

Comparisons between Married and Never Married Women Employed in Two Southern California Universities on Frequencies of Food and Beverage Consumption: Implications for Health

Michele Mouttapa^{1*}, Sharonda Wallace²

¹Department of Health Science, California State University, Fullerton, PO Box 6870, Fullerton, CA
²Program Dean, Master in Public Health, West Coast University, 8435 North Stemmons Freeway, Dallas, TX
*Corresponding author: mmouttapa@fullerton.edu

Abstract It has been estimated that over one in three adults in the United States is obese, and that obese women have higher rates of mortality from all causes compared to obese men. Attention has been devoted to background characteristics that are associated with the consumption of foods and beverages that are related to obesity. One such characteristic is marital status, and studies suggest that married individuals have healthier dietary behaviors, including more consumption of fruits and vegetables, compared to never married, divorced, or widowed individuals. This cross-sectional study expands upon existing research by examining marital status differences on the frequency of: (1) sugar-sweetened beverage (e.g., fruit-flavored beverages and non-diet sodas), (2) diet beverage, and (3) caffeinated beverage consumption (e.g., coffee and energy drinks), as well as (4) fruit (including 100% fruit juices) and (5) vegetable consumption. One hundred forty married and 104 never married female staff at two southern California universities in the United States completed a self-report online survey responding with demographic information, height, weight, and past week frequency of specific dietary intakes. Results indicated that the married and never married women had statistically similar body mass index (BMI). When controlling for demographic variables, married women had higher frequencies of vegetable consumption, diet beverages, and caffeinated beverages, while never married participants had higher frequencies of sugared beverage consumption. Previous studies have suggested that married women make healthier food choices in general compared to non-married women. However our findings suggest that further research is needed to compare married and never married women's beverage choices in greater detail, to better understand whether their varied preferences place them at differential risk for obesity in the long term.

Keywords: dietary intakes, marital status, beverages, overweight, obesity, women

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1. Introduction

Obesity remains a U.S. epidemic, with an estimated 34.9% of adults over age 20 being obese in 2011-2012 [1]. It has been estimated that obesity-related diseases such as coronary heart disease, Type 2 diabetes, hypertension, and stroke are associated with a 5-year reduction in life expectancy among U.S. women [2]. The association of Grade III obesity (defined as a BMI > 40) with mortality due to all causes is significantly higher among U.S. women compared to U.S. men [3].

Fruit and Vegetable Consumption and Obesity

Diet, specifically the high consumption of nutrient dense foods (e.g., vegetables, whole grains, fruits, and low fat dairy), relative to the consumption of energy dense

foods (e.g., those that contain added sugars and fat), is related to lower obesity rates. In a meta-analysis of 16 prospective cohort studies, Wang and colleagues [4] estimated that a one-serving increase in fruit and vegetable consumption was associated with a 4% decrease in cardiovascular-related mortality [4]. Despite the documented benefits of fruit and vegetable consumption, approximately less than one fourth of U.S. adults consumed the recommended 5+ servings of fruits and vegetables daily in 2007 [5]. Among women, high fruit and vegetable intake are associated with less weight gain [6]. The benefits of healthy eating, which include high fruit and vegetable intake, are associated with similar reductions of all-cause mortality for both men and women [7].

Beverage Consumption and Obesity

The intake of added sugar among Americans is high. Yang and colleagues [8] estimated in a prospective cohort

study that 71% of U.S. adults consume at least 10% of their calories from added sugar [8]. They also found that those who consumed 10-24.9% of their calories from added sugar were 30% more likely to die from cardiovascular disease. The American Heart Association [9] recommends that women should consume only 100 calories of added sugar per day, which translates to approximately 6% of total calories. Long-term consumers of artificially-sweetened beverages, such as diet sodas, may also be prone to overweight and obesity; this is due to the increased insulin resistance and compensatory eating associated with the consumption of such beverages [10]. Those who drink sweetened caffeinated beverages, such as coffees, teas, energy drinks, and some sodas may be especially prone to overweight and obese status, due to the addictive nature of caffeine [11].

Marital Status and Dietary Consumption

Attention has been devoted to background characteristics that are associated with the consumption of foods and beverages that are related to obesity. One such characteristic is marital status, and studies suggest that married men and women have healthier dietary behaviors compared to never married, divorced, or widowed men and women. For example, married individuals have higher rates of consuming 5+ fruit and vegetable servings daily [5], and consume a wider variety of vegetables [12], compared to non-married individuals. For men, marriage has protective associations against obesity-related morbidity; in a 22-year longitudinal study, never married men were 16% more likely to develop Type-2 diabetes compared to married men [13]. It was believed that at least some of this marital status difference in disease risk could be attributed to healthier diets among married men. Mata, Frank, and Hertwig [14] found that in nine European countries, couples reported buying more unprocessed foods and fewer convenience foods compared to unmarried individuals. Boone-Heinonen and colleagues [15] suggest that married couples in the United States may have more opportunities to eat healthier foods including fruits and vegetables compared to their non-married counterparts, since they found that married participants tended to live in higher-income neighborhoods with a higher density of supermarkets.

Henricksen, Thorsheim, and Thuen [16] suggested the companionship that relationships such as marriage provides reduces the brain's metabolic need for substances like sugar to perform daily life skills such as problem-solving, coping with potential threats, and emotion regulation. In this study, all participants were in their first trimester of pregnancy, and it was found that women who were married to, or lived with, their male partner consumed less cola and sugar-sweetened juices compared to women who did not live with a male partner. No such differences were found for diet beverages.

The Present Study

This study analyzed secondary data to examine differences between married and never married women on the consumption frequency of foods and beverages that are protective against or promote obesity. Utilizing existing baseline data from an online intervention study reported elsewhere [17], the present study examined differences between never married and currently married participants in the United States on consumption frequencies for fruit, vegetables, sugar-sweetened beverages (e.g., regular sodas

and sweetened, fruit-flavored beverages), caffeinated beverages (e.g., coffee and energy drinks), and diet sodas.

Consistent with previous findings [5,12,16], it was predicted that married women would more frequently consume fruits and vegetables, and less frequently consumed sugared beverages, compared to never married women. Similar to Henricksen, Thorsheim, and Thuen [16], it was predicted that married and never married women would not differ in their consumption frequency of diet soda. Last, since many caffeinated beverages are consumed with sugar, we also predicted that never married women would more frequently drink caffeinated beverages compared to married women. Although this cross-sectional survey study cannot test for causal relationships, it has the potential to preliminarily test previous findings that marriage is related to women's decreased metabolic cravings for sugar [16], but with women not currently pregnant, and that marriage provides increased opportunities for healthier food selections [15], statistically controlling for variations in socioeconomic status.

2. Methods

2.1. Study Setting and Research Ethics

Data for this cross-sectional study came from the baseline data of a randomized controlled trial of the Personal Nutrition Planner, a component of a larger nutrition website (www.HealthyEating.org). Please refer to Mouttapa et al. [17] for further details about the intervention procedures and findings. All study procedures described here received institutional review board approval from California State University, Fullerton prior to study implementation.

2.2. Participants

Participants were female staff members at two southern California universities. Study recruitment involved sending e-mails to over 4,000 males and females whose e-mail addresses appeared in the universities' global address list as university staff members. Male recipients were instructed that they could forward the e-mail to their female co-workers. Interested participants replied to the email and completed a brief screening tool to determine eligibility for the study. Inclusion criteria were ages 21 – 65 years old, not pregnant, not on a vegan diet, and have Internet access.

2.3. Sample Size

A total of 283 women expressed interest in participating in the intervention study, met eligibility requirements, and completed the baseline survey. Of them, 140 (49.5%) were married, 104 (36.7%) had never been married, and 39 (13.8%) were divorced or widowed. The analytic sample consisted of those who had never been married ($n = 104$) and those who were currently married ($n = 140$), for a sample size of 244. Hence, the divorced and widowed participants were not included in these analyses due to their relatively small sample sizes. Per the request of the intervention experts on the research team, we did

not ask whether participants lived with a significant other outside of marriage. It was thought that some university staff may experience potential discomfort in disclosing information about their personal lives in their work setting.

2.4. Measures

Dietary intake included the self-reported frequency of servings in each of the following groups in the past week (7 days): (1) fruits (defined as fresh and canned fruits, and 100% fruit juices), (2) vegetables (raw, leafy, and cooked vegetables, and 100% vegetable juices), (3) sugar-based beverages (fruit-flavored beverages and non-diet sodas), (4) diet sodas, and (5) caffeinated beverages (coffee and energy drinks). The answer options ranged from 0 (no consumption of the food group in the past week) to 35 (consumption of the food group 35+ times in the past week, or an average of at least 5 times per day). The questions within each category were adapted from the National Institutes of Health's All Day screener [18], Daily Food checklist [19], and Dietary Health Questionnaire [20]. Due to limitations in the accepted length of the survey, we did not ask questions regarding the estimated portion sizes of what was consumed.

Participants self-reported their best estimate of their current weight in pounds, height in inches, their marital status, ethnicity (Latino/Hispanic, non-Hispanic White, Asian, African American, or "Other"), current smoking status (smoker or non-smoker), education level (less than high school, high school graduate, some college, undergraduate degree, and post-graduate studies), and annual income (under 25,000 USD, 50,000-99,000 USD, 100,000-149,000 USD, 150,000-199,000 USD, and 200,000+ USD).

2.5. Statistical Analyses

Comparisons were made between married and never married women on demographic characteristics (smoking status, ethnicity, level of education, and individual annual income) using chi-square statistics. The estimated BMI was calculated for each participant by inputting their self-reported height and weight calculation: (Weight in lbs

$\times 703) / (\text{Height in inches})^2$ [21]. Comparisons were made between married and never married women on smoking status, ethnicity, education level, and annual income with chi-square tests. An independent samples t-test was calculated to determine whether self-reported BMI varied by marital status. Next, married and never married women were compared on the number of past week servings of vegetables, fruit, sodas, and caffeinated beverages using Mann-Whitney U-tests, as scores on these variables had positive skewness. Last, ordinal logistic regression models were run for these same comparisons, controlling for demographic variables that were related to the outcome variables in preliminary univariate analyses.

3. Results

Table 1 presents demographic characteristics of the sample by marital status. Seven participants (2.9% of the sample) reported being current smokers. Nearly two thirds of the participants (65.6%) had an undergraduate degree or higher. Married participants were more often Caucasian (60.7%) compared to the never married (44.3%), while the never married participants were more often Asian (19.2%) or African American (7.7%) compared to the married participants (8.6% and 2.9%, respectively). Married participants were more likely to earn \$50,000+ per year (87.5%) than never married participants (40.4%). Married and never married participants did not differ from each other on BMI. Across the sample, participants, on average, were in the overweight category ($\text{BMI} \geq 25$).

Table 2 presents means and standard deviations, and medians for the outcome variables by marital status. Medians (Med) are presented here. No significant differences were found between married and never married participants on fruit consumption (Med = 7.0). However married participants reported consuming vegetables (Med = 17.0), caffeinated beverages (Med = 2.0), and diet sodas (Med = 2.0) more frequently compared to never married participants (Med = 14.0, Med = 6.0, and Med = 0.0 respectively). Conversely, never married participants more frequently consumed sugared beverages (Med = 2.0) compared to married participants (Med = 0.0).

Table 1. Demographic Characteristics of the Sample by Marital Status

	Married (n = 140)	Never Been Married (n = 104)	χ^2	p
	n (%)	n (%)		
Current smoker	4 (2.9)	3 (2.9)	0.02×10^{-2}	0.99
Ethnicity			12.00	0.02
Caucasian	85 (60.7)	44 (44.3)		
Latino	28 (20.0)	23 (22.1)		
Asian	12 (8.6)	20 (19.2)		
Other	11 (7.9)	9 (8.7)		
African American	4 (2.9)	8 (7.7)		
Level of Education			3.18	0.36
High school	7 (5.0)	1 (1.0)		
Some college	43 (30.9)	32 (30.8)		
Undergraduate degree	56 (40.3)	44 (42.3)		
Postgraduate education	33 (23.7)	27 (26.0)		
Annual Income			65.06	0.01×10^{-3}
Less than \$25,000	2 (1.5)	18 (17.3)		
\$25,000-\$49,000	15 (11.0)	44 (42.3)		
\$50,000-\$99,000	60 (44.1)	30 (28.8)		
\$100,000+	59 (43.3)	12 (11.6)		
BMI (M (SD))	26.8 (5.9)	27.7 (7.9)	t 1.02	p 0.331

Table 2. Consumption Frequency Outcomes by Marital Status

Weekly Consumption Frequency for Each Food Group	Married (n= 140)		Never Married (n=104)		p
	M (SD)	Median	M (SD)	Median	
Fruit/Fruit juice	9.9 (7.8)	7.0	8.8 (7.5)	7.0	0.16
Vegetables/Veg. juice	19.1 (10.8)	17.0	16.2 (10.7)	14.0	0.01
Sugared beverages	1.2 (2.0)	0.0	2.7 (3.5)	2.0	< 0.001
Diet sodas	2.5 (4.2)	0.0	1.4 (3.5)	2.0	< 0.001
Caffeinated beverages	6.8 (7.6)	2.0	3.8 (4.9)	6.0	< 0.001

Note. P-values derived from Mann-Whitney U results.

Table 3. Ordinal Logistic Regression of Outcome Variables on Married (vs. Never Married) Status

	Wald	p	Interpretation
Fruits/ Fruit juice^a			
Marital status	0.75	0.39	(non-significant)
White ethnicity	6.53	0.01	Whites consumed fruits more frequently than non-Whites.
Vegetables/ Veg. Juice^a			
Marital status	4.86	0.03	Married women consumed vegetables more frequently than never married women.
White ethnicity	6.65	0.01	Whites consumed vegetables more frequently than non-Whites.
Sugared Beverages^{ab}			
Marital status	7.75	0.01	Married women consumed sugared beverages less frequently than never married women.
White ethnicity	8.90	0.03×10^{-1}	Whites consumed sugared beverages less frequently than non-Whites.
Annual income	6.21	0.01	Higher income was associated with less frequent sugared beverage consumption.
Diet Sodas^a			
Marital status	9.25	0.02×10^{-1}	Married women consumed diet sodas more frequently than never married women.
White ethnicity	2.81	0.09	(non-significant)
Caffeinated Beverages^b			
Marital status	5.46	0.02	Married women consumed caffeinated beverages more frequently than never married women.
Annual income	2.00	0.16	(non-significant)

^a Test statistic controlled for White ethnicity, since results of Mann-Whitney U tests indicated that White participants had higher frequencies of weekly fruit consumption (Median= 7.0), vegetable consumption (Median= 16.5), and diet sodas (Median= 1.5) and lower frequencies of sugared beverage consumption (Median= 0.0) compared to non-White participants (Medians= 5.5, 13.0, 0.0, and 1.5, respectively). All of the p-values for these analyses were 0.05 or lower.

^b Test statistic controlled for annual income, since results of Kruskal-Wallis tests indicated that higher levels of income was associated with less consumption of sugared beverages and greater consumption of caffeinated beverages. All of the p-values for these analyses were 0.05 or lower.

Non-parametric tests were run to identify demographic variables that were significantly associated with any of the dietary outcomes; as such demographic variables could be subsequently included as covariates in the multivariate analyses. Results of Mann-Whitney U tests indicated that White participants had higher frequencies of weekly fruit consumption (Med= 7.0), vegetable consumption (Med= 16.5), and diet sodas (Med= 1.5), and lower frequencies of sugared beverage consumption (Med= 0.0), compared to non-White participants (Medians= 5.5, 13.0, 0.0, and 1.5, respectively). Results of Kruskal-Wallis tests indicated that higher levels of income was associated with less frequent consumption of sugared beverages and more frequent consumption of caffeinated beverages. All of the p-values for these analyses were 0.05 or lower. None of the other demographic variables were significantly associated with any of the dietary outcomes.

Table 3 presents ordinal logistic regression results of the consumption frequency of fruits, vegetables, caffeinated beverages, diet sodas, and sugared beverages. The ordinal logistic regression models included marital status as the predictor variable, and controlling for other demographic variables that were significantly associated with the given outcome in the model. All of the significant differences

reported in Table 2 remained unchanged in these analyses. Namely, compared to never married women, married women had higher frequencies of vegetable, diet soda, and caffeinated beverage consumption, and lower frequencies of sugared beverage consumption.

4. Discussion

Our study is one of the first known ones to examine differences between married and never married women on both foods and beverages with known relations to obesity risk- specifically the weekly frequencies of fruit, vegetables, and sweetened beverages, diet sodas, and caffeinated beverages. Previous studies have also suggested that married individuals consume more vegetables [5] and a wider variety of vegetables [12]. Similarly, we observed that married women reported eating vegetables more frequently than never married women. This finding is not attributable to the income differences between married and never married women in our sample; since vegetable consumption did not vary by income level in the analyses we conducted to identify demographic covariates. Hence, marital status differences

in vegetable consumption frequency might be due to other factors. For example in a scoping review, Nicklett and Kadell [22] concluded that having young children and increasing age are associated increased fruit and vegetable intake, and that the companionship marriage provides may be linked to healthier eating habits. Such variables may have been related to vegetable consumption frequency in this study, and should be considered in future studies that examine marital status differences in dietary behaviors.

Never married women reported drinking sweetened beverages approximately 1-2 more times per week compared to married women. Although never married and married women had statistically comparable BMIs, the increased frequency of sugared beverage consumption among the never married women could place them at relatively greater risk for obesity in later years. A large 20-year longitudinal study of adults suggested that increasing one's sweetened beverage consumption by one 12-ounce serving per day is associated with a quarter pound weight gain per year [23]. Since serving sizes were not collected in our study, it was not possible to estimate how much obesity risk is associated with the additional 1-2 instances of sugared beverage consumption per week among the never married women.

Married women, on average, drank one more diet soda per week compared to never married women. Drinking diet sodas rather than sugar-sweetened beverages may be a short-term solution for abdominal fat, in that diet soda consumption was not positively correlated with visceral adipose tissue among middle-aged participants in the Framingham Heart Study [24]. However in a nine-year longitudinal study of older adults, increases in waist circumference among habitual diet soda consumers was nearly triple that of individuals who did not drink diet soda regularly [25]. Hence, although married women in this study did not drink sugar-sweetened beverages as often as their never-married counterparts, their higher rates of diet soda consumption may still place them at long-term risk for obesity.

Contrary to our predictions, married women reported drinking caffeinated beverages nearly twice as frequently as never married women. Drinking caffeinated beverages such as coffee may have some health benefits, as coffee consumption has been associated with greater life expectancy and lower rates of cardiovascular disease [26]. In mice, coffee consumption has been linked to metabolic alterations that results in the breakdown of lipids [27]. However the beneficial effects of drinking coffee beverages may be compromised if they are consumed with large amounts of sugar or artificial sweeteners, which are known to increase obesity risk [23,25]. In the present study it is not known whether participants consumed caffeinated beverages that were sweetened or unsweetened.

A noteworthy finding that was not part of our initial research hypothesis was that White women, independent of marital status, reported eating healthier than non-White women in regards to more frequent fruit and vegetable consumption and less frequent sugared beverage consumption. The differences found between White and non-White women we observed were not due to ethnic disparities in socioeconomic status, as suggested by Storey and Anderson [28], since these variables were taken into consideration in the analyses. Possible other reasons may

include that taste sensations vary by ethnicity, which can potentially influence food consumption patterns [29].

This study had a few limitations that need to be considered. Since a cross-sectional design was employed, it was not possible to examine changes in dietary patterns over time as one transitions from a single life to a married one. With such a study, one can better determine whether marital status differences in dietary consumption correspond to other lifestyle changes such as having combined incomes and having children. Secondly in an attempt to increase survey response rates in our sample, we were advised to keep the survey relatively brief. Therefore we did not include questions assessing serving sizes for the dietary intake items, or whether or not caffeinated beverages were sweetened. For reasons related to participants' privacy, we were advised against assessing age and cohabitation with a partner while unmarried. We also did not ask questions regarding marriage quality (for those who were married), or number of children, both of which could have possibly impacted study results. Therefore we do not know whether our findings vary across different age groups and whether never married individuals who live with a partner have dietary intakes that are more similar to never married women with no partner, or those who are married. Last, our study took place in two public universities in southern California, among female staff members who were predominantly Caucasian and Latina/Hispanic. Therefore findings may not generalize to non-university settings, areas outside of southern California (in the United States), males, and non-White, non-Latino-Hispanic ethnic groups.

5. Conclusions

Findings from this preliminary study suggest that married and never married women of similar BMI and employment status (e.g., employed in a university setting) may have varied food and beverage preferences that are related to obesity risk. The differences we observed may be due to a variety of reasons that have been documented in previous studies, a few of them including marital relationships providing metabolic needs that reduce sugar cravings [16], that a supportive marriage contributes to women's healthier dietary behaviors in general [30], or that marriage commonly involves child-rearing, which is linked to healthier dietary behaviors [23]. Follow-up studies are needed to further confirm marital status differences in food and beverage consumption, and to quantify serving the sizes, in order to determine whether marital status places women at differential risk for obesity based upon their consumption patterns. Further research is also needed to better understand the situational context surrounding food preferences, from the perspectives of married women and never married women. The findings of such research can better inform obesity prevention programs to address the varied needs of women, some of which may be connected to their marital status.

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