 cm with a measuring tape placed horizontally around the participant at the narrowest part of the torso. Measurements were taken over light clothing at the end of a normal exhalation.

Blood pressure—Blood pressure was measured on the right arm in a seated position after at least 5 minutes of rest using a mercury sphygmomanometer. Respondents had not smoked or consumed caffeine within the prior 30 minutes. Appropriate cuff size was determined

based on arm circumference. Two sequential blood pressure values were completed at least two minutes apart and averaged.

Blood assays—Blood was drawn after a 12-hour fast. Samples were frozen and sent for analysis to Medical Research Laboratories (Lexington, KY), which is certified by the National Heart Lung and Blood Institute, Centers for Disease Control Part III program (Myers et al., 1989). Triglycerides were analyzed by enzymatic methods on a Hitachi 747 analyzer (Boehringer Mannheim Diagnostics, Indianapolis, IN). HDL was isolated using heparin-2M manganese chloride. Glucose was determined from fasting serum samples using a hexokinase-coupled reaction (Boehringer Mannheim Diagnostics, Indianapolis, IN).

Definition of metabolic syndrome components and status—Consistent with current diagnostic criteria (Alberti et al., 2009), metabolic syndrome was defined by the presence of at least three of the following five components: abdominal obesity (waist circumference ≥ 80 cm for Chinese and Japanese women, and ≥ 88 cm for other ethnic groups), hypertension (systolic ≥ 130 mmHg, diastolic ≥ 85 mmHg, or taking blood pressure medication), low HDL (<50 mg/dl), hypertriglyceridemia (fasting triglycerides ≥ 150 mg/dl), and impaired fasting glucose (fasting glucose ≥ 100 mg/dl, or taking medication for impaired glucose regulation). Metabolic syndrome status and the total number of metabolic syndrome diagnostic components were determined at each time point.

Meal preparation/cleanup time—Subjects responded to the item, “During the past year, how much time did you spend preparing meals or cleaning up from meals?” Response options were: “1 hour or less per day,” “Between 1 and 2 hours per day,” and “More than 2 hours per day.” This item was administered as part of the SWAN physical activity assessment, which was adapted from the Kaiser Physical Activity Survey (Baecke et al., 1982; Sternfeld et al., 1999).

Covariates—Covariates were chosen based on their potential to confound the associations being tested. Study site (Pittsburgh, PA, Chicago, IL, Oakland, CA, Los Angeles, CA, Boston, MA, Detroit-area Michigan, and Newark, NJ), ethnicity/race (African-American, Non-Hispanic White, Chinese, Hispanic, Japanese), age (derived from birth date), and education (high school diploma vs. $>$ high school diploma) were documented at baseline. Models also adjusted for financial strain at baseline, which was assessed with the item “How hard is it for you to pay for the very basics like food, housing, medical care, and heating?” Response options were “not hard at all,” “somewhat hard,” and “very hard.” Time-varying covariates, assessed at annual follow-up visits, included marital status (married or living as married vs. unmarried), number of household members, employment status (≥ 35 hours/week, <35 hours/week, not employed), smoking status (no/yes), alcohol intake (0, 0 to 3, >3 drinks per week), menopausal status (premenopausal or early perimenopausal vs. late perimenopausal or postmenopausal) determined through menstrual bleeding patterns (World Health Organization Scientific, 1996), hormone therapy use (yes/no), and non-occupational physical activity (assessed on 5-point Likert and ordinal quantitative scales with total scores ranging from 3–15 and higher values indicating more frequent engagement in physical activity; (Baecke et al., 1982; Sternfeld et al., 1999).

Statistical Analyses

Analyses were performed in Stata 13 (StataCorp, LLC, College Station, TX). Meal preparation/cleanup time was assessed at baseline and visits 3, 5, 6, 9, and 12. Data on metabolic syndrome diagnostic components were available in all of these years except for visit 9. We used a two-step modeling process that captured change in meal preparation/cleanup time across all years of follow-up in a single term, thereby allowing analyses to include data on meal preparation/cleanup time from visit 9. First, a mixed effects ordered logistic regression model estimated each woman's linear change in meal preparation/cleanup time across all available years of follow-up. The intercept and slope-predicted values from these models were subsequently used as predictors representing baseline values and linear change over time. Mixed effects ordered logistic regression models tested associations between baseline levels and overall change in meal preparation/cleanup time and the number of metabolic syndrome diagnostic components (an ordinal outcome ranging from 0–5). Models utilized mean and variance adaptive Gauss Hermite quadrature integration with five integration points. A random intercept accounted for variation in the number of metabolic syndrome diagnostic components at baseline, and a random slope for the effect of time (in years since study baseline) allowed change in metabolic syndrome diagnostic components to be modeled independently for each subject. A similarly structured mixed effects logistic regression model tested associations involving the binary metabolic syndrome status variable and the five binary metabolic syndrome component variables.

RESULTS

Analyses included 8444 observations from 2755 women. The final assessment (SWAN visit 12) occurred an average of 13.74 (SD=0.45) years after baseline. Sample characteristics are summarized in Table 1. At baseline, 23.4% of women met criteria for having metabolic syndrome. This percentage slightly increased to 29.8% by visit 12. Overall, the number of metabolic syndrome diagnostic components met increased slightly from baseline (mean=1.5, SD=1.4; median=1, IQR=0–2) to visit 12 (mean=1.8, SD=1.4, median=2, IQR=1–3).

The percentages of women spending 1 hour, 1–2 hours, and >2 or more hours per day preparing and cleaning up meals at baseline (26.0%, 48.1%, and 25.9%, respectively) versus visit 12 (35.8%, 47.0%, 17.3%, respectively) indicated a slight overall decrease in this activity across 14 years of follow-up.

As shown in Table 2, the number of metabolic syndrome diagnostic components met tended to increase over time. Yet, the rate of increase was faster among those who spent more time preparing and cleaning up meals at baseline, and among those who demonstrated an increase the amount of time spent preparing and cleaning up meals across the duration of follow-up.

A similar pattern of associations was observed in a mixed effects logistic model predicting metabolic syndrome status defined by the presence of 3 or more diagnostic components (Table 2). The odds of having metabolic syndrome increased over time, with a faster increase among those who spent more time preparing and cleaning up meals at baseline, and among those whose meal preparation/cleanup time increased over the duration of follow-up.

Secondary analyses tested associations between meal preparation/cleanup time and the five individual metabolic syndrome diagnostic components (Table 3). In both unadjusted and adjusted models, the odds of impaired fasting glucose and hypertriglyceridemia increased over time at faster rates among women who spent more time preparing and cleaning up meals at baseline. In adjusted models, odds of hypertriglyceridemia, low HDL, and hypertension increased over time at a faster rate among women who showed an increase in meal preparation/cleanup time. However, these associations were attenuated in unadjusted models and were not statistically significant. No associations involving abdominal obesity were observed.

DISCUSSION

Midlife women who spent more time preparing and cleaning up meals at baseline, or who showed an increase in meal preparation/cleanup time during follow-up, had greater increases in their number of metabolic syndrome diagnostic components and in their odds of having metabolic syndrome. The likelihood of impaired fasting glucose or hypertriglyceridemia increased to a greater extent among those who reported greater meal preparation/cleanup time at baseline. Finally, greater increases meal preparation/cleanup time during follow-up were associated with increasing odds of three of the five metabolic syndrome diagnostic components (hypertriglyceridemia, low HDL cholesterol, and hypertension, but not impaired fasting glucose or abdominal obesity). However, these latter associations were only observed when adjusting for a multitude of other factors that were related to cardiometabolic risk factors, including age, physical activity, race/ethnicity, alcohol intake, education, employment status, and financial strain. Thus, after adjusting for other influences, meal preparation/cleanup time was a stronger predictor of aggregate markers of overall cardiometabolic risk than of individual risk factors.

The emphasis on home meal preparation in public health interventions appears to stem from prior research implicating frequent intake of away-from-home meals in weight gain (Duffey et al., 2007), obesity (Bowman and Vinyard, 2004; Chan and Sobal, 2011), and cardiometabolic risk (Duffey et al., 2009; Fulkerson et al., 2011). Though the current findings linking meal preparation/cleanup time to the development of an adverse cardiometabolic profile appear to contradict this conclusion, three considerations are relevant. First, the healthfulness of home-prepared foods can vary widely across households (Neumark-Sztainer et al., 2014). One study involving African-American families observed that more frequent home meal preparation was associated with increased adiposity, but the use of healthy food preparation methods was linked to lower adiposity (Kramer et al., 2012). Second, it is possible that home-prepared meals, though nutritious (Moore et al., 2009), are consumed in larger portions that contribute to cardiometabolic dysregulation. This notion is supported by a recent finding that midlife women who spent more time preparing food consumed larger, higher-calorie meals (Chu et al., 2012). However, this explanation is not consistent with the current study as meal preparation/cleanup time was unrelated to abdominal obesity. Finally, relatively healthy convenience foods that require little preparation (e.g., frozen entrées) are now widely available, and may partially account for the observed association between reduced meal preparation and improved cardiometabolic risk factors.

Roughly one-fifth to one-third of U.S. households consumes home-prepared meals infrequently (Smith et al., 2014; Virudachalam et al., 2014). The current findings suggest that promoting home meal preparation may be insufficient on its own to reduce cardiometabolic risk, and that public health interventions should place greater emphasis on cooking *healthfully*, not just cooking *frequently*. Many prior interventions that promote home meal preparation also include nutrition education, but these studies have been small and effects on cardiometabolic outcomes are rarely assessed (Reicks et al., 2014). The current findings highlight the need for more rigorous evaluation of these interventions. The effects of these interventions on the cardiometabolic health of other household members, including children, should also be explored. As an alternative to home food preparation, future research should examine the potential benefit of incorporating healthful away-from-home and convenience meals into one's diet (You et al., 2009), which would overcome the primary reported barriers to home meal preparation such as lack of time and inadequate cooking skills (Larson et al., 2006).

This study has several strengths. SWAN involves a multi-ethnic cohort of midlife women from seven U.S. sites, which increases generalizability to food preparers in typical U.S. households (Flagg et al., 2013; Harnack et al., 1998). Analyses capitalized on approximately 14 years of longitudinal data on cardiometabolic risk factors, and adjusted for numerous potential confounds. In terms of limitations, meal preparation/cleanup time was assessed via a single item indicator that did not distinguish between time spent preparing and cleaning up food. The observational nature of the study limits the ability to draw causal inferences, which would require a randomized trial. Alternative explanations for the observed findings could not be tested, including unmeasured confounders and the possibility that those with greater cardiometabolic risk are more motivated to manage their diet by preparing meals at home. Though the sample size was relatively large, it did not provide adequate statistical power to perform subgroup analyses by race/ethnicity or other factors. Finally, adequate measures of potential mediating variables, including dietary intake data, were not available for analysis. This information would be important for determining whether associations between home meal preparation and cardiometabolic risk are driven by the types of foods consumed, larger portion sizes, more frequent eating occasions, or a combination of these factors, which could have implications for refining public health interventions.

In summary, findings suggest that home meal preparation can be associated with an adverse cardiometabolic profile during midlife. Experimental studies are needed to elucidate the mechanisms underlying these associations, and rigorously evaluate public health interventions that promote home meal preparation. The potential value of healthful convenience meals for cardiometabolic risk reduction should also be examined.

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Abbreviations

SWAN	Study of Women's Health Across the Nation
HDL	high-density lipoprotein cholesterol

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HIGHLIGHTS

- We examined meal preparation and cardiometabolic risk factors in midlife women
- More time spent preparing meals was linked to increasing odds of metabolic syndrome
- Change in meal preparation and cardiometabolic risk factors were positively related
- Associations were observed with four of the five metabolic syndrome components

Table 1Baseline characteristics of 2755^a midlife women in the analytic sample.

	<i>Mean (SD)</i>
Age at baseline, years	45.9 (2.7)
Number of household members at baseline	1.9 (1.3)
Physical activity at baseline ^b (n=2688)	7.7 (1.8)
	<i>n (%)</i>
Study site	
Pittsburgh, PA	402 (14.6)
Detroit area, MI	434 (15.8)
Chicago, IL	382 (13.9)
Oakland, CA	426 (15.5)
Boston, MA	388 (14.1)
Newark, NJ	257 (9.3)
Los Angeles, CA	466 (16.9)
Race/ethnicity	
African-American	756 (27.4)
Non-Hispanic White	1319 (47.9)
Chinese	235 (8.5)
Hispanic	181 (6.6)
Japanese	264 (9.6)
Married or living as married at baseline (n=2732)	1828 (66.9)
Current smoker at baseline (n=2735)	427 (15.6)
Alcohol intake at baseline (n=2636)	
0 drinks per week	1390 (52.7)
>0 to 3 drinks per week	800 (30.4)
>3 drinks per week	446 (16.9)
Higher than high school education	2123 (77.1)
Employment status at baseline (n=2717)	
35 hours/week	1683 (61.9)
<35 hours/week	518 (19.1)
Not employed	516 (19.0)
Difficulty paying for basic necessities	
Not hard at all	1719 (62.4)
Somewhat hard	820 (29.8)
Very hard	216 (7.8)

^aNot all subjects included in analyses provided complete data at baseline. The number of baseline observations per variable is noted when different from 2755.

^bAssessed on 5-point Likert and ordinal scales with total scores ranging from 3–15 and higher score representing more frequent engagement in physical activity.

Note: By design, all women were either premenopausal or early peri-menopausal and were not taking hormone therapy at baseline

Table 2

Unadjusted and adjusted associations between time spent preparing and cleaning up meals and odds of a higher number of metabolic syndrome diagnostic components and odds of meeting criteria for metabolic syndrome based on the presence of three or more diagnostic components in midlife women (N=2755) across 14 years of follow-up.

	Number of metabolic syndrome diagnostic components	Metabolic syndrome status
	OR (95% CI)	OR (95% CI)
<i>Unadjusted model</i>		
Time ^a	1.109 (1.096–1.121)	1.110 (1.088–1.133)
Baseline meal preparation/cleanup time	0.908 (0.822–1.003)	0.883 (0.765–1.020)
Change in meal preparation/cleanup time	0.027 (0.003–0.273)	0.002 (0.000–0.059)
Time * Baseline meal preparation/cleanup time	1.010 (1.003–1.016)	1.014 (1.002–1.025)
Time * Change in meal preparation/cleanup time	1.223 (1.063–1.407)	1.415 (1.098–1.823)
<i>Adjusted model</i>		
Time ^a	1.102 (1.084–1.121)	1.091 (1.060–1.124)
Baseline meal preparation/cleanup time	0.941 (0.854–1.036)	0.952 (0.832–1.090)
Change in meal preparation/cleanup time	0.028 (0.003–0.237)	0.003 (0.000–0.060)
Time * Baseline meal preparation/cleanup time	1.011 (1.004–1.017)	1.014 (1.003–1.026)
Time * Change in meal preparation/cleanup time	1.409 (1.223–1.624)	1.608 (1.245–2.077)
Age	1.159 (1.098–1.224)	1.129 (1.053–1.210)
Number of household members	1.064 (1.002–1.131)	0.991 (0.900–1.093)
Physical activity	0.776 (0.740–0.813)	0.725 (0.671–0.783)
Study site		
Oakland, CA	Reference	Reference
Boston, MA	1.112 (0.566–2.185)	0.906 (0.376–2.182)
Chicago, IL	2.812 (1.414–5.604)	1.825 (0.758–4.395)
Detroit area, MI	3.721 (1.872–7.397)	2.492 (1.050–5.915)
Los Angeles, CA	0.520 (0.245–1.104)	0.218 (0.075–0.631)
Newark, NJ	0.968 (0.337–2.781)	0.354 (0.078–1.602)
Pittsburgh, PA	1.491 (0.765–2.906)	1.038 (0.439–2.457)
Race/ethnicity		
Non-Hispanic White	Reference	Reference
African-American	2.402 (1.630–3.539)	1.358 (0.843–2.190)
Chinese	0.380 (0.182–0.793)	0.256 (0.096–0.687)
Hispanic	2.978 (1.000–8.863)	4.758 (1.042–21.725)
Japanese	0.812 (0.402–1.643)	1.417 (0.509–3.946)
Late peri- or postmenopausal	1.054 (0.731–1.258)	1.151 (0.850–1.560)
Hormone therapy use	0.974 (0.731–1.297)	0.895 (0.550–1.457)
Married or living as married	0.901 (0.732–1.109)	0.741 (0.538–1.021)
Current smoker	1.217 (0.907–1.633)	1.530 (1.010–2.318)
Alcohol intake		

	Number of metabolic syndrome diagnostic components	Metabolic syndrome status
	OR (95% CI)	OR (95% CI)
0 drinks per week	Reference	Reference
>0 to 3 drinks per week	0.721 (0.604–0.860)	0.597 (0.452–0.789)
>3 drinks per week	0.399 (0.307–0.518)	0.231 (0.150–0.354)
Higher than high school education	0.511 (0.353–0.738)	0.590 (0.376–0.926)
Employment status at baseline		
35 hours/week	Reference	Reference
<35 hours/week	1.137 (0.959–1.347)	1.427 (1.072–1.899)
Not employed	1.405 (1.168–1.690)	1.517 (1.120–2.056)
Difficulty paying for basic necessities		
Not hard at all	Reference	Reference
Somewhat hard	1.714 (1.232–2.377)	1.733 (1.148–2.615)
Very hard	1.816 (1.032–3.194)	1.728 (0.868–3.442)

OR (95% CI)=Odds ratio and 95% confidence interval.

^aTime is quantified in years since each woman's baseline assessment.

Table 3

Unadjusted and adjusted associations between time spent preparing and cleaning up food and odds of having each of the five metabolic syndrome diagnostic components (N=2755).

	Impaired fasting glucose		Abdominal obesity		Hypertri-glyceridemia		Low HDL		Hypertension	
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
<i>Unadjusted model</i>										
Time ^a	1.083	(1.063–1.103)	1.295	(1.251–1.341)	1.029	(1.011–1.047)	0.953	(0.929–0.978)	1.266	(1.228–1.304)
Baseline meal preparation/cleanup time	0.945	(0.834–1.071)	0.983	(0.862–1.120)	0.887	(0.794–0.990)	0.883	(0.766–1.018)	1.028	(0.909–1.163)
Change in meal preparation/cleanup time	0.080	(0.004–1.449)	0.069	(0.003–1.454)	0.125	(0.010–1.569)	0.021	(0.001–0.551)	0.021	(0.001–0.381)
Time * Baseline meal preparation/cleanup time	1.012	(1.002–1.023)	0.989	(0.973–1.006)	1.011	(1.001–1.022)	1.008	(0.996–1.020)	1.006	(0.992–1.020)
Time * Change in meal preparation/cleanup time	1.202	(0.951–1.520)	0.879	(0.609–1.269)	1.169	(0.935–1.461)	1.218	(0.944–1.573)	1.290	(0.934–1.782)
<i>Adjusted model ^b</i>										
Time ^a	1.003	(0.957–1.052)	1.220	(1.171–1.271)	1.046	(1.012–1.082)	0.978	(0.945–1.012)	1.255	(1.218–1.293)
Baseline meal preparation/cleanup time	0.955	(0.847–1.076)	1.088	(0.937–1.262)	0.895	(0.787–1.019)	0.927	(0.807–1.064)	1.062	(0.939–1.202)
Change in meal preparation/cleanup time	0.071	(0.005–0.935)	0.065	(0.002–1.747)	0.060	(0.004–1.006)	0.045	(0.002–0.889)	0.014	(0.001–0.217)
Time * Baseline meal preparation/cleanup time	1.016	(1.002–1.030)	0.992	(0.978–1.007)	1.012	(1.002–1.023)	1.010	(0.999–1.022)	1.005	(0.994–1.016)
Time * Change in meal preparation/cleanup time	1.324	(0.982–1.785)	1.080	(0.772–1.512)	1.307	(1.032–1.655)	1.356	(1.105–1.746)	1.415	(1.107–1.808)

HDL= High-density lipoprotein cholesterol; OR (95% CI)=Odds ratio and 95% confidence interval.

^aTime is quantified in years since each woman's baseline assessment.

^b Adjusts for age, household size, physical activity level, study site, ethnicity/race, menopausal status, hormone therapy use, marital status, smoking status, alcohol intake, education, employment status, and financial strain.