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Low subjective social status is associated with daily selection of fewer healthy foods and more high-fat/high sugar foods

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ABSTRACT

Socioeconomic status has been related to poorer eating behaviors, potentially due to feeling of lower status relative to peers. Despite experimental evidence that temporarily feeling of lower status can contribute to greater caloric intake, it remains unclear how feeling of lower social status relate to eating behavior in daily life. This study aimed to test whether lower subjective social status (SSS)—the feeling of having relatively lower social status—in American society and relative to college peers were related to daily food selection. A sample of 131 young adults (*M*age = 20.3, *SD* = 0.8; 60% female; 46% Latinos; 34% European American; 15% Asian American; 5% of other ethnicities) reported their SSS in society and in college and completed 15 daily reports regarding the number of daily servings they had of fruits, vegetables, fried foods, fast foods, desserts, and sugary drinks. Multilevel models with days nested within individuals were used to test whether low SSS in society or college related to daily food intake. Next, we examined whether associations were driven by young adults' perceived stress and daily stressors. Analyses controlled for age, gender, ethnicity, family and personal income, and parents' education to test the unique associations between subjective status and food intake. Whereas SSS in society was not related to food intake, young adults with lower SSS in their college consumed fewer daily servings of healthy foods and more daily servings of high-fat/high-sugar foods. Although lower college SSS was related to greater perceived stress, perceived stress and daily stressors were consistently unrelated to daily food intake. Findings suggested that lower SSS in local environments (e.g., college) may impact young adults' daily food choices through processes beyond heightened stress.

1. Introduction

People from lower socioeconomic backgrounds show greater risk for obesity and poorer metabolic health (Cohen et al., 2013; Levine, 2011; Svastisalee et al., 2012). These patterns may be partially due to differences in food selection, as lower socioeconomic status has been consistently related to less healthy eating behavior (e.g., Kirkpatrick et al., 2012; Wilson et al., 2004). However, in addition to objective income, relative differences in income can also impact obesity. Indeed, countries with higher income inequality tend to have greater prevalence of obesity, and obesity is more related to country's degree of inequality than its absolute economic level (Due et al., 2009). It is possible that feeling of low status relative to local peers may similarly relate to obesity risk in daily life, although this has not been previously tested.

Perceptions of having lower status relative to others, also known as having lower subjective social status (SSS), may be another important yet understudied factor that may relate to metabolic health and food selection. Subjective evaluations of social status can account for aspects of social position that objective socioeconomic status cannot (e.g., relative income). Studies consistently suggest that SSS is only

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moderately related to indicators of objective socioeconomic status such as income and education, in part because people can account for other daily experiences such as stressors when evaluating their SSS (Adler et al., 2000; Goodman et al., 2001). Lower SSS is often uniquely predictive of poorer metabolic health, including higher obesity risk, body mass index (BMI), adiposity, and metabolic syndrome, over and above income and education in adolescents and adults (Kaiser et al., 2012; Quon & McGrath, 2014; Tang et al., 2016). Despite these associations, it remains unclear how lower SSS may influence food selection on a daily basis, and whether this association may be driven by differences in stress. Therefore, the present study examined how feeling of low status relates to stress and daily food selection during young adulthood, when individuals have newfound autonomy in their food choices and are particularly sensitive to concerns regarding social status (Bassett et al., 2008; Forbes & Dahl, 2010).

1.1. Subjective social status and eating behavior

Theoretical research suggests that the subjective experience of having low status relative to other people, or having lower SSS, may influence eating behavior. Specifically, the insurance hypothesis posits that humans increase energy intake over energy expenditure when they are uncertain about having an adequate food supply, resulting in fat storage (Nettle et al., 2017). This response may be adaptive as people can ensure they have physiological resources available in times of need. Likewise, the resource scarcity hypothesis posits that people who perceive low status or low resource access would be in a state of chronic positive energy balance (i.e., energy intake exceeds energy expenditure) and prioritize calorie intake when resources are available (Dhurandhar, 2016). People consequently capitalize on high-calorie foods as they are available, especially when status is unstable and when future access to resources is uncertain (*Kaiser* et al., *2012*). For instance, a previous study suggested that providing food access to low-income adults resulted in increased prevalence of obesity shortly thereafter (Fernald et al., 2008). People who have low SSS may also feel uncertain about their circumstances and prioritize calorie intake.

Empirical research similarly suggests that low SSS may influence eating behaviors. In animal models, both unstable and low hierarchical rank can elicit changes in eating behaviors. *S*tatus loss and social subordination result in preference for calorie-rich diets and increased adiposity in animals, potentially so that these animals can capitalize on available resources (e.g., Gosler, 1996; Roman et al., 2019). Subordinate animals consume more energy-dense foods and more food overall than dominant animals (e.g., Tamashiro et al., 2007; Wilson et al., 2008). Animals of lower hierarchical position may naturally tend to capitalize on high-energy foods in case they require energetic mobilization for processes to promote survival (e.g., fighting or fleeing). Indeed, species of birds of more subordinate status have evolved to have greater fat reserves than dominant status birds (Ekman & Lilliendahl, 1993; Pravosudov & Lucas, 2001). It is possible that lower subjective status (i.e., perceived rank status relative to other people) may better account for this form of social position that objective socioeconomic status in humans.

In humans, experimentally inducing people to feel of lower status or having lower resource access has been found to increase people's preferences for high-energy foods compared to fruits or vegetables (Cardel et al., 2016) and consumption of more calories and larger portions in subsequent snacks and meals (Cheon & Hong, 2017). Acute manipulations that induce lower perceived status can elicit physiological changes (e.g., increases in active ghrelin) that stimulate appetite (Sim et al., 2018) and promote sensitivity to the caloric load of beverages, such that people can identify and prioritize high-calorie foods (Lim et al., 2020). However, despite results from these experimental studies, it remains unclear how chronic feeling of lower status in society or in one's local community can also influence food selection in everyday life.

Eating behavior in daily life may differ from the laboratory context because participants in experimental studies may not have access to preferred foods, may be conscious of their eating in the laboratory setting, and may be influenced by other factors in their daily life (e.g., daily stress, food cost; e.g., Reichenberger et al., 2018; Robinson et al., 2015). To our knowledge, only one study to date has examined associations between low SSS and daily food preferences. In this study, lower SSS in society was associated with consumption of more calories per day among 17 college students across 14 days (Wijayatunga et al., 2019). However, additional investigation is needed to determine whether similar associations between lower SSS in society and food selection are found in a larger, more socioeconomically and ethnically diverse sample. Further, it remains unclear whether SSS relates to types of foods selected (e.g., fruits, fast foods), and whether SSS in both distal and local settings (e.g., society versus college) relates to daily food selection.

Food choices may be particularly influenced by SSS for young adults. Developmentally, youth are sensitive to social status concerns during adolescence and the transition to adulthood (Forbes & Dahl, 2010). Social comparison is prominent during the college transition, and lower SSS is related to poorer mental health at the start of this transition (Rahal et al., 2020; Yang et al., 2018). Also, as they age, youth transition from relying on their parents for meals to having greater autonomy over their own diets (Bassett et al., 2008). This adjustment can be challenging for youth, as college students often struggle to manage their weight (e.g., Nelson et al., 2008).

1.2. Associations between subjective social status, stress, and eating behavior

It is possible that feeling of low status may be stressful and thereby promote altered daily eating behavior (Bratanova et al., 2016). People of lower status generally live in circumstances which promote exposure to chronic and daily stressors, such as demands from other people, and higher perceived stress (Cundiff et al., 2020). Further, experimental and correlational studies suggest that lower SSS is related to greater psychological and physiological stress (e.g., Habersaat et al., 2018; Pieritz et al., 2016; Steen et al., 2020). Heightened stress among people with lower SSS may contribute to poorer daily eating. People often eat more when they feel stressed, potentially as a means of emotion regulation (e.g., Araiza & Lobel, 2018). Likewise, people who experience more daily hassles engage in more snacking, greater consumption of high-fat and high-sugar foods, and lower consumption of fruits and vegetables (e.g., Reichenberger et al., 2018; Zenk et al., 2014). Consequently, differences in stress may explain associations between SSS and eating behaviors. For instance, people with lower SSS were more likely to report eating as a means of managing emotions (Kauffman et al., 2020). Yet, no study has examined whether stress explains associations between SSS and food selection.

1.3. Present study

The present study examined associations between low SSS in society and in college and daily food selection in young adults, as well as whether these associations were explained by higher levels of stress. Young adults reported their SSS in American society and in college as well as their daily servings of fruits, vegetables, fried foods, fast foods, desserts, and sweet drinks across 15 days. They also reported perceived stress and frequency of daily stressors, including conflicts and demands. In line with previous studies (e.g., Wijayatunga et al., 2019), we predicted that young adults with low SSS in society and low SSS in college would report fewer daily servings of healthy foods (i.e., fruits, vegetables) and more daily servings of high-fat/high-sugar foods (i.e., fried foods, fast foods, desserts, sweet drinks). Given evidence relating both lower SSS to higher stress and higher stress to daily eating behavior (Cundiff et al., 2020; Reichenberger et al., 2018; Zenk et al., 2014), we tested higher stress as one pathway relating low SSS to poorer daily food selection. Models were repeated controlling for perceived stress over the

past month and daily stressful events to determine whether associations between low SSS and fewer daily servings of healthy foods and more daily servings of high-fat/high-sugar foods were explained by higher stress.

2. Method

2.1. Participants

Data from a community sample of 131 young adults (M_{age} = 20.3, *SD* = 0.8; 60% female) who were part of a larger three-wave longitudinal examination of the transition from adolescence to adulthood were analyzed in this study. Participants were initially recruited from the 10th and 11th grades from four high schools in the greater Los Angeles area and had the option to participate in subsequent waves of data collection. Participants from the larger study were included in the analytic sample if they completed reports of daily food selection and reported society SSS (*N* = 129) or were enrolled at college and reported SSS at college (*N* = 106; *N* = 104 reported both). Participants were ethnically diverse (46% Latinos; 34% European American; 15% Asian American; 5% of different ethnic backgrounds including Middle Eastern, African American, and biracial). A primary caregiver reported each parent's level of education, and education was averaged across both parents when available (31% did not pursue education beyond high school, 45% completed vocational school or some college, 34% completed a college degree or higher). Caregivers also reported annual income (*M* = $81,745, *SD* = $62,638, range $4,750-$410,000). If caregivers did not report income, reports were used from data collection either two (*N* = 15) or four years prior (*N* = 3). Participants reported their personal annual income from a job, although many participants were students and without current employment (*M* = $1,559, *SD* = $8,149, range $0-$36,000).

2.2. Procedures

Participants learned about the study through flyers and in-class presentations. They had the option to continue data collection two and four years later. Analyses were limited to the third and final wave of data collection because participants reported daily food servings only at this wave. Young adults completed a psychosocial survey, in which they reported their SSS in society, SSS at their college, and perceived stress.

Young adults completed up to 15 physical, paper daily checklists (*M* = 14.3 days completed per participant, 95.3% possible days completed). At the end of each day before bed, participants reported their daily food servings and various daily events, including whether they had a meal with a family member and whether they experienced any conflicts or demands each day (yes/no). Participants received $120 as compensation for completing the survey and two movie theater passes for on-time completion of the daily checklists in this wave. Procedures were approved by the University of California, Los Angeles Institutional Review Board and were in accordance with the Declaration of Helsinki, and all participants gave informed consent.

2.3. Measures

2.3.1. Society subjective social status

Young adults reported their SSS in society using the MacArthur Scale of Subjective Social Status—Youth Version (Adler et al., 2000; Goodman et al., 2001). Participants viewed a 10-rung ladder with the following prompt:

"Imagine that this ladder pictures how American society is set up. At the top of the ladder are the people who are the best off—they have the most money, the highest amount of schooling, and the jobs that bring the most respect. At the bottom are people who are the worst off—they have the least money, little or no education, no job or jobs that no one wants or respects. Now think about your family. Please tell us where you think your family would be on this ladder."

SSS is a well-established indicator of status that is consistently related to objective indicators of status, relates to perceptions of status from mixed-methods research, shows test-retest reliability, and robustly shows unique associations with health (Goodman et al., 2001; Mistry et al., 2015; Operario et al., 2004; Quon & McGrath, 2014). This validated measure asks about the family's socioeconomic status because individuals have not necessarily had enough time to develop their own socioeconomic status. Higher scores suggested higher society SSS.

2.3.2. College Subjective Social Status

Participants viewed a second ladder with this prompt:

"Now assume that the ladder is a way of picturing your school. At the top of the ladder are the people in your school with the most respect, the highest grades, and the highest standing. At the bottom are the people who no one respects, no one wants to hang around with, and have the worst grades. Where would you place yourself on this ladder?"

Again, higher scores represented higher SSS. This scale has been well-validated, and high scores are consistently associated with better health (Goodman et al., 2001; Quon & McGrath, 2014).

2.3.3. Daily food selection

Each day, participants reported how many servings they consumed of each of six types of food: fruits, vegetables, desserts, sweet drinks, fast foods, and fried foods. Items included examples of each type of food (e.g., for fast foods, "e.g., one burger, hot dog, burrito, slice of pizza, etc."). Participants were asked to specify the number of servings of each food type that they had each day. Previous large-scale and daily studies have used similar items regarding daily servings of fruits and vegetables, and have found that greater selection of fruits and vegetables relates to greater positive affect and well-being (Conner et al., 2015; Russell et al., 1999; White et al., 2013). Desserts, sweet drinks, fast foods, and fried foods have also been examined in prior studies (e.g., Chan et al., 2015). Therefore, for this study, we created items for each food category to mirror the framing of the items regarding fruits and vegetables.

We used two exploratory factor analyses (EFA) of the daily food items, first at the daily level, and second at the person level after calculating an average for each person across all 15 days. Both EFAs suggested two factors: vegetable and fruit daily servings loaded onto one factor (healthy foods) and desserts, sweet drinks, fast foods, and fried foods loaded onto a second factor (high-sugar/high-fat foods). Items showed sufficient loading onto their respective factors (Table 1). Similar categorizations have been used in prior studies (e.g., Liao et al., 2018; O'Connor et al., 2008; White et al., 2013).

2.3.4. Daily stressors

Each day, young adults reported whether they experienced conflicts using five items and daily demands using six items. Separate items assessed whether participants argued with their mother or father,

Table 1
Exploratory factor analyses for daily serving variables.

	Average Across All Days		Daily	
	High-Fat/High-Sugar Foods	Healthy Foods	High-Fat/High-Sugar Foods	Healthy Foods
Fruit	.01	**.78**	−.03	**.42**
Vegetable	−.08	**.77**	−.02	**.40**
Sweet Drinks	**.49**	.01	**.28**	.15
Desserts	**.41**	**.26**	**.25**	.05
Fried Foods	**.57**	−.05	**.42**	−.05
Fast Foods	**.54**	−.14	**.31**	−.09
Variance	1.03	1.29	0.41	0.37
Proportion	0.59	0.73	0.60	0.53

Note: Values with a factor loading over 0.25 are bolded. Oblique factor analyses were run across participants' mean daily servings (Average Across All Days) and across all observations (Daily).

argued with another family member, argued with a close friend or partner, argued with or were punished by an adult at school, and were punished or disciplined by parents. Similar items regarding arguments have been used to index emotional reactivity to daily stress in married couples (Almeida et al., 2002). Participants also completed items regarding daily demands. Separate items assessed whether they had a lot of work at school, had a lot of work at home, had a lot of demands made by teachers, had a lot of demands made by friends, had a lot of demands made by family, and had a lot of demands made by a work supervisor. Prior research has used these items as indices of daily stressors and found that young adults experience shorter sleep duration and poorer mood on days when they experience more demands, and that young adults who experience more demands tend to have poorer academic performance and greater low-grade inflammation (Flook & Fuligni, 2008; Fuligni & Hardway, 2006; Levine et al., 2017). The sum number of conflicts and demands were calculated per day, and at least one conflict or demand occurred on 30.2% of days. The same pattern of results emerged when assessing daily conflicts and demands separately, as well as when dichotomizing days with respect to whether any conflict or demand was experienced that day (0 = none, 1 = any conflict or demand experienced that day).

2.3.5. Perceived Stress Scale

As part of the psychosocial survey, young adults rated their subjective feelings of stress over the past month using the 10-item Perceived Stress Scale (Cohen et al., 1983). They rated how often they felt stressed (e.g., "How often have you found that you could not cope with all the things that you had to do") using a five-point scale from *0* (*Never*) to *4* (*Very Often*). There were four reverse-coded items, and an average was computed such that higher scores represented more perceived stress. Items showed good reliability (α = 0.88).

3. Analytic plan

Multilevel models with days (Level 1) nested within young adults (Level 2) were used to test whether SSS was related to daily food selection in Stata 16.1 software. Analyses were limited to the third and final wave of data collection because daily food servings were measured only at this wave. First, models tested the main effects of society SSS and college SSS on daily food selection, with each form of SSS tested in separate models. All models controlled for age (grand-mean centered), ethnicity (dummy-coded for Latino, Asian American, and other ethnic groups with European American as the reference group), and gender (effect-coded, −1 = male, 1 = female). Models were repeated additionally adjusting for parents' education, family income, and personal income to determine whether there was a unique effect of feeling of low status after controlling for objective socioeconomic status (e.g., Hoebel & Lampert, 2020). When associations emerged between SSS and healthy and high-fat/high-sugar foods, we tested whether SSS was especially related to a specific type of food. Society SSS, college SSS, parents' education, family income, and personal income were grand-mean centered.

Next, models examined how stress related to SSS and daily food servings. Society SSS and college SSS were tested as predictors of perceived stress in linear regressions and as predictors of daily stressors in multilevel models, controlling for demographic covariates. These models were also repeated controlling for parents' education, family income, and personal income. Perceived stress and daily stressors were then tested as predictors of daily food servings when controlling for demographic covariates. In these models, perceived stress was grand-mean centered, and the number of daily stressors was centered at the adolescent-mean. Finally, in order to determine whether associations between SSS and daily food selection may be explained by differences in stress, multilevel models tested whether SSS was related to young adults' daily food selection over and above demographic factors, indicators of objective socioeconomic status, and stress.

Because we were interested in young adults' own daily food choices, we examined only days on which participants did not eat with a family member in order to rule out the possibility that other people were selecting young adults' meals. Therefore, participants were included in analyses if they had reported daily servings on at least one day when they did not eat with a family member, and had reported either SSS in society ($N = 129$) or reported SSS at their college ($N = 106$). There were 1,035 daily observations of food choices for society SSS and 882 observations for college SSS.

4. Results

As shown in Table 2, young adults reported being above the midpoint for both society SSS and college SSS, in line with prior studies (e.g., Goodman et al., 2001). Young adults reported having about one serving each of fruits, vegetables, and sweet drinks daily and one serving each of desserts, fried foods, and fast foods every other day. As expected, young adults who had more servings of fast foods also tended to have more servings of sweet drinks, fried foods, and fast foods, and fewer vegetables. Young adults who reported having more fruits also had more vegetables and, interestingly, desserts. There was a marginally significantly association between greater daily reports of sweet drinks, fast foods, and fried foods and larger waist-to-hip ratios (Table 3).

The distributions of society SSS and college SSS were normally distributed (skewness of −0.45 and −0.05, respectively), although the distribution of caregiver-reported annual family income was positively skewed (skewness of 3.73). There were two outliers for college SSS (both 3.1 standard deviations below the mean) and one outlier for caregiver-reported family income (7.6 standard deviations above the mean). We repeated all analyses winsorizing these values to three standard deviations and observed no change in the reported pattern of results. Therefore, all models are presented using the unadjusted values.

First, multilevel models tested whether society SSS and college SSS related to daily food selection. Lower college SSS was associated with fewer daily servings of healthy foods ($B = 0.30$, $SE = 0.11$, $p = .006$) and more daily servings of high-fat/high-sugar foods ($B = -0.24$, $SE = 0.09$, $p = .007$). These associations remained significant over and above parents' education, family income, and personal income (Table 4, Fig. 1). When disaggregating across food groups, associations were found between lower college SSS and fewer servings of both fruits ($B = 0.13$, $SE = 0.05$, $p = .017$) and vegetables ($B = 0.17$, $SE = 0.06$, $p = .006$) in fully adjusted models. The association between lower college SSS and more

Table 2
Descriptive statistics of study variables.

Variable	*N*	*M*	*SD*	*Min*	*Max*
Age	131	20.3	0.8	16.5	22.1
Parents' Education	131	7.4	1.8	1.5	11.0
Family Annual Income	131	$81774.9	$62637.5	$4750.0	$410000.0
Personal Annual Earnings	131	$1559.1	$8149.4	$0.0	$36000.0
Society Subjective Social Status	129	5.9	1.6	1.0	10.0
College Subjective Social Status	106	7.0	1.5	2.0	10.0
Perceived Stress	131	1.8	0.5	0.0	3.4
Daily Fruit Servings	131	0.9	0.8	0.0	3.4
Daily Vegetable Servings	131	0.8	1.0	0.0	4.9
Daily Sweet Drink Servings	131	1.0	0.8	0.0	3.5
Daily Dessert Servings	131	0.7	0.6	0.0	3.3
Daily Fried Foods Servings	131	0.6	0.5	0.0	2.3
Daily Fast Foods Servings	131	0.7	0.8	0.0	6.0

Note: Averages for each participant are calculated across all days for daily servings.

Table 3
Correlations between mean daily servings ($N = 131$).

	1.	2.	3.	4.	5.	6.
1. Fruit Mean	–					
2. Vegetable Mean	.68***	–				
3. Sweet Drinks Mean	−.02	−.06	–			
4. Desserts Mean	.19*	.08	.19*	–		
5. Fried Foods Mean	−.01	−.12	.31***	.15	–	
6. Fast Foods Mean	−.12	−.20*	.24**	.25**	.39***	–
7. Waist-Hip Ratio	−.12	−.06	.18*	−.06	.16†	.16†

Note: † = $p < .1$, * = $p < .05$, ** = $p < .01$, *** = $p < .001$.

servings of high-fat/high-sugar foods was primarily driven by greater selection of sweet drinks ($B = -0.10$, $SE = 0.04$, $p = .028$), and marginally significantly greater selection of fast food ($B = -0.08$, $SE = 0.04$, $p = .065$). In contrast, society SSS was consistently not associated with daily food servings when adjusting for demographic factors and when additionally adjusting for parents' education, family income, and personal income, all $ps > .38$ (Table S1).

Interestingly, when examining model covariates, we observed that male participants had about 0.35 more servings of high-fat/high-sugar foods than female participants across models. Therefore, we also tested whether the degree to which associations between society SSS and college SSS differed by gender by testing interactions between SSS and gender. There was no evidence that associations between either society SSS or college SSS and daily servings were moderated by gender, all $ps > .07$.

Next, models examined whether SSS was related to perceived stress and daily stressors. Associations with stress were tested in hierarchical regressions, adjusting first for demographics and then adjusting for family income, personal income, and parents' education. Although society SSS was not related to perceived stress ($B = -0.02$, $SE = 0.03$, $p = .49$), lower college SSS was related to higher perceived stress as hypothesized ($B = -0.11$, $SE = 0.04$, $p = .003$) and this association remained significant after adjusting for objective socioeconomic status (Table S2). Associations between SSS and experiencing daily conflicts or demands were tested with multilevel models. Neither society nor college SSS were related to daily conflicts or demands, $ps > .50$ (Table S3).

Finally, models examined whether associations between SSS and daily food serving were explained by differences in stress. Models tested whether perceived stress and daily stressors were related to daily food selection, and suggested that neither perceived stress nor daily stressors were related to either healthy or high-fat/high-sugar foods when controlling for demographic factors and when additionally controlling for socioeconomic status, $ps > .06$ (Table S4). Importantly, when perceived stress and daily stressors were included in the model, college SSS remained a significant predictor of daily selection of healthy foods ($B = 0.28$, $SE = 0.11$, $p = .015$) and high-fat/high-sugar foods ($B = -0.19$, $SE = 0.09$, $p = .043$). Overall, there was no evidence that perceived stress or daily stressors explained associations between college SSS and daily

Table 4
Selection of healthy foods (left) and high-fat/high sugar foods (right) as a function of college subjective social status.

	Healthy Foods				High-Fat/High-Sugar Foods			
	Unadjusted Model		Adjusted for SES		Unadjusted Model		Adjusted for SES	
	B	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*
Constant	1.98***	0.30	2.03***	0.32	3.46***	0.25	3.41***	0.27
College SSS	0.30**	0.11	0.30**	0.11	−0.24**	0.09	−0.24**	0.09
Asian American	−0.68	0.46	−0.81	0.48	0.02	0.38	0.14	0.40
Latino	−0.34	0.37	−0.43	0.40	−0.45	0.31	−0.36	0.34
Other Ethnicity	−0.81	0.81	−0.89	0.81	−0.75	0.71	−0.71	0.71
Gender	−0.12	0.17	−0.10	0.17	−0.73***	0.14	−0.73***	0.15
Age	0.17	0.22	0.17	0.22	0.10	0.18	0.10	0.19
Parents' Education	–	–	0.04	0.10	–	–	−0.01	0.09
Family Income	–	–	−0.02	0.02	–	–	0.02	0.02
Personal Earnings	–	–	−0.20	0.27	–	–	0.07	0.22

Note. *$p < .05$; **$p < .01$; ***$p < .001$; SSS = subjective social status; SES = socioeconomic status. College SSS, Age, Parents' Education, Family Income, and Personal Earnings were grand mean-centered. Family Income and Personal Earnings were divided by $10,000. Ethnicity was dummy-coded with European American as the reference group. Gender was effect-coded (−1 = male, 1 = female).

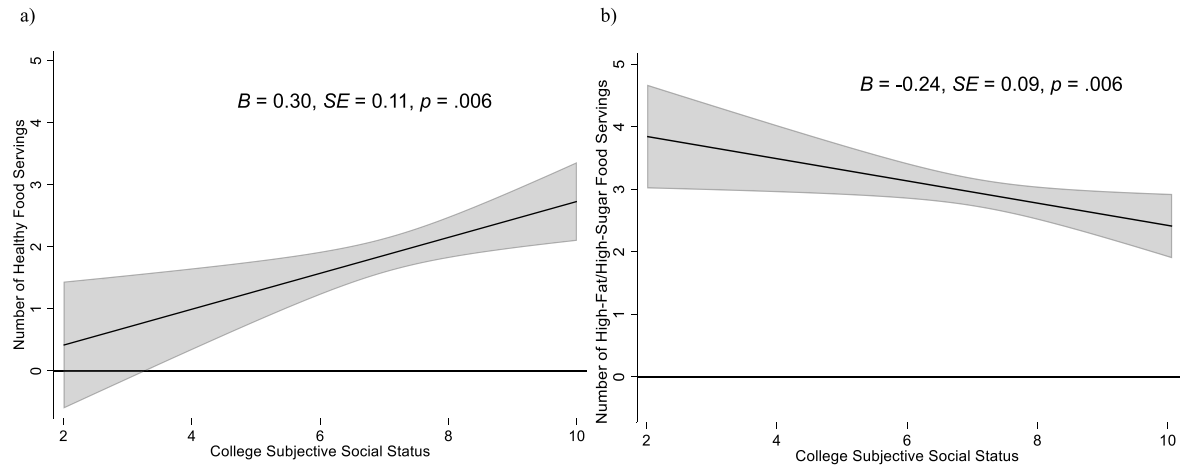

Fig. 1. Modeled Values of Daily Servings of Healthy Foods (a) and High-Fat/High-Sugar Foods (b) as a Function of College Subjective Social Status, Adjusting for Demographic Factors and Objective Socioeconomic Status (i.e., Parents' Education, Family Income, and Personal Income). Note: Shaded region indicates 95% confidence interval.

food selection.

5. Discussion

Although there are socioeconomic status-based disparities in obesity and metabolic health (e.g., Cohen et al., 2013; Levine, 2011), it remains unclear whether feeling of low status may contribute to poorer daily eating behavior. The present study examined how feeling of low status relative to others in society and college relates to daily food selection. Results suggested that young adults with lower college SSS had fewer daily servings of healthy foods and more servings of high-fat/high-sugar foods, even after controlling for objective socioeconomic status and stress, suggesting that feeling of low status in college may uniquely relate to poorer food selection.

As hypothesized, lower college SSS was related to daily selection of fewer healthy foods and more high-fat/high-sugar foods, particularly sweet drinks. In line with the resource scarcity hypothesis, young adults who have low SSS may capitalize on eating high-calorie foods including high-fat/high-sugar foods rather than healthy foods including fruits and vegetables (Dhurandhar, 2016). Research suggests that individuals tend to consume high-energy foods to promote physiological mobilization when perceiving uncertainty in food or other resources (Caldwell & Sayer, 2019). Academic performance and peer belonging are of high priority for college students (Tinto, 1975), and individuals who report low college SSS may feel insecure or uncertain about their social or academic rank relative to peers specifically. Uncertainty associated with psychologically feeling of low status relative to peers may promote poor eating behaviors, even without food insecurity or low objective socioeconomic status.

Our findings align with prior experimental studies that have found that temporarily feeling of low status is related to preference for higher-calorie meals (Cardel et al., 2016; Cheon & Hong, 2017) and heightened sensitivity to calorie-richness (Lim et al., 2020). Still, other experimental studies have found that individuals who are assigned to temporarily have lower social status (i.e., as a follower versus a leader; more challenging versus easier rules for earning money in Monopoly) do not show differences in lunchtime daily energy needs and energy intake (Cardel, Pavela, et al., 2020; Pavela et al., 2017). Findings from the present study suggest that manipulating aspects of an individual's status relative to peers (e.g., academic rank, perceived reputation) may influence eating behavior.

Furthermore, our findings extend prior experimental research by examining how persistent low SSS in society and college relates to daily food selection. One prior study found that college students with lower SSS in society consume more calorie-rich foods (Wijayatunga et al., 2019). However, we observed that low SSS in college, as opposed to in society, was related to the types of foods that young adults select, which is important in light of the protective health benefits of consuming fruits and vegetables (e.g., Van Duyn & Pivonka, 2000). It is possible that associations for society SSS would have emerged if measures assessed selection of more calorie-rich foods (e.g., grains, meat). These findings also suggest that low SSS relative to peers may position young adults for poorer health and may contribute to socioeconomic disparities in obesity and eating fruits and vegetables (e.g., Fismen et al., 2016; Sweeting et al., 1994).

The association between low college SSS and high-fat/high-sugar foods was driven by greater servings of sweet drinks. Low college SSS may position young adults for poorer metabolic health, as having sweet drinks increases risks for obesity (Luger et al., 2017; Te Morenga et al., 2013), and greater selection of sweet drinks by people of low socioeconomic status has been posited to contribute to socioeconomic status-based disparities in obesity (Bolt-Evensen et al., 2018; Hu, 2013). Young adults with lower college SSS may have more high-sugar beverages because they are more sensitive to the energy density of drinks. Prior research has demonstrated that people induced to feel of low status show greater preference for high-calorie foods and heightened ability to differentiate high- from low-calorie beverages, potentially through attentiveness to energy cues (e.g., sweetness; Cheon & Hong, 2017; Lim et al., 2020). As a result, people with chronically lower SSS in daily life may have more sweet drinks, as opposed to sugar-free substitutes or healthier alternatives.

Interestingly, lower college SSS, but not society SSS, was related to selection of fewer daily servings of healthy foods and more daily servings of high-sugar/high-fat foods. It is possible that individuals develop a unique sense of status across social contexts, as individuals tend to show only a moderate association between their standing in society and their standing in local contexts (Goodman et al., 2001; Rahal et al., 2020). Local SSS is often more strongly related to health outcomes than society SSS, potentially because local standing is more salient than societal standing (e.g., Habersaat et al., 2018; Rahal et al., 2020; Zell et al., 2018). For instance, female adolescents with lower school SSS have been previously found to show greater increases in BMI the following year (Goodman et al., 2003). Young adults may be more affected by their local status because they have more perceived control over their college status than their status in society. Perceptions of family's standing may become less tied to food selection as youth transition to adulthood and develop their own sense of status (e.g., Goodman et al., 2001). Also, social relationships and status are particularly salient during adolescence and young adulthood (e.g., Forbes & Dahl, 2010). As a result, young adults may be more invested in their status relative to peers than relative to society, and consequently more affected on a daily basis by their college SSS than their society SSS.

We also found that male participants reported daily selection of more high-fat/high-sugar foods, but not healthy foods, than female participants. This difference aligns with prior evidence that male young adults are more likely to have fast food and soft drinks compared to female young adults (Lee & Allen, 2021; Park et al., 2014). Yet, in contrast to a prior experimental study (Cardel, Pavela, et al., 2020), we did not observe differences in associations between SSS and daily food selection between male and female participants. It is possible that gender differences may emerge in acute, but not chronic, feelings of low status may relate to diet-related outcomes. Another non-experimental study found that higher SSS was related to lower severity of metabolic syndrome among women but not men in a sample of adults (Cardel, Guo, et al., 2020), suggesting that gender differences in associations may emerge later in adulthood or with respect to diet-related outcomes beyond food selection.

Associations between low college SSS and food selection appeared to be independent of stress. Lower college SSS was related to higher perceived stress, but not daily stress, and society SSS was not related to perceived or daily stress. Society SSS is inconsistently related to perceived stress (e.g., Steen et al., 2020; Ursache et al., 2015), and associations may be weaker for young adults, who experience stressors in varied domains including jobs and academics, than for older adults (Eccles et al., 2003). Also, neither perceived stress over the past month nor daily stressors related to food selection across the full sample in this study. This may be because the effect of stress on food selection has been found most robustly in the context of experimental rather than naturalistic stressors (e.g., Oliver et al., 2000), and the effect of stress on daily food selection often varies with dispositional factors, such as emotion regulation or stress management (e.g., Errisuriz et al., 2016).

Given that stress did not explain associations between low college SSS and poorer food selection, it is possible that low SSS may promote a sense of relative deprivation—or feeling lesser and worse off relative to other people—and this feeling may contribute to poorer food selection. For instance, low status has been associated with lower sense of control, such that people may capitalize on resources and high-calorie foods when available (Kraus et al., 2009). Young adults may also compensate for their low status by selecting high-calorie foods that are associated with higher status (Briers & Laporte, 2013). Certain foods such as meat are viewed as symbols of high status (Chan & Zlatevska, 2019), whereas plant-based diets can be more stigmatized or viewed more negatively

(Markowski & Roxburgh, 2019).

This study has strengths including the socioeconomic and ethnic diversity of the sample, the rigorous sampling of food selection across 15 days, and the high levels of data completion across days. However, results must be interpreted in the context of limitations. First, participants were at different colleges. Both access to healthy foods and grocery stores and the effects of low college SSS may vary across college campuses. Future studies could be improved by measuring participants' perceptions of availability and barriers to access of different types of food. Second, generalizability of the results is limited by aspects of the sample. College SSS was assessed only among participants who were enrolled in college, and future research can assess whether college SSS with respect to the local community or workplace may also relate to daily food selection. Participants also reported generally high levels of college SSS on average, and no participants endorsed the scale minimum. Although the mean level of college SSS is comparable to values found in other studies of college students (e.g., Rahal et al., 2020), future studies should replicate these associations with greater representation of students with low college SSS. Further, although the present sample is ethnically diverse and has an ethnic breakdown comparable to the larger county, results should be replicated with nationally representative samples that include larger numbers of other ethnic groups (e.g., African Americans). Third, young adults reported foods via self-report. To reduce the burden of rigorously reporting food selection daily over two weeks, participants were asked about servings of only certain food groups. Although this scale was developed to mirror existing scales, the present study did not use a validated measure of daily food servings, and the administered scale omitted daily servings of meat, grains, and snacks. Therefore, we were unable to determine whether society SSS and college SSS are related to daily selection of these foods.

Fourth, this study was embedded within a larger longitudinal study, such that attrition from earlier waves may have influenced participant characteristics (i.e., participants with lower society SSS may be less likely to continue to complete subsequent waves of the study). This also resulted in a relatively low sample size which may limit statistical power, and future studies may be better positioned to identify associations between low college SSS and perceived stress by including larger sample sizes. Still, the present study included up to 15 daily checklists per participant, which enabled assessment of associations at the daily level (i.e., associations between daily food selection and daily stressors), and included a larger and more diverse sample compared to previous studies (Wijayatunga et al., 2019). Fifth, although family and personal income were covaried in analyses, there was no measure of participants' subjective financial concerns or economic hardship. Finally, this study was correlational. Although low SSS may causally influence daily food choices in line with prior experiments, it is also possible that aspects of the home environment or personality factors (e.g., neuroticism) influence both food selection and college SSS. There is also the possibility for the reverse causal pathways, as individuals who have poorer eating habits may be mistreated by peers based on their appearance and therefore report lower college SSS. Further research is needed to identify the specific psychophysiological mechanisms that may explain associations between low college SSS and poorer food selection.

6. Conclusions

Taken together, results suggested that young adults with lower college SSS tend to have fewer daily servings of fruits and vegetables and more servings of high-sugar/high-fat foods, particularly sweet drinks. Feeling of low status or relative inequality may permeate one's daily life and contribute to dietary choices. Colleges can consider means of mitigating status-based differences in obesity by addressing factors that may influence students' perceived status, such as by promoting social belonging and reducing mistreatment for individuals from marginalized backgrounds. To reduce existing disparities in obesity, interventions may need to address both low objective socioeconomic status as well as feeling of relatively lower status.

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Ethical statement

Research was performed in accordance with the Declaration of Helsinki and was approved by the University of California, Los Angeles Institutional Review Board.

Declaration of competing interest

The authors have no conflicts of interest to disclose.

Data availability

Data will be made available on request.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.appet.2022.106338.

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