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Work Schedule and Adherence to Leisure-Time Physical Activity Recommendations among U.S. Workers: Results from the 2010 National Health Interview Survey Occupational Health Supplement

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Abstract

Work Schedule and Adherence to Leisure-Time Physical Activity Recommendations among U.S. Workers: Results from the 2010 National Health Interview Survey Occupational Health Supplement

By Dara L. Burris

Introduction: As sedentary jobs are getting more common, leisure-time physical activity (LTPA) is becoming increasingly important for preventing disease and promoting health. Both the number of hours worked per week and the type of work shift are thought to affect LTPA; however no studies have examine the relation of overall job schedule (the type of shift and its duration taken together) to LTPA levels.

Methods: Data on work schedule and LTPA of 15,649 workers from the 2010 National Health Interview Survey (NHIS) Occupational Health Supplement (OHS) were analyzed to determine whether workers met the Healthy People 2020 guidelines for aerobic and muscle-strengthening physical activities. The work schedule variable included six categories: 1) a long (≥ 48 hours/week) regular daytime schedule; 2) a typical full-time (40-47 hours/week) regular daytime schedule; 3) a long, irregular schedule; 4) a typical full-time, irregular schedule; 5) a part-time (<40 hours/week) regular schedule; and 6) a part-time, irregular schedule.

Results: Using logistic regression adjusted for demographic variables, we found that men who worked irregular shifts were more likely to meet the LTPA guidelines than men who worked regular, daytime shifts. There was no difference in adherence to LTPA guidelines between men who worked long hours and men who did not. Women who worked long hours (≥48 hours/week) were more likely to meet the LTPA guidelines than women who did not. Type of shift worked was not associated with meeting the LTPA guidelines.

Conclusions: These results suggest that work schedule may be associated with LTPA levels, but the mechanism of the observed association is not clear. In terms of lifestyle and health seeking behaviors people who work long or irregular hours may be systematically different from their counterparts who have regular, daytime work schedules.

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Introduction

Physical activity lowers the risk of premature death and helps prevent a variety of health problems including coronary heart disease, stroke, high blood pressure, adverse lipid profile, type 2 diabetes, metabolic syndrome, and certain cancers. Physical activity also helps in the prevention of weight gain, promotes weight loss, improves cardiorespiratory and muscular fitness, prevents falls, and reduces depression (1).

Total physical activity consists of occupational physical activity (OPA), transport physical activity (TPA), and leisure time physical activity (LTPA). OPA and TPA have decreased over time as jobs and methods of transportation have become more sedentary, increasing the contribution of LTPA to total physical activity. It has been shown that LTPA is associated with a reduced risk of cardiovascular and all-cause mortality among men and women independent of other physical activity types (2).

The Healthy People 2020 physical activity objectives aim to increase the proportion of adults who meet the guidelines for aerobic and muscle-strengthening exercise to 20.1% from the 2008 estimate of 18.2%. The aerobic physical activity guideline is at least 150 minutes/week of moderate intensity activity, or 75 minutes/week of vigorous intensity activity, or an equivalent combination. The muscle-strengthening physical activity guideline is performing muscle-strengthening activities on two or more days of the week (3). Although many Americans do not meet the physical activity guidelines, the CDC has identified this area as a "Winnable Battle," which is a public health priority area where significant progress, particularly with respect to LTPA, can be made with additional effort (4).

A number of personal, interpersonal, environmental, and socio-political factors have been shown to determine the amount and frequency of LTPA (5). An important attribute of a person's

lifestyle and environment is work. Psychosocial and physical working conditions such as skill discretion, decision latitude, job security, and physical work demands have all been shown to influence LTPA (6). One specific work characteristic that may affect LTPA is job schedule, which can be measured in terms of the number and the regularity of work hours. These are important factors to consider because long work hours and shift work are common in the United States. According to the Bureau of Labor Statistics, about 2-10% of employees in almost any occupation worked a non-regular, daytime shift in 1997 (7). According to the 2010 National Health Interview Survey (NHIS), about 29% of U.S. adults worked an alternate shift (8). Working a non-regular schedule is becoming more common. Because of this trend, more research on the health effects of working alternative shifts is needed.

As recently reviewed elsewhere (9), several studies have reported an inverse association of LTPA with number of work hours, overtime work and part-time employment, but the results were not entirely consistent. While the results differ across studies there seems to be a threshold of about 45-50 work hours/week where above this level the inverse association between work hours and LTPA becomes more apparent (9).

There have been few studies that examined whether there is an association between type of shift worked (e.g., night, day, rotating) and LTPA. Among male Italian railway service workers, Barbadoro found no statistically significant difference in self-reported LTPA between daytime workers and rotating shift workers (10). Another recent review of the literature concluded that working a schedule other than a regular daytime shift can have a significant impact on health behaviors, both directly as well as indirectly, through insufficient sleep (11). In a recent study at a chemical plant in Southern France rotating shift workers had higher levels of physical activity, particularly during work time, than day workers (12). Shift work in that study was also independently directly associated with an increased risk of metabolic syndrome (12).

On balance, the literature suggests an inverse association between work hours and LTPA and it appears that work schedule may also influence health status. However, in previous studies, job schedule was always considered separately from total number of work hours. Also, previous studies only included workers in certain industries and occupations, and these studies were often done outside the U.S. This study represents all U.S. workers in every industry and occupation. To our knowledge no previous study examined whether number of hours of work and work schedule jointly influence LTPA. To address this knowledge gap, we analyzed data from a national survey to assess whether working long hours, alone or in combination with not having a regular daytime schedule, may be associated with LTPA levels.

Methods

Data sources and study population

Data from the 2010 National Health Interview Survey (NHIS) were used for this study. The NHIS is a cross-sectional in-person household survey conducted continuously since 1957 by the National Center for Health Statistics (NCHS), Centers for Disease Control and Prevention (CDC). Data are collected on the civilian non-institutionalized population of the United States and exclude persons in correctional or long-term care facilities (e.g., nursing homes). Active-duty Armed Forces personnel (but not their civilian family members), and U.S. nationals living in foreign countries are also excluded. The survey uses a multi-stage clustered sample design, with oversampling of black, Hispanic, and Asian persons, and produces nationally representative data. Data are collected through a personal household interview conducted by trained interviewers. In rare instances when a sampled adult is physically or mentally unable to respond, proxy responses are accepted (<1.5% of sample).

Each year the NHIS includes (1) a core set of questions that change little from year to year and (2) supplemental questions varying from year to year that are concerned with nationally important, timely health issues. Supplements to the 2010 NHIS included occupational health questions.

Survey questions were developed after consultation with content experts and thorough literature reviews. The 2010 National Health Interview Survey (NHIS) was approved by the Research Ethics Review Board of the National Center for Health Statistics (Protocol #2009-16) and the U.S. Office of Management and Budget (Control #0920-0214). Written consent for participation in the 2010 NHIS was not received, but instead all 2010 NHIS respondents provided oral consent prior to participation. For this study, Emory University's Institutional Review Board (IRB) granted an exemption given that the NHIS was previously approved and the data were publicly available with no personally identifying information (Appendix D).

In 2010, NHIS interviews were conducted in 34,329 households accounting for 89,976 persons in 35,177 families. The estimates presented in this paper are based on data collected from 15,649 sample adults who were employed in the week preceding the interview. The household response rate was 79.5%, the conditional sample adult response rate was 77.3% and the final sample adult response rate was 60.8%.

Assessment of LTPA

The survey section on leisure-time physical activity was introduced with the following statement: "The next questions are about physical activities (exercise, sports, physically active hobbies...) that you may do in your LEISURE time." In this section, respondents were asked to summarize their usual leisure-time physical activity –in terms of both frequency and duration. It required some mental calculations by the respondents. Respondents reported their physical activity in terms of the number of episodes over a given unit of time (i.e. per day, week, month, or year).

For each type of activity, responses were recoded into a standardized frequency in times per week. LTPA questions inquired about frequency and duration of light to moderate and vigorous activities, as well as frequency of muscle strengthening activities. Adherence to the LTPA recommendations was defined as meeting the Healthy People 2020 physical activity guidelines of at least 150 minutes/week of moderate intensity activity, or 75 minutes/week of vigorous intensity activity, or an equivalent combination, and performing muscle-strengthening activities on two or more days of the week.

Measures of Work Time and Schedule

All currently employed sample adults were asked what type of shift they worked at their current job. The question stated, "Which of the following best describes the hours you usually work/worked?" Response choices included: (1) regular daytime schedule, (2) regular evening shift, (3) regular night shift, (4) rotating shift, and (5) some other schedule. For this study, work schedule was categorized based on 2 variables from the survey: number of hours worked in the week preceding the interview and the shift usually worked. The resulting work schedule variable included six categories: 1) a long (≥ 48 hours/week) regular daytime schedule; 2) a typical full-time (40-47 hours/week) regular daytime schedule; 3) a long, irregular schedule; 4) a typical full-time, irregular schedule; 5) a part-time (<40 hours/week) regular schedule; and 6) a part-time, irregular schedule.

Covariates of Interest

All covariates of interest were self-reported. Respondents were asked if they were male or female. Respondents were asked if they considered themselves to be Hispanic/Latino. Respondents selected 1 or more of 16 race categories. For this study, race /ethnicity was categorized as non-Hispanic white, non-Hispanic black, non-Hispanic Asian, non-Hispanic other race, or Hispanic. Age was reported in years and for the purposes of this study grouped into 4 categories: 18-29, 30-

44, 45-64, and ≥65. Marital status was reported as married, widowed, divorced, separated, never married, or living with partner. For this study, divorced and separated were combined into 1 category. Participants reported their highest level of education. Education level was categorized as less than HS diploma, HS/GED diploma, some college, and college degree or more. Current smokers were defined as persons who have ever smoked 100 cigarettes and who currently smoke every day or some days. Activity limitation was defined as whether someone had any self-reported activity limitation. Participants were asked about their current height and weight. No physical measurements were taken. Respondents had the option of reporting their height and weight in either U.S. Customary (lbs/oz; ft/in) or metric (kg; m/cm) format. Body mass index (BMI) was calculated as weight in kilograms / (height in meters)^2. The following classification of body weight status, established by the World Health Organization, was used: underweight (BMI < 18.5 kg/m^2); healthy weight (18.5 kg/m^2 ≤ BMI < 25 kg/m^2); overweight (25 kg/m^2 ≤ BMI < 30 kg/m^2); and obese (BMI ≥ 30 kg/m^2).

Information about current or most recent occupation (type of work) was collected in narrative form. To these data, coding experts assigned 4-digit Census occupation codes based on the 2010 Standard Occupational Classification (SOC) system.

Information on OPA for each worker was imputed from occupation-level data obtained from the Occupational Information Network (O*Net). O*Net is a comprehensive database of worker attributes and job characteristics. Data collection methods for O*Net have been described elsewhere (13). Using a job exposure matrix that links self-reported occupation with O*Net codes, OPA for every NHIS occupation category was estimated.

A job exposure matrix was created for five occupational physical activity related variables: performing general physical activities level, performing general physical activities importance, time spent sitting, time spent standing, and time spent walking/running. Each variable is scored

on a scale of 0 to 100 with 100 as the highest level of that variable. For all OPA variables except time spent sitting, a score of 100 means an occupation requires a high level of physical activity. For time spent sitting, since sitting is a sedentary activity, the scale is reversed and scores of 100 mean the occupation requires a low level of physical activity. Performing general physical activities level score indicates to what extent an occupation involves performing physical activities that require considerable use of your arms and legs and moving your whole body. The OPA variable scores were grouped into quartiles. Performing general physical activities level and time spent walking or running were used to represent OPA in the model building.

Data analysis

All analyses were conducted using SAS 9.3 callable SUDAAN Release 11.0 (Research Triangle Institute, Research Triangle Park, NC) to account for the complex sampling design of the NHIS. To represent the U.S. civilian, non-institutionalized population age 18 years and over, and to estimate the total number of employed US civilian workers represented by each individual in the sample, all estimates were weighted using the NHIS sample adult record weight.

Initial descriptive analysis was conducted to identify individuals with incomplete data. Any individuals that were missing information on an independent variable (work schedule, sex, age, race/ethnicity, marital status, education level, current smoker, any functional limitation, body mass index (BMI), performing general physical activities level, or time spent walking/running) were excluded during analyses. The weighted and unweighted prevalences of meeting LTPA recommendations were calculated across various demographic and work-related categories. The weighted prevalences were accompanied by 95% confidence intervals (CI). The final model logistic regression model evaluating the association between work schedule and adherence to LTPA guidelines was constructed in a step-wise fashion. In the initial model, all possible two-way interactions involving the work schedule variable were assessed. Interactions were

eliminated from the model one at a time until all remaining interactions were significant at α=0.01 level. Next in the backward elimination process, covariates were dropped from the model if their exclusion did not change the association of LTPA adherence with work schedule by more than 10% Stratified analysis was done in the presence of a significant interaction. The multivariable analysis results were presented as adjusted prevalence ratios (PR) and the corresponding 95% CI. The initial model was assessed for collinearity and all final models were examined for goodness of fit.

Results

There were 15,649 persons in the study sample used in the descriptive analyses; of those 1,095 (7.0%) were excluded from the initial model and 329 individuals (2.1%) were excluded from the final model due to missing information on at least one of the variables. The distributions of various demographic and job-related characteristics were mostly similar in persons included in the analyses and those excluded due to missing data. (Appendix A). There is an apparent difference in the proportion of females included and excluded in the initial model (50.2% vs. 61.5%). This is because female were more likely to have missing BMI. Over 98% of males reported BMI compared to 95% of females. However, the proportion of females in the final model is similar among the included and excluded observations.

Demographic and Health Characteristics of Sample

As shown in Table 1, which is based on all eligible participants, the sample included 51% females, and the most common age category was 45-64 years (38% of the sample). Most of the participants were non-Hispanic whites (57%) and Hispanics comprised about 20% of the population. Slightly less than half of the study subjects were married (47%). Most participants

had at least some college education (64.2%); approximately 80% were not current smokers and 25% had some kind of activity limitation. Most survey responders were overweight or obese (62%).

Descriptive Analysis by Demographic and Health Characteristics

About 22% of all study participants met the LTPA recommendations. Males were more likely to meet the physical activity recommendations (27.0%) compared to females (18.8%). Prevalence of meeting physical activity recommendations decreased as age increased. Meeting LTPA recommendations was most common among non-Hispanics who self-identified as "other race" and was least common among Asians. Hispanics (17.2%) were less likely than non-Hispanics (18.6%-27.2%) to meet the LTPA guidelines. Those that were never married and those that were widowed were most and least likely to meet the LTPA recommendations, respectively. Prevalence of meeting LTPA recommendations increased with increasing level of education. Other factors associated with lower adherence to LTPA guidelines included self-reported activity limitations and obesity (Table 1).

Descriptive Analysis by Work Characteristics

Working a regular evening shift was associated with lower average number of hours worked per week compared to working a regular daytime schedule or working some other irregular schedule (Table 2). As shown in Table 3, there were no significant differences in meeting LTPA recommendations among those who worked different shifts. Those who worked regular, daytime schedules were about as likely to meet the LTPA recommendations as those who worked an irregular schedule. The number of hours worked in the previous week was directly related to the likelihood of meeting LTPA recommendations. Those who worked 48 or more hours per week were most likely to meet the LTPA recommendations. The prevalence of meeting LTPA recommendation was slightly lower among persons working part-time. Among part-time workers,

those who worked an irregular schedule were more likely to adhere to LTPA guidelines. However, among full-time workers, percentages of workers meeting LTPA recommendations did not vary by work shift. For all OPA variables, as the level of OPA increased, adherence to LTPA recommendations decreased.

Descriptive Analysis Results by Occupation

As shown in Table 4, prevalence of meeting LTPA guidelines varied by occupation. Among the occupations with the lowest prevalence were farming, fishing, and forestry (7.7%), maintenance (13.6%), and production (13.6%). Art, design, entertainment, sports, and media (36.5%), and computer and mathematical (36.2%) occupations were among the occupations with the highest prevalence of adherence to the LTPA guidelines.

Multivariable Analysis Results

In the multivariable analyses after elimination of non-significant interaction terms and covariates that did not affect the results the final model was adjusted for sex, age, and education level. Because of the significant interaction between sex and work schedule, all results are presented separately for men and women. Both final sex-specific models demonstrated good fit. The Hosmer-Lemeshow Satterthwaite F test statistics of 1.07 (p-value=0.39) for men and 0.43 (p-value=0.91) for women.

The results of the multivariable logistic regression models stratified on gender are presented in Table 5. Using men who have full-time (40-47 hours/week) day job as the reference category, men with irregular schedule had greater adherence to the LTPA guidelines; this association was statistically significant for those with long and irregular works hours (PR=1.18; 95% CI; 1.03-1.35) and for those who had part time jobs with irregular shifts (PR= 1.21; 95% CI; 1.04-1.40), but not for those who had irregular full-time jobs (PR=1.11; 95% CI; 0.97-1.28). The corresponding analyses among women, demonstrated greater adherence to the LTPA guidelines

associated with working long hours. This association was statistically significant for women who worked long regular day time shifts (PR=1.25; 95% CI; 1.06-1.47) as well as those who had long hours with irregular schedules (PR=1.34; 95% CI; 1.03-1.75). In both men and women LTPA guideline adherence was also significantly and inversely associated with age and education (Table 5). The PR estimates in the final analysis (Table 5) were similar to those obtained in the initial model (Appendix B).

Discussion

The results observed in this study appear counterintuitive. Working long hours may not allow for enough time off to achieve adequate LTPA levels (14). Also irregular, non-daytime schedule may prohibit participation in organized physical activities which normally occur when others are off work. Based on this, we would expect to see the lowest levels of LTPA in those who work long, full-time, irregular shifts. In this study, we found quite the opposite: men working an irregular schedule had a greater adherence to LTPA guidelines whereas women were more likely to meet the LTPA recommendations if they worked long hours.

A number of previous studies examined whether LTPA varies by number of hours worked. The literature on LTPA and work hours is extensive with multiple studies conducted in the U.S. and Europe; however, only 14 of these studies specifically looked for interaction between work hours and gender. Five of these studies found gender differences in the association between work hours and LTPA (15-19). Among men, seven studies found an inverse association between number of hours worked and LTPA levels (15-17, 20-23). Two studies found a positive association (18, 19), and three studies, in keeping with our findings, reported null results (24-26). Among women, five studies found an inverse association between work hours and LTPA levels (20-23, 27). Nine

studies did not find an association among women (15-19, 24-26, 28). There were no studies that found higher LTPA levels among women who work more hours.

Relatively few studies evaluated the association between work shift and LTPA, and only one of those was conducted in the U.S (29). Four of these studies observed that working an alternative shift was not associated with LTPA (12, 29-31). One study found that LTPA levels were lower in alternative shift workers (23), and two studies reported that LTPA levels were higher in workers who worked a non-regular daytime shift (10, 32). The results from the literature are decidedly mixed with no clear pattern. There are few studies representing all U.S. workers, especially recently as the relevant studies using nationally representative data were done in the 1990's (16, 25, 33). Strengths of this study include the number of covariates considered and the inclusion of workers across multiple occupations within various industries. Multiple demographic and health characteristics were considered as potential confounders. The complex sample design of the survey allows for generalization of the findings to the entire U.S. working population. With respect to data analysis methods, the distinguishing features of this study include a systematic assessment of interaction and the ability to assess the joint effects of work hours and shift type. Unlike many previous studies, we adjusted for OPA; however, OPA values were estimated at the occupational category level rather than from individual workers. This limitation may explain why OPA was not a significant predictor of LTPA in the final model.

A notable limitation of this study is the inability to consider each possible type of irregular schedule. Irregular work schedules represent a diverse category with important differences in terms of shift duration, pattern (e.g. continuous vs. on-call), and time between shifts. All of these factors may influence health behaviors and may need to be considered. Another limitation of this study is its cross-sectional design which does not allow for assessment of temporality. It is possible that some workers self-select their work schedule. Those who cannot tolerate long hours and irregular shifts may be the ones who are less likely to exercise. Moreover it is possible that

persons who make it a priority to engage in regular LTPA are the ones who are less affected by more strenuous work schedules. In addition to the issue of possible self-selection (survival on the job), it is also important to consider the effects of misclassification. Both work schedule and LTPA levels were self-reported. This methodological feature of the current study raises concerns about information bias due to inaccurate reporting and perhaps incomplete recall.

Another limitation of this study is the definition of LTPA guideline adherence. It was defined as meeting the Healthy People 2020 recommendations. Results may differ if muscle-strengthening physical activities are considered separately from aerobic exercise. Knowing the stresses of work schedule is important for developing productive and healthy work schedules. Lack of time is reported as the major barrier to physical activity (14). Contrary to our initial hypothesis irregular work schedule and long hours did not seem to be associated with less LPTA in the present study. In fact the associations were in the opposite direction. It appears that people whose work requires long or irregular hours may be systematically different from their counterparts who have regular full-time day jobs. These differences may reflect important lifestyle characteristics and health seeking behaviors that could not be considered in this study. Moreover, the inter-relation of the unaccounted for factors with variables already considered in the present study may be complex and may not be adequately examined in a cross-sectional design with the use of traditional logistic regression models. To permit more definitive conclusions, future studies may have to involve longitudinal data collection, administer in-depth surveys, and employ more complex statistical techniques such as structural equation models or path analyses.

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Tables

Table 1. Prevalence of Meeting LTPA[1] Recommendations among currently employed US adults by demographic characteristics and health status and behaviors: 2010 National Health Interview Survey (n=15,649)

Characteristic	Unweighted Sample Size	%	Unweighted % Meeting LTPA Recommendations	Weighted % Meeting LTPA Recommendations	95% CI[2] of Weighted % Meeting LTPA Recommendations
Total	15,649	100.0	22.4	23.2	22.2, 24.1
Demographic Characteristics					
Sex					
Male	7,666	49.0	26.8	27	25.7, 28.4
Female	7,983	51.0	18.2	18.8	17.7, 20.0
Age (years)					
18-29	3,426	21.9	28.0	28.3	26.3, 30.3
30-44	5,485	35.1	24.1	24.4	23.1, 25.8
45-64	5,947	38.0	18.8	19.9	18.5, 21.4
≥65	791	5.1	13.9	14.5	11.7, 17.3
Race/ethnicity					
Non-Hispanic white	8,978	57.4	25.6	25.1	23.9, 26.2
Non-Hispanic black	2,266	14.5	18.7	20.3	18.0, 22.6
Non-Hispanic Asian	1,029	6.6	17.9	18.6	15.4, 21.7
Non-Hispanic other race	302	1.9	29.8	27.2	22.1, 32.3
Hispanic	3,074	19.6	16.6	17.2	15.4, 19.0
Marital Status					
Married	7,376	47.1	20.8	21.9	20.6, 23.2
Widowed	433	2.8	14.3	13.2	9.6, 16.9
Divorced or separated	2,697	17.2	20.4	20.8	19.2, 22.5

Never married	4,040	25.8	27.9	28.9	26.9, 31.0
Living with partner	1,076	6.9	20.9	21.6	18.7, 24.5
Education					
Less than HS diploma	1,785	11.4	9.4	10.3	8.5, 12.1
HS/GED diploma	3,784	24.2	15.0	14.8	13.4, 16.2
Some college	4,876	31.2	22.9	23.3	21.6, 24.9
College degree or more	5,161	33.0	32.0	32.8	31.2, 34.4
Health Status and Behaviors					
Current Smoker					
Yes	2,974	19.0	18.0	18.1	16.5, 19.8
No	12,581	80.4	23.6	24.5	23.4, 25.6
Activity Limitation					
Limited in any way	3,878	24.8	15.8	16.4	14.8, 18.0
Not limited in any way	11,731	75.0	24.7	25.5	24.4, 26.6
Body Mass Index (BMI)					
Underweight	122	0.8	12.3	12.2	5.2, 19.1
Healthy Weight	5,359	34.2	26.5	26.8	25.3, 28.4
Overweight	5,485	35.1	24.7	25.9	24.4, 27.5
Obese	4,155	26.6	16.2	16.8	15.4, 18.3

[1] Leisure-time physical activity

[2] Confidence interval

Table 2. Number of hours worked per week by shift among US adults: 2010 National Health Interview Survey (n=15,649)

			Number of Hours Worked Per Week			
Work Shift[1]	Unweighted Sample Size[2]	%	Mean	Median	Quartile 1	Quartile 3
Regular daytime schedule	11,192	71.5	39.7	40.0	38.0	43.0
Regular evening shift	784	5.0	35.1	35.1	25.0	40.0
Regular night shift	579	3.7	39.1	40.0	35.0	40.0
Rotating shift	1,425	9.1	38.2	40.0	30.0	44.0
Some other schedule	1,360	8.7	37.1	40.0	20.0	50.0

[1]# of observations missing work shift= 24

[2]# of observations missing work hours per week= 285

Table 3. Prevalence of Meeting LTPA[1] Recommendations among US adults by work schedule and occupational physical activity: 2010 National Health Interview Survey (n=15,649)

Characteristic	Unweighted Sample Size	%	Unweighted % Meeting LTPA Recommendations	Weighted % Meeting LTPA Recommendations	95% CI[2] of Weighted % Meeting LTPA Recommendations
Work Shift					
Regular daytime schedule	11336	72.4	22.2	22.8	21.8, 23.8
Regular evening shift	795	5.1	22.3	24.2	20.5, 27.9
Regular night shift	589	3.8	20.4	20.1	16.2, 24.0
Rotating shift	1462	9.3	23.3	24.6	21.7, 27.6
Some other schedule	1443	9.2	24.6	25.2	22.2, 28.2
Work Hours Per Week					
≤20	1754	11.2	20.5	21.7	19.1, 24.3
21-39	3000	19.2	18.8	19.2	17.3, 21.0
40	6559	41.9	22.0	22.9	21.6, 24.1
41-47	1066	6.8	23.9	23.1	19.9, 26.3
≥48	2979	19.0	27.8	28.3	26.4, 30.1
Work Schedule					
Full-time, regular schedule	6188	39.5	22.4	23.0	21.7, 24.2
Long, full-time, regular schedule	2106	13.5	27.5	28.0	25.6, 30.3
Full-time, irregular schedule	1430	9.1	21.7	22.9	20.1, 25.6
Long, full-time, irregular schedule	889	5.7	28.2	28.6	25.0, 32.2
Part-time, regular schedule	2916	18.6	17.7	18.2	16.4, 20.1
Part-time, irregular schedule	1829	11.7	22.2	22.9	20.2, 25.6
Occupational Physical Activity Performing General Physical Activities Level					
Q[3]1 (score: 0-28)	3740	23.9	26.2	27.4	25.5, 29.2

Q2 (score: 28-39.9)	3995	25.5	25.2	26.2	24.5, 28.0
Q3 (score: 39.9-54)	3831	24.5	21.0	22.2	20.5, 23.9
Q4 (score: ≥54)	3813	24.4	17.6	17.2	15.6, 18.7
Performing General Physical Activities Importance					
Q1 (score: 0-26.8)	3795	24.3	27.3	28.6	26.8, 30.4
Q2 (score: 26.8-51.6)	3509	22.4	25.2	25.8	24.0, 27.7
Q3 (score: 51.6-64.7)	4243	27.1	20.9	22.0	20.3, 23.6
Q4 (score: ≥64.7)	3832	24.5	17.2	17.0	15.5, 18.5
Time Spent Sitting					
Q1 (score: ≥71.8)	4022	25.7	26.5	27.7	25.9, 29.4
Q2 (score: 41.5-71.8)	4013	25.6	26.0	25.8	23.9, 27.6
Q3 (score: 24.5-41.5)	3689	23.6	20.3	21.4	19.7, 23.1
Q4 (score: 0-24.5)	3655	23.4	16.5	17.7	16.1, 19.3
Time Spent Standing					
Q1 (score: 0-32.9)	3814	24.4	26.3	27.5	25.7, 29.3
Q2 (score: 32.9-56.9)	3649	23.3	25.4	25.4	23.5, 27.3
Q3 (score: 56.9-78.8)	3954	25.3	22.2	22.8	21.1, 24.5
Q4 (score: ≥78.8)	3962	25.3	16.6	17.8	16.2, 19.3
Time Spent Walking/Running					
Q1 (score: 0-24.3)	3669	23.4	27.2	28.6	26.7, 30.4
Q2 (score: 24.3-45.6)	4078	26.1	25.2	25.3	23.6, 27.0
Q3 (score: 45.6-58.9)	3555	22.7	21.2	21.1	19.4, 22.9
Q4 (score: ≥58.9)	4077	26.1	16.7	18.3	16.8, 19.8

[1]Leisure-time physical activity

[2]Confidence interval

[3]Quartile

Table 4. Prevalence of Meeting LTPA Recommendations among US adults by occupation grouping: 2010 National Health Interview Survey (n=15,649)

Occupation	Unweighted Sample Size	%	Unweighted % Meeting LTPA[1] Recommendations	Weighted % Meeting LTPA[1] Recommendations	95% CI[2] of Weighted % Meeting LTPA[1] Recommendations
Architecture and Engineering	277	1.8	27.4	26.9	20.9, 32.8
Art, Design, Entertainment, Sports, and Media	335	2.1	34.6	36.5	30.6, 42.4
Building and Ground Cleaning and Maintenance	681	4.4	12.8	13.6	10.4, 16.7
Business and Financial Operations	743	4.7	29.6	29.8	25.3, 34.2
Community and Social Service	308	2.0	25.3	26.2	20.8, 31.5
Computer and Mathematical	446	2.9	32.1	36.2	30.5, 41.9
Construction and Extraction	771	4.9	16.6	17.6	14.3, 20.9
Education, Training, and Library	998	6.4	26.2	26.5	23.0, 30.0
Farming, Fishing, and Forestry	107	0.7	7.5	7.7	1.8, 13.5
Food Preparation and Serving Related	849	5.4	17.7	21.0	17.2, 24.8
Healthcare Practitioners and Technical	810	5.2	28.0	28.1	24.4, 31.8
Healthcare Support	432	2.8	21.1	22.5	17.5, 27.5
Installation, Maintenance, and Repair	515	3.3	19.4	17.0	13.3, 20.8
Legal	186	1.2	33.3	35.3	27.6, 43.0
Life, Physical, and Social Science	169	1.1	30.8	32.8	25.5, 40.1
Management	1,393	8.9	29.2	29.5	26.8, 32.3
Military Specific	19	0.1	52.6	55.3	30.6, 80.0
Office and Administrative Support	2,109	13.5	19.1	19.0	17.1, 20.8
Personal Care and Service	595	3.8	19.7	20.5	16.6, 24.5
Production	922	5.9	13.6	13.6	10.7, 16.4
Protective Service	329	2.1	35.9	35.2	29.6, 40.9

Sales and Related	**1,530**	**9.8**	**22.0**	**24.2**	**21.6, 26.8**
Transportation and Material Moving	**874**	**5.6**	**18.1**	**17.0**	**13.7, 20.3**

[1]Leisure-time physical activity

[2]Confidence interval

Table 5. Multivariable logistic regression analyses of the association between work schedule and meeting LTPA recommendations among adult men and women in the US: 2010 National Health Interview Survey

Characteristics of study participants	Men (n=7,514)		Women (n=7,806)	
	PR	95% CI	PR	95% CI
Work Schedule				
Full-time, regular schedule	1.0	reference	1.0	reference
Long, full-time, regular schedule	1.09	0.98, 1.23	1.25	1.06, 1.47
Full-time, irregular schedule	1.11	0.97, 1.28	0.86	0.68, 1.10
Long, full-time, irregular schedule	1.18	1.03, 1.35	1.34	1.03, 1.75
Part-time, regular schedule	0.88	0.74, 1.04	0.96	0.83, 1.11
Part-time, irregular schedule	1.21	1.04, 1.40	0.93	0.77, 1.13
Age (years)				
18-29	1.0	reference	1.0	reference
30-44	0.74	0.67, 0.82	0.89	0.78, 1.03
45-64	0.59	0.53, 0.66	0.80	0.70, 0.93
≥65	0.43	0.33, 0.55	0.60	0.46, 0.83
Education Level				
College degree or more	1.0	reference	1.0	reference
Some college	0.65	0.58, 0.72	0.74	0.65, 0.85
HS/GED diploma	0.43	0.38, 0.49	0.44	0.37, 0.52
Less than HS diploma	0.33	0.27, 0.41	0.25	0.17, 0.36

Appendices

Appendix A: Comparison of Included and Excluded Observations

Appendix A. Distribution of demographic, health, and occupational characteristics between included and excluded persons in the initial and final models: 2010 National Health Interview Survey

	Initial Model[1]		Final Model[2]	
	Unweighted % of Included Observations (n=14,554)	Unweighted % of Excluded Observations (n=1,095)	Unweighted % of Included Observations (n=15,320)	Unweighted % of Excluded Observations (n=329)
Demographic Characteristics				
Sex				
Male	49.8	38.5	49.0	46.2
Female	50.2	61.5	51.0	53.8
Age (years)				
18-29	22.2	17.5	21.8	24.3
30-44	35.2	32.3	35.2	29.2
45-64	37.6	44.0	38.0	37.1
≥65	5.0	6.1	5.0	9.4
Race/ethnicity				
Non-Hispanic white	57.7	52.5	57.5	52.9
Non-Hispanic black	14.2	17.5	14.4	18.2
Non-Hispanic Asian	6.6	6.1	6.6	5.8
Non-Hispanic other race	1.9	2.1	1.9	2.1
Hispanic	19.5	21.7	19.6	21.0
Marital Status				
Married	47.2	47.6	47.2	46.6
Widowed	2.8	2.7	2.8	3.1

Divorced or separated	17.2	18.6	17.4	11.7
Never married	25.9	25.2	25.8	29.8
Living with partner	7.0	5.9	6.8	8.9
Education				
Less than HS diploma	11.3	13.1	11.4	14.7
HS/GED diploma	24.1	26.2	24.1	29.4
Some college	31.3	31.0	31.3	29.7
College degree or more	33.3	29.7	33.2	26.2
Health Characteristics				
Current Smoker				
Yes	19.3	16.8	19.1	18.9
No	80.7	83.2	80.9	81.1
Activity Limitation				
Limited in any way	24.9	24.3	24.7	29.6
Not limited in any way	75.1	75.7	75.3	70.4
Body Mass Index (BMI)				
Underweight	0.8	0.2	0.8	0.0
Healthy Weight	35.3	39.5	35.4	38.9
Overweight	36.2	37.4	36.3	34.0
Obese	27.7	22.9	27.5	27.1
Work Schedule				
Full-time, regular schedule	40.1	44.4	40.3	31.6
Long, full-time, regular schedule	13.8	11.8	13.7	10.5
Full-time, irregular schedule	9.2	11.0	9.3	13.2
Long, full-time, irregular schedule	5.8	5.1	5.8	2.6
Part-time, regular schedule	18.9	20.1	19.0	23.7
Part-time, irregular schedule	12.2	7.6	11.9	18.4
Work Shift				

Regular daytime schedule	72.8	69.3	73.0	52.3
Regular evening shift	5.2	4.0	5.1	4.6
Regular night shift	3.8	3.8	3.8	3.1
Rotating shift	9.4	9.3	9.3	13.0
Some other schedule	8.9	13.6	8.9	26.9
Hours Worked Per Week				
≤20	11.4	11.0	11.4	10.5
21-39	19.6	17.4	19.5	31.6
40	42.3	49.8	42.7	44.7
41-47	7.0	6.0	7.0	0.0
≥48	19.6	15.9	19.4	13.2
Occupational Physical Activity				
Performing General Physical Activities Level				
Q[3]1 (score: 0-28)	24.2	25.4	24.4	18.3
Q2 (score: 28-39.9)	26.1	24.2	26.0	23.4
Q3 (score: 39.9-54)	24.9	24.4	25.0	22.4
Q4 (score: ≥54)	24.7	25.9	24.6	35.9
Performing General Physical Activities Importance				
Q1 (score: 0-26.8)	24.7	23.8	24.8	16.7
Q2 (score: 26.8-51.6)	22.8	23.9	22.8	22.8
Q3 (score: 51.6-64.7)	27.8	24.6	27.7	22.8
Q4 (score: ≥64.7)	24.8	27.8	24.6	37.8
Time Spent Sitting				
Q1 (score: ≥71.8)	26.2	26.2	26.3	18.6
Q2 (score: 41.5-71.8)	26.1	25.8	26.1	25.3
Q3 (score: 24.5-41.5)	23.8	26.8	23.9	29.2
Q4 (score: 0-24.5)	23.9	21.2	23.7	26.9

Time Spent Standing				
Q1 (score: 0-32.9)	24.8	24.2	25.0	17.0
Q2 (score: 32.9-56.9)	23.7	24.8	23.7	25.0
Q3 (score: 56.9-78.8)	25.6	26.8	25.7	28.2
Q4 (score: ≥78.8)	25.9	24.1	25.7	29.8
Time Spent Walking/Running				
Q1 (score: 0-24.3)	23.9	23.6	24.0	18.9
Q2 (score: 24.3-45.6)	26.4	28.1	26.5	26.0
Q3 (score: 45.6-58.9)	23.1	23.4	23.1	24.0
Q4 (score: ≥58.9)	26.6	24.8	26.4	31.1

[1]Stratified on sex; each adjusted for age, race/ethnicity, marital status, education level, smoking status, activity limitation, body mass index, performing general physical activities level, and time spent walking/running

[2]Stratified on sex; adjusted for age and education level

Appendix B: Initial Model Results

Initial logistic regression[1] of meeting LTPA[2] recommendations results for men and women: 2010 National Health Interview Survey

Characteristic	PR[3]	95% CI of PR[2]	DF[3]	P-value[5]
Men				
Work Schedule				
Full-time, regular schedule	Ref		5	0.0354
Long, full-time, regular schedule	1.07	0.95, 1.21		
Full-time, irregular schedule	1.11	0.97, 1.28		
Long, full-time, irregular schedule	1.13	0.99, 1.30		
Part-time, regular schedule	0.87	0.74, 1.03		
Part-time, irregular schedule	1.13	0.97, 1.32		
Women				
Work Schedule			5	0.0017
Full-time, regular schedule	Ref			
Long, full-time, regular schedule	1.26	1.07, 1.49		
Full-time, irregular schedule	0.98	0.77, 1.23		
Long, full-time, irregular schedule	1.48	1.14, 1.92		
Part-time, regular schedule	0.95	0.82, 1.10		
Part-time, irregular schedule	0.91	0.75, 1.11		

[1]Stratified on sex; each adjusted for age, race/ethnicity, marital status, education level, smoking status, activity limitation, body mass index, performing physical activities level on the job, and time spent walking/running on the job

[2]Leisure-time physical activity

[3]Prevalence ratio

[4]Degrees of freedom

[5]Wald test

Appendix C: SAS/SUDAAN Modeling Code

```
*************************************************
Modeling
*************************************************;

*Initial Model with all variables and interactions;
proc rlogist data=thesis.thesis_final2 design=wr;
nest strat_p psu_p / missunit;
weight wtfa_sa;
subpopn indicator=1;
class wrktype sex age4grp race marrd educ_all_4l
smoker fla1ar bmi4c perform_lvl_q time_walkrun_q;
reflevel age4grp=1 marrd=1 bmi4c=2;
model pameet= wrktype sex age4grp race marrd educ_all_4l
smoker fla1ar bmi4c perform_lvl_q time_walkrun_q wrktype*sex
wrktype*age4grp wrktype*race wrktype*marrd wrktype*educ_all_4l
wrktype*smoker wrktype*fla1ar wrktype*bmi4c wrktype*perform_lvl_q
wrktype*time_walkrun_q;
predmarg wrktype(6)/adjrr;
run;

*Dropped least significant interaction term (wrktype*bmi4c);
proc rlogist data=thesis.thesis_final2 design=wr;
nest strat_p psu_p / missunit;
weight wtfa_sa;
subpopn indicator=1;
class wrktype sex age4grp race marrd educ_all_4l
smoker fla1ar bmi4c perform_lvl_q time_walkrun_q;
reflevel age4grp=1 marrd=1 bmi4c=2;
model pameet= wrktype sex age4grp race marrd educ_all_4l
smoker fla1ar bmi4c perform_lvl_q time_walkrun_q wrktype*sex
wrktype*age4grp wrktype*race wrktype*marrd wrktype*educ_all_4l
wrktype*smoker wrktype*fla1ar wrktype*perform_lvl_q
wrktype*time_walkrun_q;
predmarg wrktype(6)/adjrr;
run;

*Dropped least significant interaction (wrktype*fla1ar);
proc rlogist data=thesis.thesis_final2 design=wr;
nest strat_p psu_p / missunit;
weight wtfa_sa;
subpopn indicator=1;
class wrktype sex age4grp race marrd educ_all_4l
smoker fla1ar bmi4c perform_lvl_q time_walkrun_q;
reflevel age4grp=1 marrd=1 bmi4c=2;
model pameet= wrktype sex age4grp race marrd educ_all_4l
smoker fla1ar bmi4c perform_lvl_q time_walkrun_q wrktype*sex
wrktype*age4grp wrktype*race wrktype*marrd wrktype*educ_all_4l
wrktype*smoker wrktype*perform_lvl_q
wrktype*time_walkrun_q;
predmarg wrktype(6)/adjrr;
run;
```

```
*Dropped least significant interaction (wrktype*educ_all_41);
proc rlogist data=thesis.thesis_final2 design=wr;
nest strat_p psu_p / missunit;
weight wtfa_sa;
subpopn indicator=1;
class wrktype sex age4grp race marrd educ_all_4l
smoker fla1ar bmi4c perform_lvl_q time_walkrun_q;
reflevel age4grp=1 marrd=1 bmi4c=2;
model pameet= wrktype sex age4grp race marrd educ_all_4l
smoker fla1ar bmi4c perform_lvl_q time_walkrun_q wrktype*sex
wrktype*age4grp wrktype*race wrktype*marrd
wrktype*smoker wrktype*perform_lvl_q
wrktype*time_walkrun_q;
predmarg wrktype(6)/adjrr;
run;

*Dropped least significant interaction (wrktype*age4grp);
proc rlogist data=thesis.thesis_final2 design=wr;
nest strat_p psu_p / missunit;
weight wtfa_sa;
subpopn indicator=1;
class wrktype sex age4grp race marrd educ_all_4l
smoker fla1ar bmi4c perform_lvl_q time_walkrun_q;
reflevel age4grp=1 marrd=1 bmi4c=2;
model pameet= wrktype sex age4grp race marrd educ_all_4l
smoker fla1ar bmi4c perform_lvl_q time_walkrun_q
wrktype*sex wrktype*race wrktype*marrd
wrktype*smoker wrktype*perform_lvl_q
wrktype*time_walkrun_q;
predmarg wrktype(6)/adjrr;
run;

*Dropped least significant interaction (wrktype*race);
proc rlogist data=thesis.thesis_final2 design=wr;
nest strat_p psu_p / missunit;
weight wtfa_sa;
subpopn indicator=1;
class wrktype sex age4grp race marrd educ_all_4l
smoker fla1ar bmi4c perform_lvl_q time_walkrun_q;
reflevel age4grp=1 marrd=1 bmi4c=2;
model pameet= wrktype sex age4grp race marrd educ_all_4l
smoker fla1ar bmi4c perform_lvl_q time_walkrun_q
wrktype*sex wrktype*marrd
wrktype*smoker wrktype*perform_lvl_q
wrktype*time_walkrun_q;
predmarg wrktype(6)/adjrr;
run;

*Dropped least significant interaction (wrktype*time_walkrun_q);
proc rlogist data=thesis.thesis_final2 design=wr;
nest strat_p psu_p / missunit;
weight wtfa_sa;
subpopn indicator=1;
class wrktype sex age4grp race marrd educ_all_4l
smoker fla1ar bmi4c perform_lvl_q time_walkrun_q;
reflevel age4grp=1 marrd=1 bmi4c=2;
model pameet= wrktype sex age4grp race marrd educ_all_4l
```

```
smoker fla1ar bmi4c perform_lvl_q time_walkrun_q
wrktype*sex wrktype*marrd
wrktype*smoker wrktype*perform_lvl_q;
predmarg wrktype(6)/adjrr;
run;

*Dropped least significant interaction (wrktype*perform_lvl_q);
proc rlogist data=thesis.thesis_final2 design=wr;
nest strat_p psu_p / missunit;
weight wtfa_sa;
subpopn indicator=1;
class wrktype sex age4grp race marrd educ_all_4l
smoker fla1ar bmi4c perform_lvl_q time_walkrun_q;
reflevel age4grp=1 marrd=1 bmi4c=2;
model pameet= wrktype sex age4grp race marrd educ_all_4l
smoker fla1ar bmi4c perform_lvl_q time_walkrun_q
wrktype*sex wrktype*marrd
wrktype*smoker;
predmarg wrktype(6)/adjrr;
run;

*Dropped least significant interaction (wrktype*marrd);
proc rlogist data=thesis.thesis_final2 design=wr;
nest strat_p psu_p / missunit;
weight wtfa_sa;
subpopn indicator=1;
class wrktype sex age4grp race marrd educ_all_4l
smoker fla1ar bmi4c perform_lvl_q time_walkrun_q;
reflevel age4grp=1 marrd=1 bmi4c=2;
model pameet= wrktype sex age4grp race marrd educ_all_4l
smoker fla1ar bmi4c perform_lvl_q time_walkrun_q
wrktype*sex wrktype*smoker;
predmarg wrktype(6)/adjrr;
run;

*Dropped last insignificant interaction (wrktype*smoker);
proc rlogist data=thesis.thesis_final2 design=wr;
nest strat_p psu_p / missunit;
weight wtfa_sa;
subpopn indicator=1;
class wrktype sex age4grp race marrd educ_all_4l
smoker fla1ar bmi4c perform_lvl_q time_walkrun_q;
reflevel age4grp=1 marrd=1 bmi4c=2;
model pameet= wrktype sex age4grp race marrd educ_all_4l
smoker fla1ar bmi4c perform_lvl_q time_walkrun_q
wrktype*sex;
predmarg wrktype(6)/adjrr;
run;

*Dropped non-significant covariate of interest (time_walkrun_q);
proc rlogist data=thesis.thesis_final2 design=wr;
nest strat_p psu_p / missunit;
weight wtfa_sa;
subpopn indicator=1;
class wrktype sex age4grp race marrd educ_all_4l
smoker fla1ar bmi4c perform_lvl_q;
reflevel age4grp=1 marrd=1 bmi4c=2;
```

```
model pameet= wrktype sex age4grp race marrd educ_all_4l
smoker fla1ar bmi4c perform_lvl_q wrktype*sex;
predmarg wrktype(6)/adjrr;
run;

*Dropped marrd;
proc rlogist data=thesis.thesis_final2 design=wr;
nest strat_p psu_p / missunit;
weight wtfa_sa;
subpopn indicator=1;
class wrktype sex age4grp race marrd educ_all_4l
smoker fla1ar bmi4c perform_lvl_q;
reflevel age4grp=1 bmi4c=2;
model pameet= wrktype sex age4grp race educ_all_4l
smoker fla1ar bmi4c perform_lvl_q wrktype*sex;
predmarg wrktype(6)/adjrr;
run;

*Dropped perform_lvl_q;
proc rlogist data=thesis.thesis_final2 design=wr;
nest strat_p psu_p / missunit;
weight wtfa_sa;
subpopn indicator=1;
class wrktype sex age4grp race marrd educ_all_4l
smoker fla1ar bmi4c;
reflevel age4grp=1 bmi4c=2;
model pameet= wrktype sex age4grp race educ_all_4l
smoker fla1ar bmi4c wrktype*sex;
predmarg wrktype(6)/adjrr;
run;

*Dropped race;
proc rlogist data=thesis.thesis_final2 design=wr;
nest strat_p psu_p / missunit;
weight wtfa_sa;
subpopn indicator=1;
class wrktype sex age4grp marrd educ_all_4l
smoker fla1ar bmi4c;
reflevel age4grp=1 bmi4c=2;
model pameet= wrktype sex age4grp educ_all_4l
smoker fla1ar bmi4c wrktype*sex;
predmarg wrktype(6)/adjrr;
run;


*Dropped smoker;
proc rlogist data=thesis.thesis_final2 design=wr;
nest strat_p psu_p / missunit;
weight wtfa_sa;
subpopn indicator=1;
class wrktype sex age4grp educ_all_4l
fla1ar bmi4c;
reflevel age4grp=1 bmi4c=2;
model pameet= wrktype sex age4grp educ_all_4l
fla1ar bmi4c wrktype*sex;
predmarg wrktype(6)/adjrr;
run;
```

```
*Dropped fla1ar;
proc rlogist data=thesis.thesis_final2 design=wr;
nest strat_p psu_p / missunit;
weight wtfa_sa;
subpopn indicator=1;
class wrktype sex age4grp educ_all_4l bmi4c;
reflevel age4grp=1 bmi4c=2;
model pameet= wrktype sex age4grp educ_all_4l
bmi4c wrktype*sex;
predmarg wrktype(6)/adjrr;
run;

*Dropped bmi4c -this is the final model since age4grp
cannot be dropped;
proc rlogist data=thesis.thesis_final2 design=wr;
nest strat_p psu_p / missunit;
weight wtfa_sa;
subpopn indicator=1;
class wrktype sex age4grp educ_all_4l;
model pameet= wrktype sex age4grp educ_all_4l
wrktype*sex;
predmarg wrktype(6) sex age4grp(1) educ_all_4l wrktype(6)*sex/adjrr;
run;

**********************************************
Running separate models for males and females
**********************************************;

*Males;
proc rlogist data=thesis.thesis_final2 design=wr;
nest strat_p psu_p / missunit;
weight wtfa_sa;
subpopn indicator_m=1;
class wrktype age4grp educ_all_4l;
reflevel age4grp=1;
model pameet= wrktype age4grp educ_all_4l;
predmarg wrktype(6) age4grp(1) educ_all_4l/ adjrr;
run;

*Females;
proc rlogist data=thesis.thesis_final2 design=wr;
nest strat_p psu_p / missunit;
weight wtfa_sa;
subpopn indicator_f=1;
class wrktype age4grp educ_all_4l;
reflevel age4grp=1;
model pameet= wrktype age4grp educ_all_4l;
predmarg wrktype(6) age4grp(1) educ_all_4l/ adjrr;
run;
```

Appendix D: Institutional Review Board Letter

EMORY UNIVERSITY

Institutional Review Board

7/12/2013

Dara Burris
Master of Public Health Candidate, May 2014, Epidemiology
Rollins School of Public Health, Emory University

RE: Determination: No IRB Review Required
Title: *Associations between work-related factors, current industry and occupation, and meeting recommended leisure-time physical activity levels among U.S. workers*
PI: Dara Burris

Dear Dara:

Thank you for requesting a determination from our office about the above-referenced project. Based on our review of the materials you provided, we have determined that it does not require IRB review because it does not meet the definition of research with "human subjects" as set forth in Emory policies and procedures and federal rules, if applicable. Specifically, in this project, you will study associations between work-related factors (i.e., work organization characteristics and psychosocial workplace exposures), current industry and occupation, and meeting recommended leisure-time physical activity levels among U.S. workers. To do this you will perform data analysis of the 2010 National Health Interview Survey that is publicly available and completely de-identified of or lacking any personal or HIPAA identifiers including names, postal addresses, geographic subdivisions smaller than a state, dates directly related to an individual, telephone numbers, fax numbers, electronic mail addresses, social security numbers, medical record numbers, account numbers, health plan beneficiary numbers, certification/license numbers, vehicle identifiers and serial numbers, device identifiers and serial numbers, web universal resource locator, internet protocol address numbers, biometric identifiers, and photographic images.

Please note that this determination does not mean that you cannot publish the results. If you have questions about this issue, please contact me.

This determination could be affected by substantive changes in the study design, subject populations, or identifiability of data. If the project changes in any substantive way, please contact our office for clarification.

Thank you for consulting the IRB.

Sincerely,

Michael Arenson, MA
Analyst Assistant

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