Association Between Sleep Duration and Fruit and Vegetable Consumption in United States Adults and Veterans.

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Abstract

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INTRODUCTION: Adequate sleep and a diet rich in fruits and vegetables are essential components of a healthy lifestyle. A growing body of evidence suggests an association between sleep duration and fruit and vegetable (FV) consumption, but it has not been well established in U.S. adults. It's unclear if this association differs for groups at higher risk for sleep disturbances and poor diet quality. We examined the relationship between categories of sleep duration and prevalence of low fruit and vegetable consumption among U.S. adults and Veterans.

METHODS: We performed a cross sectional analysis of data from 2017 Behavioral Risk Factor Surveillance System of US adults (N = 60,479), of whom 7,904 were Veterans. We used logistic regression to assess the relationship between categories of sleep duration (short, recommended, and long) and low FV consumption (consumption of FV less than once per day) adjusting for age, race/ethnicity, employment status, physical activity level, smoking status, and number of children in the household for the population as a whole and additionally overall, and stratified by Veteran status

RESULTS: The unadjusted odds of low FV consumption was 56% higher for adults who reported short sleep (OR 1.56; 95% CI 1.44,1.68) and 76% higher for adults who reported long sleep (OR 1.76; 95% CI 1.54, 2.02) compared to adults who reported recommended sleep. After adjustment for covariates, the odds of low FV consumption became attenuated to 32% higher for adults who reported short sleep (OR 1.32; 95% CI 1.21,1.43) and 40% higher for adults who reported long sleep (OR 1.40; 95% CI 1.21, 1.61) compared to adults who reported recommended sleep. The association between sleep and low FV consumption did not differ meaningfully by Veteran status.

DISCUSSION: Short and long sleep duration were associated with higher odds of low FV consumption and the association did not differ based on Veteran status.

Introduction

Sleep, nutrition, and exercise are widely considered as the three pillars of health. The United States Army is one prominent organization to prioritize sleep, nutrition, and exercise in optimizing health and wellbeing of its troops with their performance triad campaign.[1] Numerous guidelines have been published to standardize and promote recommended levels of sleep, nutrition, and exercise. The National Sleep Foundation recommends 7-9 hours of sleep for adults 18 to 64-years-old and 7-8 hours of sleep for adults 65 and older for optimal sleep health.[2] Short (less than recommended) sleep duration and long (more than recommended) sleep duration have been associated with multiple adverse outcomes related to physical, psychological, and spiritual health.[3] Past research has linked short sleep and long sleep with higher incidence of chronic diseases (e.g. hypertension, type 2 diabetes, and stroke) and increased risk of mental health disorders (e.g., depression, posttraumatic stress disorder, and suicide).[4] A meta-analysis of prospective cohort studies observed associations between short sleep and long sleep with increased risk of all-cause mortality and cardiovascular events.[5] Despite mounting evidence showing the importance of adequate sleep for overall health, more than a third of adults in the United States report receiving less than 7 hours of sleep per day.[6]

Nutritional guidelines have emphasized the importance of eating a diet rich in fruits and vegetables (FV) as it has been associated with decreased risks of many chronic diseases including heart disease, stroke, hypertension, and diabetes.[8] Despite

this, less than 10% of Americans report eating enough FV to meet federal dietary recommendations of 5 or more servings of FV per day.[7, 8]

Growing evidence suggests a reciprocal association between sleep duration and consumption of FV.[9] Although a few experimental studies have showed inconsistent results regarding FV appetite and snacking behavior change following sleep restriction and sleep extension, numerous observational studies have shown consistent association between short sleep duration and higher total energy intake and lower quality diets including low FV consumption.[10–12] Potential mechanisms for the proposed association between sleep duration and FV intake can be classified as homeostatic and non-homeostatic. Homeostatic mechanisms include hormonal changes that balance satiety and hunger signals in the brain through release of leptin and ghrelin. Leptin inhibits hunger by signaling satiety whereas ghrelin promotes hunger by signaling for an increase in appetite.[13] Several laboratory studies have shown that ghrelin increases following sleep restriction. [14–18] One such study by Heath et al involving 12 healthy men showed that sleep restriction reduced leptin by 18% and increased ghrelin by 29%.[14] This change in appetite related hormonal balance following sleep restriction is thought to increase preference for energy-rich food and lower consumption of FV.[14,18] Non-homeostatic mechanisms that are thought to drive the association between short and long sleep duration and low FV consumption include hedonic feeding, defined as the consumption of food primarily for pleasure. [9] Brain imaging studies have shown that daytime sleepiness from insufficient sleep reduced activation of ventromedial prefrontal cortex, a region of the brain involved in inhibiting and controlling emotions and behavior, when participants were shown images of “high calorie food” compared to “low calorie

food" images (including fruits and vegetables).[19] Appetite sensations and food reward consistently increased following sleep restriction compared to controls.[20] Enhanced preference for high calorie foods and decreased intake of fruits and vegetables following sleep restriction is common to both homeostatic and non-homeostatic pathways.

Despite higher exercise levels and increased exposure to health promotional information such as the US Army's performance triad during their military service, Veterans are a vulnerable population to unhealthy sleep and inadequate FV consumption. For an example, an estimated 26% of US Veterans have insomnia compared to 10% of the general American adult population.[21] In addition, a study by the United States Department of Agriculture show that Veterans have lower healthy eating index (HEI) scores for overall diet quality than non-Veterans after controlling for demographic characteristics.[8]

To our knowledge, few if any studies have assessed the relationship between sleep duration and FV consumption in Veterans using nationally representative data. Veterans account for approximately 7% of the adult population[22] and over 60% of recent Veterans have utilized VA health care since the War on Terror began in 2001.[23] Cost effective health care for Veterans is in the national interest as a large fraction of Veterans receive lifelong healthcare from the Department of Veterans Affairs, which Is funded by tax dollars. Health behaviors such as insufficient sleep and inadequate consumption of FV contribute to health disparities experienced by Veterans.[24] Investment in preventive measures for Veterans' health is imperative to honor our Nation's commitment to Veterans, optimize quality of care, and increase cost-

effectiveness of care delivery. Elucidating the association between sleep duration and FV consumption may assist in developing effective health promotional tools and interventions.

The objective of this study was to determine the association between sleep duration and FV consumption in a representative sample of US adults. We also assessed the role of Veteran status in the association between sleep duration and fruit and vegetable consumption.

Methods:

Data Source

We used data from 2017 Center for Disease Control Behavioral Risk Factor Surveillance System (BRFSS) survey as that was the most recent year when questions regarding sleep duration and FV consumption were asked. The BRFSS is a system of ongoing health-related telephone surveys designed to collect data on health-related risk behaviors, chronic health conditions, and use of preventive services from the non-institutionalized adult population (≥18 years) residing in the United States and its territories. More than 400,000 respondents complete the BRFSS survey each year.[25] BRFSS consists of core questions such as the Fruit and Vegetable module that is included in alternating years, and optional modules such as the Sleep Disorder module, that states can opt into.

Our population was restricted to survey participants living in the 10 states/districts that included the sleep disorders optional module (Arizona, District of

Columbia, Kansas, Kentucky, Minnesota, Nebraska, Nevada, North Dakota, Oregon, and Tennessee). We excluded 23,812 respondents who refused to report or did not answer the questions on FV consumption (n=3,829) or hours of sleep (n=19,983). We excluded 701 participants with missing age as sleep categories were determined based on age. Also, we excluded 236 participants who reported implausible fruit and vegetable consumption values (i.e., consuming fruit >16 times and vegetables >23 times per day). [26]

Exposure

The exposure of interest was sleep duration. Respondents were asked to report the average number of hours they sleep in a 24-hour period. Their response was recorded as a whole number ranging from 0 to 24 hours. Sleep duration was categorized into 3 bins: short sleep (≤6h), recommended sleep (7-9h for participants 18-64 years old and 7-8h for participants 65 years and older), and long sleep (≥10h for participants 18-64 years old and ≥9h for participants 65 years and older).

Outcome

The outcome of this study was low FV consumption. Self-reported daily FV consumption as frequency of consumption per day was ascertained based on responses to four questions regarding FV consumption including: 1) 'During the past month, not including juices, how many times per day, week, or month did you eat fruit?'; 2)'During the past month, how many times per day, week, or month did you eat a green leafy or lettuce salad, with or without other vegetables?; 3) 'During the past month, how

many times per day, week, or month did you eat any other kind of potatoes, or sweet potatoes, such as baked, boiled, mashed potatoes, or potato salad? 4) 'During the past month, not including lettuce salad and potatoes, how many times per day, week, or month did you eat other vegetables? Reponses to the above questions were converted into values representing daily consumption. These values were summed to create a total daily FV consumption variable then categorized into two groups, less than once a day or once or more a day, to create our primary outcome variable of low FV consumption. As consumption of fried potatoes have been associated with increased mortality risk and published dietary guidelines have excluded fried potatoes as a recommended source of FV, we excluded fried potatoes consumption in calculating our primary outcome variable.[27]

Covariates

We considered age (18-29, 30-49, 50-64, 65+), race/ethnicity (American Indian/Alaskan Native, Asian, Black, Hispanic, Other race, White), employment status (employed, unemployed, homemaker, retired, student, unable to work), physical activity level (active, highly active, insufficiently active, inactive), smoking status (current, former, or never smoker), and number of children in the household (no children, one or two children, or three or more children) as factors that could potentially confound the relationship between sleep duration and FV consumption. We hypothesized that the relationship between sleep duration and FV consumption would be weaker among Veterans than non-Veterans because Veterans would have greater habituation to hedonic eating.[28]

Statistical analyses

All analyses were performed in R Studios software package 4.1 version, accounting for BRFSS's complex survey design as well as nonresponse by using survey commands and CDC-calculated weights. We conducted our analysis in four key steps: First, we described our population in terms of demographic and other characteristics by sleep categories using weighted percentages. Next, we used descriptive analytic techniques to estimate median daily count of FV consumed and interquartile ranges based on demographic, socioeconomic, and health characteristics and sleep categories. Third, we used logistic regression to calculate unadjusted and adjusted odds ratios (ORs) and corresponding 95% confidence intervals (Cis) between categories of sleep duration and low FV consumption overall and stratified by Veteran status both adjusting for confounders we selected using a priori approach. Fourth, We tested for effect modification by Veteran status by comparing adjusted ORs for meaningful differences.

Per the University of Washington Human Subjects Division, this study was not classified as human subjects research and therefore did not require IRB review.

Results

A total of 60,479 participants were included in the study (Table 1). The majority of participants were female (55.8%), white (77.3%), non-Veteran (87.4%), and lived in a household with no children (73.6%). Most participants denied any history of smoking (53.8%) and denied binge drinking (84.2%) or heavy alcohol use (92.4%) in the

previous 30 days. Most of the participants reported recommended sleep (61.1%) while approximately a third of participants reported short sleep (34.0%) and about 1 in 20 reported long sleep (5.1%). Groups with characteristics historically associated with lower socioeconomic status and poor health (e.g. racial minority, low income/education, inactivity, smoking) had higher prevalences of short sleep and long sleep. Conversely, groups with characteristics historically associated with higher socioeconomic status and good health (e.g. white, high education/income, physical activity, no smoking) had higher prevalences of recommended sleep. The prevalence of low FV consumption showed similar trends with characteristics to sleep duration (Table 2). Long sleep was notably more prevalent in people who were 65 year and older (12.3%), Veterans (8.1%), and those who were retired (11.8%). Sleep duration was inversely associated with number of children in the household as participants with no children in the household had higher prevalences of recommended (62.5%) and long (6.3%) sleep while participants with three or more children in the household had a high prevalence of short sleep (42.0%).

In the unadjusted logistic regression model, the odds of low FV consumption were 56% higher for adults who report short sleep (OR 1.56; 95% CI 1.44, 1.68) and 76% higher for adults who report long sleep (OR 1.76; 95% CI 1.54, 2.02) compared to adults who report recommended sleep (Table 3). After adjusting for age, race/ethnicity, Veteran status, employment status, physical activity level, smoking status, and number of children in the household, the odds of low FV consumption were attenuated to 32 % higher for adults who report short sleep (OR 1.32; 95% CI 1.21, 1.43) and 40% higher for adults who report long sleep (OR 1.40; 95% CI 1.21, 1.61) compared to adults who

report recommended sleep (Table 3). The association between sleep duration and FV consumption was similar in Veterans and non-Veterans (Table 3).

Discussion

In this cross-sectional study using data from the CDC's 2017 BRFSS survey, we compared the prevalence of low FV consumption between categories of sleep duration in US adults and Veterans. Short sleep and long sleep were associated with higher odds of low FV consumption compared recommended sleep. Our study results are consistent with prior studies that linked short and long sleep durations with lower intakes of micronutrients or sources of micronutrients such as fruits and vegetables.[20,29,30] In addition, our findings are consistent with Noorwali et al's study that showed a non-linear relationship in the association between sleep duration and FV consumption as participants who reported recommended sleep were least likely to report low FV consumption compared to participants who reported short sleep or long sleep.[20]

The association between sleep duration and FV consumption did not differ based on Veteran status. Our results suggest that Veteran status or history of military service does not affect the relationship between sleep duration and FV consumption. One possibility for this finding is that history of military service may not affect non-homeostatic pathway of hedonic eating in the association between sleep duration and FV through habituation as we hypothesized. That is, there may be no difference in the rates of hedonic eating between Veterans and non-Veterans. There have been previous cross-sectional studies focusing on cohorts of nurses, pregnant women, college students, motor freight workers, and resident physicians. However, the role of

Veteran status on the association between sleep duration and FV consumption had not been explored prior to this study.

A key strength of our study is our utilization of defined cut offs for sleep duration based on National Sleep Foundation guidelines. There have been heterogenicity in cutoffs for sleep duration categories in previous studies. Our study accounts for sleep physiology changes that occur with aging by adjusting the threshold for recommended sleep and short sleep by 1 hour shorter for individuals 65 years and older per National Sleep Foundation guidelines. Our approach supports improving standardization and consistency of sleep duration category cutoffs among similar studies.

This study has several limitations. First, given its cross-sectional study design, we cannot evaluate the temporal association between sleep duration and FV consumption. Consequently, causal inferences cannot be made based on our study results. Second, as sleep duration and FV consumption were self-reported by participants, the data may be influenced by recall and social desirability bias. Third, the FV questions addressed frequency of consumption but did not address quantity or serving size of FV consumption. Although our data cannot be used to directly compare FV consumption reported by our participants to federal dietary recommendations which is provided as servings per day, it provides an estimate that can be used to predict whether a respondent met the federal recommendation through CDC developed scoring algorithms.[24] In addition, this study is unable to disaggregate Veteran status down to service in Active Duty, Reserves, or National Guard nor specify the branch of service. As there are significant differences in culture, resources, and occupational exposures in Veterans based on their type and branch of military service, aggregating all Veterans

into one group may hide differing effects of the association between types of Veteran status. Lastly, as our data were limited to the states that participated in the optional Sleep module, it may not be generalizable to adults in states that did not participate in the optional Sleep module.

Conclusion

Our study found that both short and long sleep duration was associated with higher prevalence of low FV consumption; the association did not differ by Veteran status. Future research should continue to focus on identifying the strength and mechanism of association between sleep duration and fruit and vegetable consumption to inform development of public health intervention and/or policy change.

Table 1: Study population by sleep categories

		n [1]	Less than Recommended (<6hrs)	Meets Recommendation (7-9hrs)[2]	More than Recommended (10hrs or more)[3]
All Participants		60,479	(34.0)	(61.1)	(5.1)
Sex	Female	29768	(33.0)	(61.8)	(5.2)
	Male	27232	(35.1)	(60.0)	(4.9)
	Missing	*24*	*(28.7)*	*(70.4)*	*(1.0)*
Age	18-29	6176	(35.8)	(60.7)	(3.5)
	30-49	14631	(38.2)	(59.3)	(2.5)
	50-64	18566	(35.4)	(61.4)	(3.2)
	65+	21106	(24.7)	(63.0)	(12.3)
Race/Ethnicity	AI/AN, Non-Hispanic	1087	(37.9)	(55.6)	(6.5)
	Asian, Non-Hispanic	730	(39.7)	(58.4)	(1.9)
	Black, Non-Hispanic	3326	(46.4)	(47.8)	(5.8)
	Hispanic	3869	(35.0)	(60.6)	(4.3)
	Other , Non-Hispanic	1365	(43.7)	(51.7)	(4.7)
	White, Non-Hispanic	50102	(32.1)	(62.7)	(5.2)
Veteran Status	Veteran	7904	(34.6)	(57.3)	(8.1)
	Non-Veteran	52533	(33.9)	(61.4)	(4.6)
	Missing	*41*	*(26.4)*	*(58.3)*	*(15.3)*
Education[4]	Did not graduate High school	3120	(35.4)	(56.2)	(8.4)
	Graduated High school	15257	(35.7)	(58.4)	(5.9)
	Some college	18471	(36.6)	(58.8)	(4.6)
	Graduated college	23524	(28.7)	(67.9)	(3.4)
	Missing	*107*	*(29.4)*	*(61.1)*	*(9.6)*
Income	0- $14,999	3975	(41.4)	(50.9)	(7.8)
	$15,000 - $24,999	7848	(37.0)	(55.7)	(7.4)
	$25,000 - $34,999	5404	(36.3)	(57.6)	(6.2)
	$35,000 - $49,999	8053	(34.3)	(60.2)	(5.5)
	$50,000 or more	27397	(31.6)	(65.7)	(2.7)
	Missing	*7802*	*(32.6)*	*(60.2)*	*(7.2)*

Employment	Employed	31956	(36.4)	(61.5)	(2.1)
	Unemployed	2365	(38.1)	(55.5)	(6.4)
	Homemaker	2849	(30.4)	(64.7)	(4.8)
	Retired	18130	(23.8)	(64.4)	(11.8)
	Student	1459	(31.3)	(65.9)	(2.8)
	Unable to work	3395	(47.3)	(42.1)	(10.6)
	Missing	*325*	*(29.7)*	*(63.0)*	*(7.3)*
Children in the Household	None	44790	(31.2)	(62.5)	(6.3)
	One or two	11544	(38.1)	(59.2)	(2.7)
	Three or more	4005	(42.0)	(55.0)	(3.0)
	Missing	*140*	*(39.9)*	*(52.9)*	*(7.2)*
Physical Activity Level	Highly Active	19946	(31.0)	(64.2)	(4.8)
	Active	11086	(31.6)	(65.5)	(3.0)
	Insufficiently active	11059	(33.9)	(62.0)	(4.1)
	Inactive	16709	(39.0)	(53.7)	(7.3)
	Missing	*1679*	*(34.9)*	*(58.6)*	*(6.5)*
Smoking Status	Current Smoker	8654	(45.1)	(49.3)	(5.6)
	Former Smoker	17082	(32.3)	(60.8)	(6.9)
	Never Smoked	34435	(31.5)	(64.5)	(4.1)
	Missing	*308*	*(35.2)*	*(58.2)*	*(6.6)*
Binge Drinking[6]	Yes	8740	(37.9)	(58.4)	(3.70)
	No	50941	(33.2)	(61.5)	(5.27)
	Missing	*798*	*(35.6)*	*(56.8)*	*(7.6)*
Heavy Drinking	Yes	3658	(36.9)	(57.1)	(6.0)
	No	55881	(33.8)	(61.2)	(5.0)
	Missing	*940*	*(32.7)*	*(61.4)*	*(5.9)*

[1] Statistics presented: n (weighted %)

[2] Meets Recommendation defined as reporting 7-9hrs of sleep for adults 18-64yrs and 7-8hrs of sleep for adults 65yrs and older in 24hr period

[3] More than recommended defined as reporting 10hrs or more of sleep for adults 18-64yrs and 9hrs or more of sleep for adults 65yrs and older in a 24hr period

[4] Categories “Some college” and “Graduated from college” include technical or trade school.

[5] Employed category includes respondents employed for wages or self-employed; unemployed category includes respondents who reported being homemaker, student, retired, unable to work, and out of work for less than or greater than 1 year

[6] Binge drinking was recorded as having five or more drinks on one occasion for men and having for or more drinks on one occasion in the previous 30 days.

Table 2: Average frequency of daily fruit and vegetable consumption and prevalence of low fruit and vegetable intake by study population characteristics

		Total Daily Fruit and Vegetable Consumption[1]		Prevalence of Low Fruit and Vegetable Consumption[2]
		Median	*Interquartile Range*	*Weighted %*
Overall		3.1	2.1-4.4	5.6
Sex	Female	3.3	2.2-4.7	4.7
	Male	2.9	2.0-4.1	6.6
	Missing	2.7	1.6-4.1	0
Age	18-29	2.8	1.8-4.3	6.6
	30-49	3.1	2.1-4.5	4.9
	50-64	3.0	2.0-4.4	6.1
	65+	3.2	2.2-4.4	5.3
Race/Ethnicity	AI/AN, Non-Hispanic	3.1	1.9-4.7	6.3
	Asian, Non-Hispanic	3.2	2.2-4.6	4.5
	Black, Non-Hispanic	3.1	2.0-4.8	7.3
	Hispanic	2.9	1.8-4.3	8.8
	Other , Non-Hispanic	3.1	2.1-4.4	5.7
	White, Non-Hispanic	3.1	2.1-4.4	5.0
Veteran Status	Veteran	3.0	2.0-4.2	5.9
	Non-Veteran	3.1	2.1-4.4	5.6
	Missing	*3.2*	*1.9-4.3*	*0.8*
Education[3]	Did not graduate High school	2.6	1.6-4.1	12.1
	Graduated High school	2.8	1.8-4.1	7.5
	Some college	3.0	2.1-4.3	4.8
	Graduated college	3.4	2.4-4.8	2.3
	Missing	*2.9*	*1.9-4.1*	*4.2*
Income	0- $14,999	2.6	1.6-4.0	12.1
	$15,000 - $24,999	2.9	1.9-4.2	8.2
	$25,000 - $34,999	2.9	1.9-4.2	8.2
	$35,000 - $49,999	3.0	2.1-4.4	4.1
	$50,000 or more	3.2	2.3-4.6	3.0

	Missing	*3.1*	*2.0-4.4*	*7.2*
Employment	Employed	3.1	2.1-4.4	4.9
	Unemployed	2.9	1.8-4.3	8.6
	Homemaker	3.4	2.4-5.0	4.4
	Retired	3.2	2.2-4.4	5.4
	Student	3.0	1.9-4.5	4.4
	Unable to work	2.5	1.5-3.9	12.8
	Missing	*3.0*	*1.9-4.6*	*6.0*
Children in the Household	None	3.1	2.1-4.4	6.2
	One or two	3.1	2.1-4.5	4.3
	Three or more	3.2	2.2-4.7	5.5
	Missing	*3.2*	*2.3-5.0*	*1.8*
Physical Activity Level	Highly Active	3.4	2.4-4.9	2.9
	Active	3.3	2.3-4.6	3.1
	Insufficiently active	2.9	2.0-4.3	6.0
	Inactive	2.6	1.7-3.8	10.1
	Missing	*3.2*	*2.2-4.5*	*5.5*
Smoking status	Current Smoker	2.6	1.7-3.9	9.8
	Former Smoker	3.1	2.1-4.3	4.8
	Never Smoked	3.2	2.2-4.6	4.8
	Missing	*3.1*	*2.1-4.5*	*5.4*
Binge Drinking[5]	Yes	2.8	1.9-4.0	5.7
	No	3.1	2.1-3.6	5.6
	Missing	*3.0*	*2-4.298*	*8.6*
Heavy Drinking	Yes	2.9	2.0-4.2	5.4
	No	3.1	2.1-4.4	5.6
	Missing	*3.0*	*2.0-4.3*	*9.4*

[1] Calculated as sum of reported frequency of daily consumption of fruits and vegetables

[2] Low Fruit and Vegetable consumption defined as reporting consumption of fruits and vegetables less than once a day

[3] Categories “Some college” and “Graduated from college” include technical or trade school.

[4] Employed category includes respondents employed for wages or self-employed; unemployed category includes respondents who reported being homemaker, student, retired, unable to work, and out of work for less than or greater than 1 year

[5] Binge drinking was recorded as having five or more drinks on one occasion for men and having for or more drinks on one occasion in the previous 30 days.

Table 3: Associations between sleep duration and low FV consumption overall and by Veteran Status, BRFSS 2017 (n= 60,479)

	Sleep Categories	Unadjusted odds ratio	95% Confidence Interval	Adjusted* odds ratio	95% Confidence Interval
Overall	Recommended	1			
	Less than recommended	1.56	(1.44, 1.68)	1.32	(1.21, 1.43)
	More than recommended	1.76	(1.54, 2.02)	1.40	(1.21, 1.61)
Veteran	Recommended	1			
	Less than recommended	1.85	(1.50, 2.27)	1.55	(1.24, 1.93)
	More than recommended	1.60	(1.16, 2.21)	1.26	(0.89, 1.78)
Non-Veteran	Recommended	1			
	Less than recommended	1.52	(1.40, 1.65)	1.28	(1.18, 1.40)
	More than recommended	1.80	(1.55, 2.09)	1.43	(1.22, 1.68)

*Model adjusted for age category, employment status, race/ethnicity, physical activity level, smoking status, and number of children in the household

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