

Examining the Association of Sleep Quality and Timing with Dietary Choices



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ABSTRACT

The objective of this study was to investigate the relationship between sleep quality and timing with dietary choices among Americans. A retrospective review of data from the Add Health Cross-Sectional study (Wave IV) was done. A little over half of the sample were female (51.6%), and over half (55.9%) of the sample reported having trouble staying asleep in the past week. One-Way ANOVA found no significant differences in fast food consumption among trouble staying asleep groups ($p=.793$, $F=.421$). Independent T-Test significant differences in sugar-sweetened beverage consumption between those who went to bed in the AM versus PM. The mean difference in sugar-sweetened consumption groups going to bed in the AM and PM is 2.25 (CI: 1.5-3.0) ($p<0.001$). Future studies should investigate the relationship between sleep quality and dietary choices to examine causality and further support the association between sleep and nutrition.

INTRODUCTION

The US population is experiencing two simultaneous and problematic patterns– an increase in obesity and a decrease in sleep. About 65% of Americans are overweight or obese and 40% of Americans do not get sufficient sleep. Consumption of high calorie, low nutrient foods is a critical factor in the cause of nutrition-related chronic diseases. Research has found that inadequate and insufficient sleep is associated with increased caloric consumption and poor dietary habits, thus contributing further to risk of obesity (Chaput et al, 2013). It is important to investigate the relationship between sleep and dietary consumption because studies have shown that sleep duration alone cannot explain the variation in weight status. Sleep timing and quality are also important factors to consider when establishing the relationship.

RESEARCH QUESTIONS AND HYPOTHESIS

- Does sleep quality and timing have an effect on consumption of fast food and sugar-sweetened beverages?
- Poorer sleep quality will result in higher frequency of fast food and sugar-sweetened beverage consumption
- Going to bed after midnight will result in higher frequency of fast food and sugar-sweetened beverage consumption

METHODS

- Data Collection**
 - Retrospective study of data collected from a cross-sectional study of United States young adults ranging from 24 to 32 years old (Harris, 2009)
 - Wave IV of the ADD Health study included in-home interviews designed to investigate health trajectories among the participants
- Variables**
 - Gender, Age, and Body Mass Index [weight (kg) / height (m^2)]
 - “On the days you go to work, school, or similar activities, what time do you usually wake up?” [AM/PM]
 - “On those days, what time do you usually go to sleep the day before?”[AM/PM]
 - “Over the past four weeks: How often did you have trouble staying asleep throughout the night?”
 - “How many times in the past seven days did you eat food from a fast food restaurant... ?”
 - “In the past 7 days, how many regular (non-diet) sweetened drinks did you have?...”
- Statistical Analysis**
 - One-way Analysis of Variance (ANOVA) and Independent T-Tests to measure mean differences between categorical variables
 - Multiple Linear Regression to measure the association between continuous variables and control for categorical predictors
 - Analyses were done using SPSS V25

Variable	N (%)
Gender	
Male	3147 (48.4)
Female	3356 (51.6)
Frequency of Trouble Staying Asleep	
Never	2237 (44.1)
Less than once/week	866 (17.1)
1 or 2 times/ week	866 (17.1)
3 or 4 times/week	500 (9.9)
5 or more times/week	598 (11.8)
Time going to sleep	
AM	1681 (32.9)
PM	3421 (67.1)
Time Waking up	
AM	4834 (94.9%)
PM	358 (5.1%)

SAMPLE CHARACTERISTICS

Table 1: Sample Characteristics

A total of $n=6503$ participants were analyzed. There was a nearly equal representation of males and females. The majority of participants did not have trouble staying asleep, went to bed in the PM, woke up in the AM, and had a normal BMI.

Variable	Mean (SD)
Age	29 (1.8)
Body Mass Index (BMI)	29.1 (7.5)
Frequency of Sugar Sweetened Beverage Consumption (in past 7 days)	11.32 (12)
Frequency of Fast Food Consumption (in past 7 days)	2.34 (2.9)

RESULTS

- Sleep Timing and Dietary Intake**
 - The mean consumption of sugar-sweetened beverages (SSB) were compared between two groups of time going to sleep
 - Independent T-Test found that, on average, the AM group consumed sugar sweetened drinks at a significantly higher frequency per week compared to the PM group. The mean difference in sugar-sweetened consumption groups going to bed in the AM and PM is 2.25 (CI: 1.5-3.0) ($p<0.001$). We reject the null hypothesis.

	N	MEAN (SD)	P-VALUE
AM	1657	12.8 (13.4)	$P< 0.001^*$
PM	3400	10.6 (11.2)	$F= 53.9$

Table 2: Independent T-Test comparing sugar sweetened beverage consumption between going to sleep in the AM and PM

Figure 1: Box Plot of sugar-sweetened beverage consumption across time to sleep categories

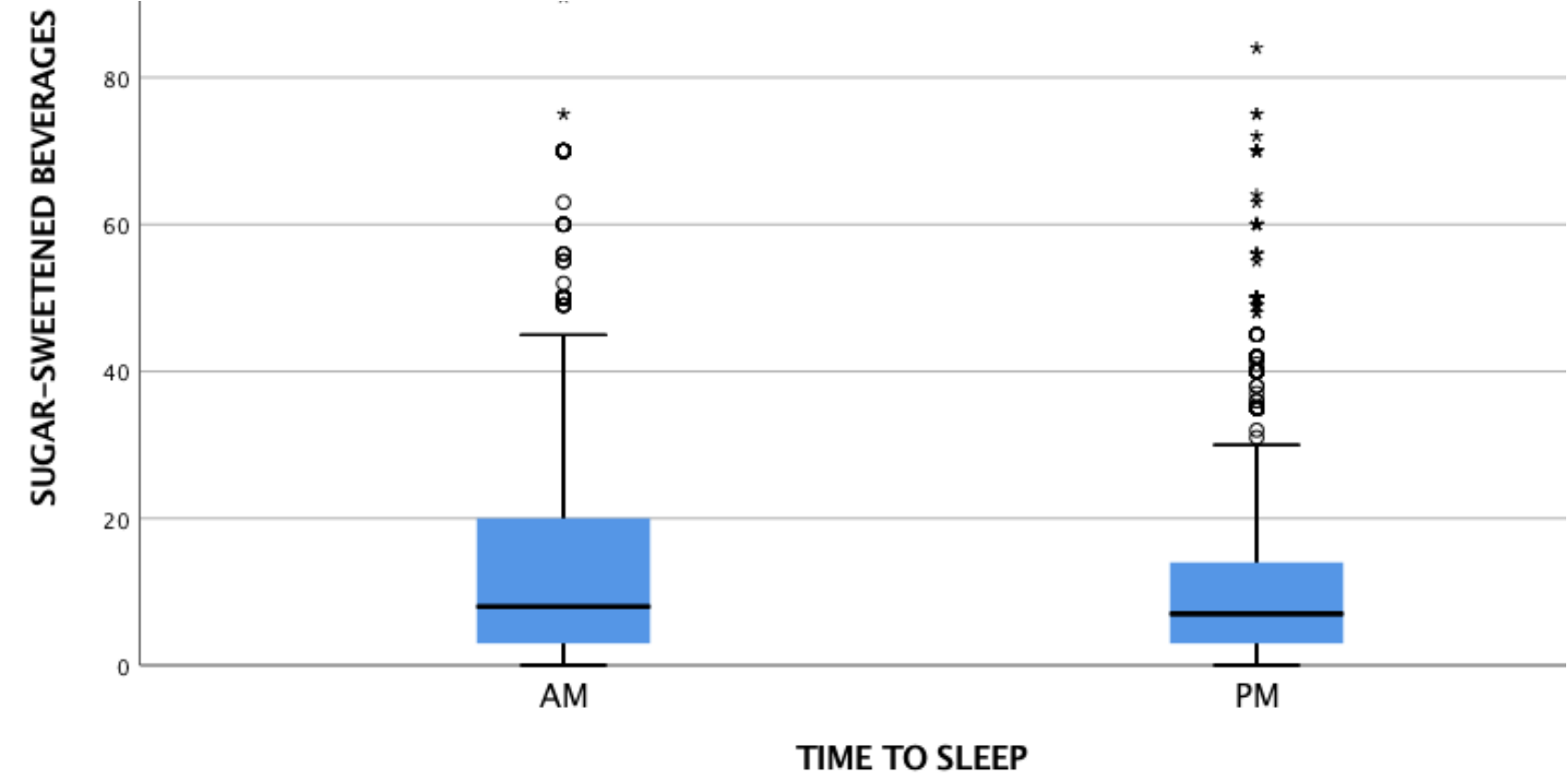
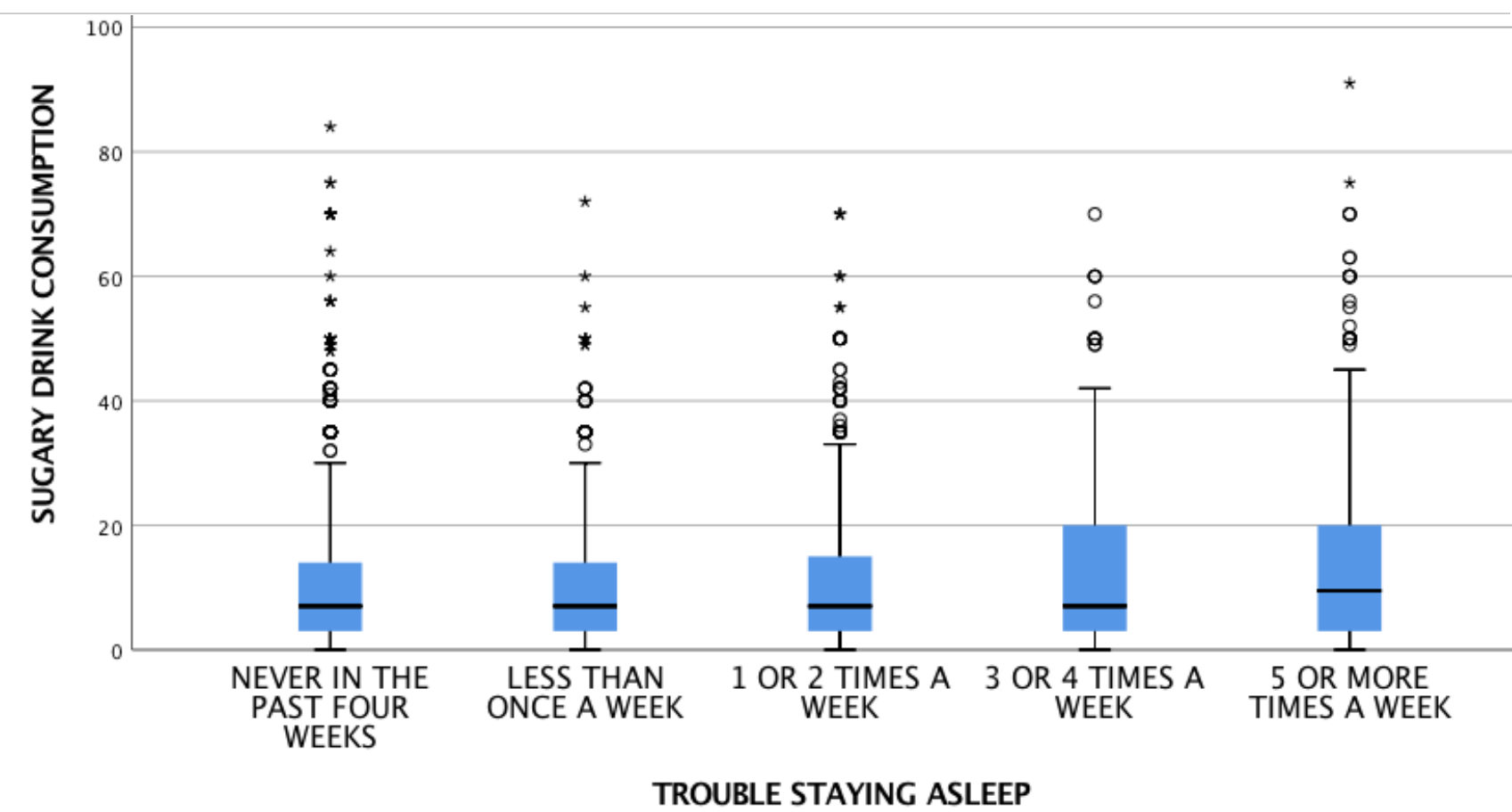


Figure 2: Box Plot of sugar-sweetened beverage consumption across trouble staying asleep



- Sleep Quality and Dietary Intake**
 - Multiple Linear Regression with Categorical Predictors
 - Outcome: Frequency of sugar-sweetened beverages
 - Predictor: Body mass index
 - Predictor: Trouble staying asleep
 - Null: Trouble staying asleep is not associated with frequency of SSB consumption after controlling for BMI. All levels of trouble staying asleep have the same relationship with SSB consumption
 - B_1 : After controlling for trouble staying asleep, for everyone unit increase in BMI, their SSB consumption increases by .018. (95% CI: -.026-.063). This is not a significant relationship ($p=.424$).
 - B_2 : Those reporting never having trouble staying asleep have 2.58 (95% CI:-3.7,-1.5, $p<0.001$) less frequency of SSB consumption compared to those have trouble 5 or more times a week.
 - B_5 : Those reporting 3 or 4 times a week having trouble staying asleep do not differ significantly in SSB consumption compared to having trouble 5 or more times a week (95% CI:-2.78, .100, $p=.068$).

Table 3: Multiple Linear Regression of Sugar-Sweetened Beverage consumption among trouble staying asleep groups $R^2=.007$

Parameter	B	t	Sig	CI Lower Bound	CI Upper bound
Intercept	13.07	.15.64	$>0.001^*$	11.44	14.717
B_2 :Trouble Sleep =0	-2.58	-4.61	$>0.001^*$	-3.68	-1.48
B_3 :Trouble Sleep=1	-3.40	-5.27	$>0.001^*$	-4.67	-2.14
B_4 :Trouble Sleep =2	-2.36	-3.65	$>0.001^*$	-3.62	-1.09
B_5 :Trouble Sleep =3	-1.34	-1.82	.068	-2.78	.10
BMI	.018	.80	.42	-.03	.06

CONCLUSION

- Discussion**
 - One-way ANOVA test found no significant differences in fast food consumption among trouble staying asleep groups ($p=.793$, $F=.421$)
 - Independent T-tests found significant differences in sugar-sweetened beverage consumption between sleep timing groups.
 - After controlling for trouble falling asleep, BMI is not significantly related to sugar-sweetened beverage consumption. Trouble falling asleep is significantly associated with sugar-sweetened beverage consumption, the average sugar-sweetened beverage consumption increases as frequency of trouble staying asleep increases.
 - The results support evidence that there is a significant association with sleep timing and dietary consumption of sugar-sweetened beverages. Baron et al found similar results, where people who went to bed later were at higher risk for poorer dietary choices (2011).The current study also supports evidence that sleep quality is associated with poorer dietary choices. Owen's et al. found women who had trouble staying and falling asleep had higher hip to waist ratios, but evidence was limited looking at dietary choices specifically (1998). It is important to investigate these aspects of sleep because of the growing issue of Americans not getting adequate sleep and making poorer dietary habits.
 - Limitations included the use of self-reported data, did not control for many confounding factors such as ethnicity, and cross-sectional studies cannot establish causality in relationships
- Implications**
 - The current study provides evidence that sleep timing and quality are important predictors of dietary consumption habits. Further research is warranted to examine the association of going to bed before or after midnight, and whether nutrition-related behavior can change as a result.

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