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Original Article

Gender difference in working from home and psychological distress - A national survey of U.S. employees during the COVID-19 pandemic

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Abstract: The COVID-19 pandemic has precipitated broad and extensive changes in the way people live and work. While the general subject of working from home has recently drawn increased attention, few studies have assessed gender differences in vulnerability to the potential mental health effects of working from home. Using data from 1,585 workers who participated in the Health, Ethnicity, and Pandemic (HEAP) study, a national survey conducted in the U.S. during the COVID-19 pandemic in October 2020, associations of working from home with psychological distress were examined with weighted logistic regression among 1,585 workers and stratified by gender. It was found that workers who worked from home had higher odds of psychological distress

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(aOR and 95% CI = 2.62 [1.46, 4.70]) compared to workers who did not work from home, adjusting for demographic factors, socioeconomic status, and health behaviors. In gender-stratified analyses, this positive association between working from home and psychological distress was significant in women (aOR and 95% CI = 3.68 [1.68, 8.09]) but not in men. These results have implications for female workers' mental health in the transition towards working from home in the COVID-19 pandemic era.

Key words: COVID-19, Working from home, Mental health, Gender, Workers

Introduction

The COVID-19 pandemic has precipitated extensive changes in the way people live and work, including a broad-scale shift towards working from home rather than commuting to a public workplace. Working from home as a widespread practice is a novel phenomenon, with burgeoning evidence indicating that working from home may increase symptoms of depression and anxiety, possibly due to reduced social support and in-person interactions or difficulty mentally detaching from work after hours, as well as pain, stress, and family-work conflict[1–5].

Though family-work conflict has historically been considered a gendered phenomenon disproportionately affecting women, COVID-19 work from home measures have led to both men and women working in untraditional ways, juggling home and work responsibilities[6, 7]. The disruption of childcare and school activities has further amplified the work of parents, especially women, negatively impacting their productivity at work and leading to higher levels of unpaid work, stress, and exhaustion[8].

Given the sudden and rapid shift to working from home in the wake of the COVID-19 pandemic, the transition is likely to produce a multitude of yet unknown effects, presenting a critical knowledge gap. Due to the abrupt switch to remote work, many employees began working from home without proper preparation while lacking the necessary skills, technological support, and home office arrangements[9, 10]. Hence, there is an urgent need to leverage novel and timely data in characterizing the potential mental health impacts of working from home. Such data may also have utility in shaping government and employer policy responses in supporting a general societal transition towards increased flexibility in working practices and supportive childcare arrangements. Furthermore, while the topic of working from home has recently drawn increased attention as a research focus, few studies have assessed gender differences in vulnerability to the potential mental health effects of working from home. This study offers a valuable opportunity to address these knowledge gaps by capturing the acute impacts of transitioning to working from home and their associations with psychological distress.

The purpose of our study is to examine the association of working from home with psychological distress using a nationally representative, population-based sample of U.S. workers, and to compare these associations across gender to identify potential differences in vulnerability to psychological distress. To the best of our knowledge, no such study using nationally representative data has been done before. We hypothesize that American workers working from home will have elevated psychological distress, compared to with workers who are not working from home. We additionally hypothesize that such associations of working from home with psychological distress will be stronger in women than in men, as mounting evidence suggests that women may be more severely impacted by the transition to working from home amidst increased household and childcare responsibilities[8, 11–14].

Subjects and Methods

Study Sample

The current study utilizes data from the 2020 Health, Ethnicity and Pandemic (HEAP) study. The HEAP study was conducted by the National Opinion Research Center (NORC) at the University of Chicago on behalf of the University of Nebraska Medical Center in October 2020. Study participants were drawn from NORC's AmeriSpeak Panel, and a supplementary sample of Asian-American respondents were recruited from global online market research firm Dynata's nonprobability online opt-in panel. Participants were selected for recruitment from the AmeriSpeak panel based on 48 sampling strata, including age, race, ed-

ucation, and gender. A total of 2,709 web-based responses were collected, constituting a weighted sample from the American Association for Public Opinion Research (AAPOR). NORC conducted weighting procedures to align the distributions of the study sample with the broader sociodemographic distribution of the U.S. in order to better approximate a nationally representative sample[15–18]. The NORC Institutional Review Board reviewed and approved this study (NORC IRB Protocol #20.10.43), and obtained written informed consent from each participant. The research protocol conformed to the principles embodied in the Declaration of Helsinki. This current analytic project was reviewed and approved for exemption by the University of California, Los Angeles (UCLA) Institutional Review Board (UCLA IRB Protocol #21-000363).

We included participants who were employed before the COVID-19 pandemic and had complete data on psychological distress and other covariates, yielding a final sample size of 1,585 workers. Participants with a race outside of the four categories of non-Hispanic White, Hispanic or Latino, non-Hispanic Black, or non-Hispanic Asian were excluded from the analysis due to low numbers. The procedure followed for sample size selection is shown in Fig. 1 below.

Measures

Working from home status was assessed via affirmative response to a single question, "Have you switched to working from home during the pandemic?". Psychological distress in the past 30 days was assessed with the Kessler Psy-

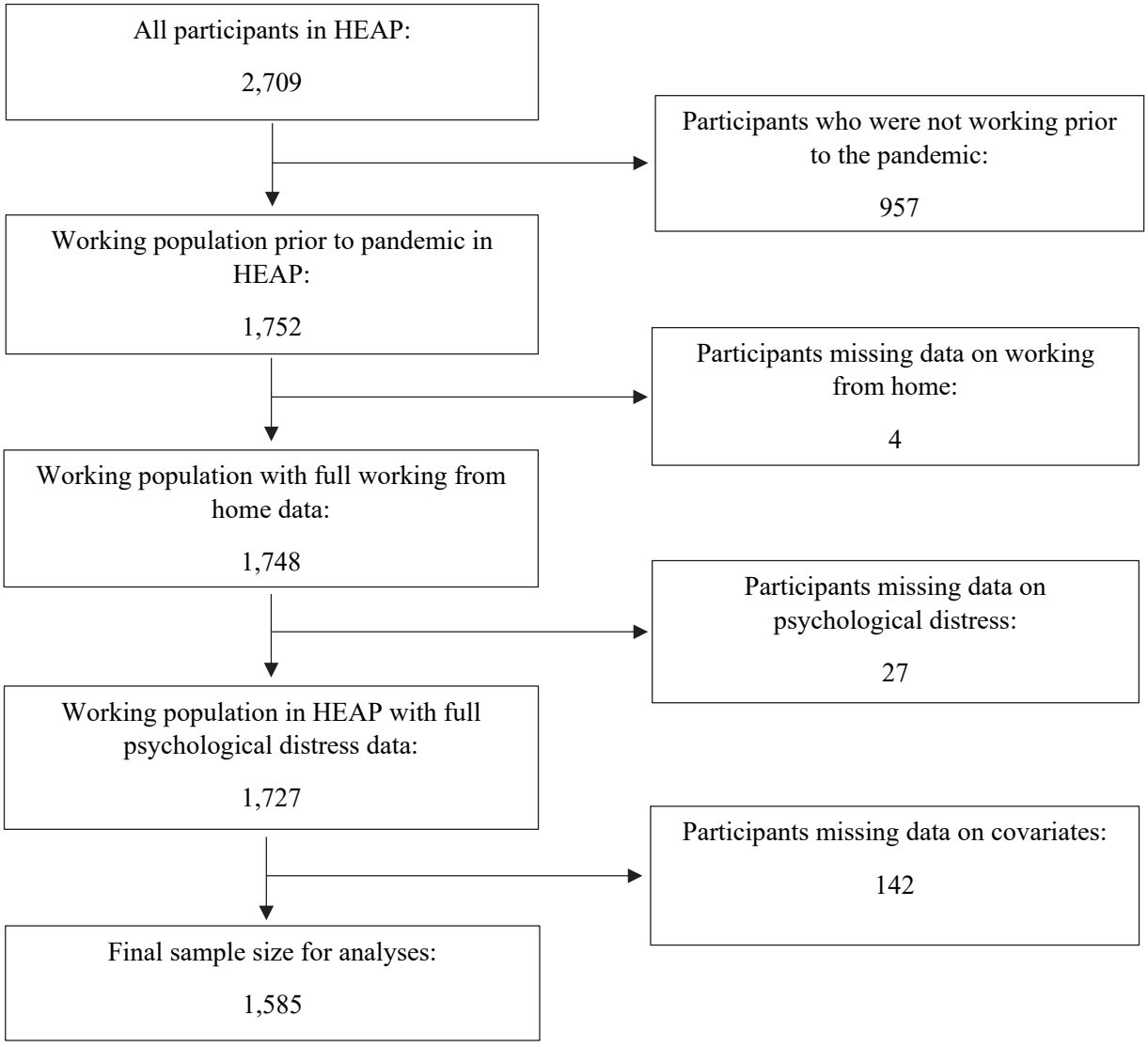

Fig. 1. Sample Size Selection Flowchart.

chological Distress Scale (K6), a validated and widely used self-report measure of psychological distress[19, 20]. The K6 measures psychological distress with six questions (e.g., "How often did you feel nervous? "How often did you feel worthless?") scored on a five-point Likert scale ranging from "none of the time" to "all of the time." K6 ranged from 0–24, with a high value indicating a high level of psychological distress. As a rule of thumb in psychiatric research, serious mental illness is indicated when the value of K6 is 13 or above[19, 20].

Data regarding sociodemographic factors and health behaviors were also collected, including gender, age (18–35; 36–50; 51+), race (non-Hispanic White; Hispanic or Latino; non-Hispanic Black; non-Hispanic Asian), marital status (married/living with a partner; never married; divorced/widowed/separated), educational attainment (high school or less; some college; university degree or more), annual household income (<$40,000; $40,000–99,999, >$99,999), current physical exercise (less than 30 mins/day; 30–60 mins/day; more than 60 mins/day), current smoking status (no; yes), and alcohol consumption (no drinking; moderate drinking – up to two drinks per day for men and one drink per day for women; heavy drinking –more than two drinks per day for men and more than one drink per day for women[21]).

Statistical Analysis

First, weighted descriptive statistics were generated. Relative frequencies were examined for characteristics of the study sample, and the Chi-square test was applied to compare the differences of the variables with categorical measures between men and women. Next, associations of working from home with psychological distress were estimated using weighted multivariable logistic regression, and the results were expressed as adjusted odds ratios (aORs) with 95% confidence intervals (CIs). Two-sided hypothesis testing was conducted at the significance level α=0.05. Multivariable models were calculated in three steps: Model I adjusted for age and gender; Model II included further adjustment for race, marital status, educational attainment, and household income; and Model III additionally adjusted for physical exercise, smoking, and alcohol consumption. Moreover, we tested the interactions of working from home by age, gender, race, marital status, education, household income, smoking, alcohol consumption, and physical exercise with psychological distress as the outcome. The interaction between working from home and gender was the only significant finding (p=0.0053), therefore we conducted stratified analyses in order to examine effect modification by gender. Sensitivity analyses were conducted with weighted linear regression when using continuous psychological distress as an outcome, to test the robustness of the associations. All analyses were performed using the SAS 9.4 software package, Survey Analysis Procedures.

Results

The characteristics of the study population are presented in Table 1. The study sample of 1,585 employees consisted of similar proportions of young (37.90%), middle-aged (29.52%), and older workers (32.58), with an age range of 18 to 60+, representing U.S. employees across the working lifespan. There were generally equal numbers of men and women, and more than half of the participants were married (56.45%). Most participants had at least some college education and nearly half had a household income of $40,000–$99,999. The majority of participants were non-smokers (81.83%), exercised less than 30 min/day (51.09%), and engaged in moderate or no drinking (88.55%). The sample comprised White (61.58%), Hispanic (18.94%), Black (13.18%), and Asian (6.30%) racial/ethnic groups. Most participants did not experience a change in working from home status (63.00%). The prevalence of serious psychological distress in the sample was 16.00%. Compared to men, women had significantly lower levels of income and alcohol consumption and higher levels of psychological distress. We did not observe any other obvious differences in participant characteristics between men and women. Additionally, compared to participants with complete data, those with missing data were more likely to be women, younger, distressed, Hispanic or Black, and had less educational attainment and lower household income. However, we did not observe systematic differences in marital status, physical exercise, smoking status, alcohol consumption, or working from home between the two groups.

Results of the logistic regression analyses for the entire sample and the stratified analyses by gender are shown in Table 2. Compared to workers who did not change to working from home, those who changed to working from home had higher odds of psychological distress (fully-adjusted ORs and 95% CI=2.62 [1.46, 4.70]) after controlling for age, sex, race, marital status, educational attainment, household income, smoking status, alcohol consumption, and physical exercise. Stratified analysis by gender further illustrated that the association of working from home with psychological distress was only significant among women

Table 1. Characteristics of the Sample Population, Weighted (N=1,585)

Variables	N (%)	Men (N, %)	Women (N, %)	*p*
Gender				
Men	811 (49.21)			
Women	774 (51.89)			
Age				0.83
18–35	630 (37.90)	297 (38.77)	333 (37.05)	
36–50	503 (29.52)	265 (28.23)	238 (30.77)	
51+	452 (32.58)	249 (33.00)	203 (32.18)	
Race				0.27
Non-Hispanic White	289 (61.58)	165 (59.37)	124 (63.72)	
Hispanic or Latino	354 (18.94)	205 (20.83)	149 (17.10)	
Non-Hispanic Black	383 (13.18)	171 (12.89)	212 (13.47)	
Non-Hispanic Asian	559 (6.30)	270 (6.91)	289 (5.71)	
Marital Status				0.31
Married	853 (56.45)	461 (57.70)	392 (55.25)	
Never married	524 (27.78)	250 (29.03)	274 (26.57)	
Divorced/widowed/separated	208 (15.77)	100 (13.27)	108 (18.18)	
Education				0.65
University degree or more	691 (38.83)	348 (38.90)	343 (38.76)	
Some college	595 (27.80)	298 (26.11)	297 (29.44)	
High school or less	299 (33.37)	165 (34.99)	134 (31.80)	
Household income				<0.05
$99,999+	403 (25.94)	239 (30.84)	164 (21.19)	
$40,000–$99,999	679 (45.22)	350 (43.67)	329 (46.72)	
<$40,000	503 (28.84)	222 (25.49)	281 (32.09)	
Physical exercise				0.97
More than 60 mins/day	336 (20.15)	190 (19.82)	146 (20.46)	
30–60 mins/day	425 (28.76)	218 (28.56)	207 (28.95)	
Less than 30 mins/day	824 (51.09)	403 (51.62)	421 (50.59)	
Smoking				0.82
No	1,322 (81.83)	664 (82.24)	658 (81.45)	
Yes	263 (18.17)	147 (17.76)	116 (18.55)	
Alcohol consumption				<0.001
No drinking	772 (44.02)	353 (37.58)	419 (50.25)	
Moderate drinking	707 (44.53)	413 (53.87)	294 (35.48)	
Heavy drinking	106 (11.45)	45 (8.55)	61 (14.27)	
Working from home				0.44
No	945 (63.00)	492 (64.73)	453 (61.34)	
Yes	640 (37.00)	319 (35.27)	321 (38.66)	
Psychological distress				<0.001
No	1,329 (84.00)	713 (89.83)	616 (78.37)	
Yes	256 (16.00)	98 (10.17)	158 (21.63)	

(fully-adjusted OR and 95% CI=3.68 [1.68, 8.09]). The findings of sensitivity analyses with weighted linear regression when using continuous psychological distress as an outcome showed a similar pattern of associations (see Supplemental Table 1).

Discussion

The purpose of this study was to test the hypothesis that switching to working from home during the COVID-19

Table 2. Associations of Working from Home with Psychological Distress (OR and 95% CI)

Entire sample (*N*=1,585)	Working from Home	Prevalence of Psychological Distress (%)	Model I	Model II	Model III
	No	16.30	1.00	1.00	1.00
	Yes	15.94	1.34 (0.79, 2.26)	2.68 (1.48, 4.85)	2.62 (1.46, 4.70)
Sub-groups by gender	Working from Home	Prevalence of Psychological Distress (%)	Model I*	Model II	Model III
Men (*N*=811)	No	13.01	1.00	1.00	1.00
	Yes	10.66	0.67 (0.31, 1.45)	1.18 (0.51, 2.70)	1.05 (0.47, 2.34)
Women (*N*=774)	No	19.87	1.00	1.00	1.00
	Yes	21.18	1.91 (0.96, 3.79)	3.83 (1.69, 8.69)	3.68 (1.68, 8.09)

Multivariable logistic regression, weighted.
Model I: adjustment for age and gender (* Adjustment for gender was omitted in the stratified analyses);
Model II: Model I + additional adjustment for race, marital status, education, and household income;
Model III: Model II + additional adjustment for smoking, alcohol consumption, and physical exercise.

pandemic was associated with increased psychological distress in a nationally representative, population-based sample of working adults in the U.S. In addition to the initial analyses of the entire sample, we conducted further stratified analyses examining potential effect modification by gender. Our results indicated significant associations of switching to working from home with serious psychological distress in a nationally representative, population-based sample of working adults in the U.S, primarily driven by the corresponding association among women.

The results of our study agree with recent international evidence indicating increased psychological distress among those working from home during the COVID-19 pandemic[2, 10, 22–24]. Several studies across over 25 European countries reported increased prevalence of depression and anxiety symptoms during the COVID-19 pandemic compared to prior, in addition to overall worsening of mental health symptoms such as trouble sleeping, feelings of loneliness, and broad-scale negative impacts on mental well-being[1, 25, 26]. Similarly, studies from Asian countries such as Japan and Thailand reported significant associations of working from home with increased psychological distress, depression, and burnout[27, 28].

In contrast, a study of 2,301 U.S. adults found that those who switched to working from home did not differ from those who did not across a broad range of self-rated mental health outcomes, including depression, anxiety, stress, and positive mental health[29]. However, these results may be explained by the timing of data collection, as surveys were administered in April 2020, at a very early stage of the COVID-19 pandemic. Another study of 2,485 US adults above age 55 found that working from home was not associated with symptoms of depression or anxiety[30]. The international literature may serve to explain disparities and inconsistencies across findings. For example, studies of adults in Spain and Hong Kong found that working away from home was associated with higher psychological stress compared to working at home primarily due to increased risk of contagion and fears regarding disease[31, 32]. Similarly, a study of 3,123 office workers across 23 tertiary industries in Japan found that working from home was associated with the reduction of psychological and physical stress responses, independent of changes in occupational exposures, social support, sleep disturbance, and total sleep time on workdays[33].

The differing responses to the phenomenon of working from home across countries and regions suggest a key role of sociocultural influences in responses to financial and occupational upheaval during the COVID-19 pandemic. For instance, a study of 1,642 adults in Cyprus showed that participants who were able to transition to working from home while still receiving their regular salaries had the lowest symptoms of anxiety and depression[34]. Finally, a randomized controlled trial of a social media-based intervention for employees working at home demonstrated significant improvements in stress, anxiety, and depression scores, suggesting that short-term virtual interventions may be effective for improving the physical and mental health of those working from home[35]. These data suggest that given adequate organizational or institutional support, the effect of working from home on workers' mental health can be buffered.

Our findings regarding elevated psychological distress among women working from home must be evaluated in the context of societal pressures and social norms. Recent evidence has suggested that the increased need to care for children due to at-home schooling or reduced childcare services during COVID-19 may "revive traditional gender roles", and that COVID-19 may have further effects on gender pay gaps present in the labor market[12]. According to the International Labour Organization, between 2019 to 2020, women globally were approximately 40% more likely than men to lose their jobs. In the United States alone, women's economic participation hit its lowest point in 33 years in January 2021[36, 37]. Certainly, parenting responsibilities during the COVID-19 pandemic have been shown to modify the impact of working at home on mental health outcomes, where women with children report higher levels of stress than men, and a significantly higher proportion of women experience time stress and "always feeling rushed or pressed for time" [2, 8].

Though the COVID-19 pandemic necessitates the need for many men and women to work from home, recent literature arising from the pandemic suggests that women continue to disproportionately bear the responsibilities of unpaid care work at home, such as taking care of children and the elderly[8]. Large studies of adults in the United Kingdom found that women spent far more time on unpaid care work than men during the COVID-19 lockdown[14] and identified being female as a predictor of stress and depressive symptoms, with place and pattern of work having a greater impact on women[38]. These findings are also consistent with surveys of Chinese academics during the pandemic, which found that female economists spent more time on house chores while male economists spent more time on research[39]. In a similar vein, a study of U.S. opposite-sex dual-career parents found that women exhibited lower self-rated work productivity and job satisfaction than men

during, but not before, the COVID-19 pandemic lockdown, with authors hypothesizing that such gender differences may be due to expectations of women to perform housework or care for children during closures of school and childcare centers[13]. Furthermore, in a large, nationally representative sample of U.S. workers, significant prospective associations of family strain with depression were identified in both men and women, yet women experienced greater family strain than men[40]. These findings are also supported by a snowball sampling study of 988 U.S. adults working from home, as decreased overall physical and mental well-being following working from home was associated with children at home, distractions while working, and indoor workspace environmental factors[6]. Possibly the greatest risk for women regarding future developments in the workplace may be the solidification and widening of gender gaps in pay, productivity, and job satisfaction; if employers continue to adopt working from home as a primary mode of work, evidence suggests that without the provision of adequate support by employers, such as flexible schedules, childcare support, and work assignments, workplace inequalities between men and women may continue to widen.

Strengths

The major strengths of this study are founded upon the nature and timing of the data collection; data were collected in October 2020 during the Fall surge of the COVID-19 pandemic and hence, participant survey responses were able to capture the acute effects of the pandemic, including real-time changes in employment and mental health, i.e. working from home and psychological distress[41]. To the best of our knowledge, this is the first study to assess associations of working from home with psychological distress during the COVID-19 pandemic in a nationally representative sample of U.S. workers.

Limitations

The primary limitations of this study are the cross-sectional nature of the data, precluding causal inference. Furthermore, our results may be impacted by selection bias, as participants who were excluded from the analysis due to missing data were younger, more psychologically distressed, and had lower socioeconomic status. Finally, we were unable to examine plausible mechanisms underlying the observed associations, due to a lack of systematic measures of family- and work-related information such as childcare responsibilities and occupational categories of the study participants.

Conclusion

In this study of a nationally representative, population-based sample of U.S. employees, working from home was associated with increased odds of psychological distress in women. Women's mental health may be more severely impacted by working from home. These results have major implications for workers' overall transition towards working from home in the COVID-19 pandemic era, as arrangements to continue working from home are likely to persist beyond the pandemic. Such developments indicate a dire need for government and employer policy interventions targeting workers' mental health in the workplace.

Availability of Data and Material

All data analyzed during this study are included in this published article.

Authors' Contributions

DS, ZC and HL raised the funds. LC, DZ, XH, ZC, LS, YL, MW, HL and DS were involved in the study design and implementation. JL, TAM, LC and DS actively participated in data acquisition. JL conceived the analytic concept. TAM and JL conducted the data analysis. TAM, JL, CL, and NO contributed to the manuscript drafting. All authors were involved in critically interpreting the results, revising the manuscript, and approved the final version.

Conflict of Interest

The authors of this manuscript declare that they have no conflicting interests.

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Appendix

Supplementary Table 1. Associations of Working from Home with Continuous Psychological Distress (β and 95% CI)

Entire sample (*N*=1,585)	Working from Home	Mean Level of Psychological Distress	Model I	Model II	Model III
	No	7.04	0.00	0.00	0.00
	Yes	7.00	0.73 (−0.19, 1.65)	1.69 (0.78, 2.60)	1.58 (0.69, 2.46)
Sub-groups by gender	Working from Home	Mean Level of Psychological Distress	Model I*	Model II	Model III
Men (*N*=811)	No	6.26	0.00	0.00	0.00
	Yes	6.33	0.33 (−0.79, 1.46)	1.09 (−0.09, 2.28)	0.99 (−0.14, 2.13)
Women (*N*=774)	No	7.85	0.00	0.00	0.00
	Yes	7.66	1.05 (−0.38, 2.47)	2.08 (0.77, 3.39)	1.82 (0.59, 3.05)

Multivariable linear regression, weighted.

Model I: adjustment for age and gender (* Adjustment for gender was omitted in the stratified analyses);

Model II: Model I + additional adjustment for race, marital status, education, and household income;

Model III: Model II + additional adjustment for smoking, alcohol consumption, and physical exercise.