



Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.



COVID-19 stress and eating and drinking behaviors in the United States during the early stages of the pandemic

Jenna R. Cummings^{a,*,1}, Joshua M. Ackerman^a, Julia A. Wolfson^{b,c,2}, Ashley N. Gearhardt^a

^a Department of Psychology, University of Michigan, Ann Arbor, USA

^b Department of Health Management and Policy, University of Michigan, Ann Arbor, USA

^c Department of Nutritional Sciences, University of Michigan, Ann Arbor, USA

ARTICLE INFO

Keywords:

COVID-19
Drinking to cope
Eating to cope
Food addiction
Stress

ABSTRACT

The coronavirus SARS-CoV-2 (COVID-19) pandemic has created widespread stress. Since many people cope with stress by eating, the current study investigated whether eating behaviors shifted among U.S. adults after the emergence of the pandemic. Data from national, crowdsourced surveys conducted on March 31st, 2020 and February 13th, 2019 were compared. Average levels of eating to cope and food addiction symptoms did not appear to shift during the early stages of the pandemic; however, U.S. adults ate about 14% more added sugars. Moreover, greater stress in response to the pandemic was associated with greater eating to cope, added sugars intake, food addiction symptoms, drinking to cope, and drinking frequency. These associations differed by the presence of state-level stay-at-home orders, perceived vulnerability to disease, age, U.S. political party affiliation, and gender. Although eating behaviors did not appear to majorly shift during the early stages of the pandemic, stress from the pandemic may intensify some maladaptive coping tendencies among U.S. adults.

1. Introduction

The emergence of the coronavirus SARS-CoV-2 (COVID-19) pandemic in the U.S. has created widespread stress. American Psychological Association surveys indicate U.S. adults reported a stress level of 5.9/10 related to the COVID-19 pandemic, and a stress level of 5.4/10 in general during early 2020; this marks the first significant increase in general stress levels since the American Psychological Association began surveying stress levels in 2007 (American Psychological Association, 2020). How might U.S. adults cope with the stress from this pandemic?

Many people cope with stress by eating more food, especially processed foods high in added sugars (Adam & Epel, 2007; Greeno & Wing, 1994), and drinking more alcohol (Pohorecky, 1991). When stressed, people also are more reactive to food and drug cues, more likely to crave food and drugs, and more likely to engage in compulsive food- and drug-seeking behaviors; stress thus can accelerate the development of addictions (Sinha & Jastreboff, 2013). In accordance, the public and scholars alike have predicted increases in eating to cope, drinking to cope, and addiction symptoms among individuals during the COVID-19 pandemic (Cherikh et al., 2020; Creswell, 2020; Muscogiuri, Barrea,

et al., 2020; Nelson, 2020; Pellechia, 2020; Rehm et al., 2020). These maladaptive coping tendencies, in particular, may be amplified during the pandemic because stay-at-home orders have rapidly shifted the environments in which people eat and drink as well as how much food and alcohol people have at home. These maladaptive coping tendencies may also ironically increase risk for complications from COVID-19 infection by leading to weight gain over time (Boggiano et al., 2015); indeed, COVID-19 patients with obesity are considered high-risk and are more likely to need hospitalization (Muscogiuri, Pugliese, et al., 2020).

It is important to consider, however, that people vary in how likely they are to eat and drink in response to stress (Adam & Epel, 2007). For instance, women are more likely to eat to cope (Greeno & Wing, 1994) whereas men are more likely to drink to cope (Pohorecky, 1991). Another factor that may be relevant is a person's sensitivity to the threats associated with the COVID-19 pandemic. Threat sensitivities predict reactivity to relevant threat cues; for example, people who perceive themselves as particularly vulnerable to disease exhibit stronger behavioral reactions to pathogen threats (Ackerman et al., 2018; Duncan et al., 2009). To the extent that the pandemic presents similar pathogen cues, those who report high levels of vulnerability to disease

* Corresponding author. 6710 Rockledge Drive, Bethesda, MD, 20817, USA.

E-mail address: jenna.cummings@nih.gov (J.R. Cummings).

¹ Jenna R. Cummings is now at the Social and Behavioral Sciences Branch of the Eunice Kennedy Shriver National Institute of Child Health and Human Development.

² Julia A. Wolfson is now at the Department of International Health, Johns Hopkins Bloomberg School of Public Health.

may experience greater threat and therefore be more likely to cope by eating and drinking.

In addition, age and U.S. political party affiliation may be relevant to whether U.S. adults eat and drink in response to the COVID-19 pandemic. Older adults are more likely to develop serious complications from COVID-19 infection (Centers for Disease Control and Prevention, 2020). Although older compared to younger adults generally worry less, practice more adaptive coping strategies (e.g., maintaining a positive attitude), and practice fewer maladaptive coping strategies (e.g., smoking cigarettes; Hunt et al., 2003), perceiving that one is more susceptible to complications from COVID-19 infection could increase stress levels in response to the pandemic. This, in turn, could lead older adults to practice more maladaptive coping strategies including eating and drinking to cope.

Nationally representative data indicate that Democrats compared to Republicans typically eat fewer processed foods (Kannan & Veazie, 2018), yet Democrats may have experienced relatively higher levels of stress from the COVID-19 pandemic. Democrats compared to Republicans perceived they were more vulnerable to COVID-19 infection in early March 2020 (Calvillo et al., 2020), and in mid-March, Democrats compared to Republicans believed the death toll from COVID-19 was higher and worried more about the adverse consequences (e.g., getting sick, friends getting sick, hard to get necessary items) of the pandemic (Kushner Gadarian et al., 2020). Democrats' elevated perceptions of vulnerability to COVID-19 infection could increase their stress levels, which could shift their typical tendencies to eat well into tendencies to eat/drink to cope.

Four studies (to our knowledge) have investigated eating and drinking behaviors during the COVID-19 pandemic; two were survey studies diffused through social media in the French population (Cherikh et al., 2020; Rolland et al., 2020), one was a survey study internationally diffused through emails and social media (Ammar et al., 2020), and one was a survey study diffused through social media targeting individuals with eating disorders in the U.K. (Branley-Bell & Talbot, 2020). Across the French and international population studies, 10–37% of responders reported stress management by eating, increases in caloric/salty food intake, increases in unhealthy diet/food, or increases in alcohol intake during the pandemic (Ammar et al., 2020; Cherikh et al., 2020; Rolland et al., 2020). In the study targeting individuals with eating disorders, 66.7% of responders reported that their relationship with food had changed due to the pandemic (Branley-Bell & Talbot, 2020). However, responders in these studies retrospectively determined what their eating and drinking behaviors were like pre- and post-pandemic, which could introduce recall bias. Without comparing data collected during the COVID-19 pandemic to that collected before the pandemic, it remains unclear whether average levels of certain behaviors have actually shifted during the pandemic. These studies also did not use validated measures to assess eating and drinking behaviors.

To fill gaps in the literature, the current study thus investigated whether eating behaviors—including eating to cope and added sugars intake, an indicator of highly processed food intake (Monteiro et al., 2019)—and food addiction symptoms acutely shifted among individuals after the emergence of the COVID-19 pandemic in the U.S. We conducted a national, crowdsourced survey on March 31st, 2020, when the total reported case number in the U.S. was 186,101 (Centers for Disease Control and Prevention, 2020), and when 32 states had executed statewide stay-at-home orders and 12 states had executed partial stay-at-home orders (Mervosh et al., 2020). We compared this survey to another national, crowdsourced survey conducted on February 13th, 2019, prior to the emergence of the COVID-19 pandemic and stay-at-home orders (Cummings et al., 2020). In addition, the current study investigated whether subjective stress responses to the COVID-19 pandemic would be associated with eating to cope, added sugars intake, food addiction symptoms, drinking to cope, and drinking frequency, and whether these associations would differ based on the presence of state-level stay-at-home orders, gender, perceived vulnerability to

disease, age, and U.S. political party affiliation.

We hypothesized that the March 2020 “cohort” would show greater eating to cope, added sugars intake, and food addiction symptoms compared to the February 2019 “cohort.” We also hypothesized that COVID-19 stress would be positively associated with eating to cope, added sugars intake, food addiction symptoms, drinking to cope, and drinking frequency, and that these positive associations would be stronger among those residing in states with stay-at-home orders, those high in perceived vulnerability to disease, older adults, and Democrats. With regards to gender, we expected that positive associations between COVID-19 stress and eating to cope, added sugars intake, and food addiction symptoms would be stronger among women whereas positive associations between COVID-19 stress and drinking to cope and drinking frequency would be stronger among men. All hypotheses and methods were preregistered on the Open Science Framework: <https://osf.io/5v68w>.

2. Methods

2.1. Participants

The sample for the February 2019 cohort has been previously described (Cummings et al., 2020). A near-identical recruitment procedure was used for the March 2020 cohort. Specifically, on March 31st, 2020, participants were recruited via Amazon's Mechanical Turk platform for “A Study on Beliefs about Eating and Drinking #2” in which they would “complete questionnaires that ask about your beliefs, behaviors, thoughts, and feelings related to eating and drinking.” A total of 1000 participants were recruited; however, 1038 participants completed the study before expiration. This sample size was based upon available research funds.

The inclusion criterion was 18 years old and living in the U.S. with no exclusion criteria. Participants were dropped for analysis if they did not follow study instructions ($n = 2$), completed the questionnaire in less than 3 min ($n = 0$), reported improbable values for adult height and weight ($n = 33$), and/or incorrectly answered quality control questions at the end of the study ($n = 135$). These criteria matched those used to determine the sample in the February 2019 cohort, with identical quality control questions used in both studies (Cummings et al., 2020). Table 1 presents demographic characteristics of the February 2019 and March 2020 cohorts.

2.2. Procedure

The University Institutional Review Board approved the research procedure in accordance with the provisions of the World Medical Association Declaration of Helsinki. The procedure for the February 2019 cohort has been previously described (Cummings et al., 2020). For the March 2020 cohort, participants completed informed consent. Then, in randomized order, participants answered questionnaires that were administered to the February 2019 cohort: Palatable Eating Motives Scale (Burgess et al., 2014), National Cancer Institute's Dietary Screener Questionnaire (Thompson et al., 2017), modified Yale Food Addiction Scale 2.0 (Schulte & Gearhardt, 2017), and Perceived Vulnerability to Disease (Duncan et al., 2009). They also answered questionnaires specific to the current study: modified Impact of Event Scale – Revised (Weiss & Marmar, 1997), Drinking Motives Questionnaire – Revised (Cooper, 1994), and questions on drinking frequency and quantity. All participants reported their demographics, answered exploratory items, and then were compensated \$1.00 for their time (Buhmester et al., 2011).

2.3. Measures

2.3.1. Palatable Eating Motives Scale (PEMS)

The 20-item PEMS measures motivations for eating highly processed

Table 1
Demographic characteristics of cohorts.

	February 2019 (Comparison) n = 247	March 2020 (COVID-19) n = 868	F or χ^2	p	η^2 or Φ
Age (M, SD)	36.84 (11.27)	39.32 (12.86)	7.54	.006	.01
Gender (n, %)			10.17	.017	.10
Man	129 (52.2%)	408 (47.2%)			
Woman	112 (45.3%)	449 (51.9%)			
Trans	0 (0.0%)	3 (0.3%)			
Fluid	6 (2.4%)	5 (0.6%)			
Race/ethnicity (n, %)			3.79	.705	.06
American Indian or Alaskan Native Native Hawaiian/ Pacific Islander	3 (1.2%)	7 (0.8%)			
Asian	10 (4.0%)	57 (6.6%)			
Black	34 (13.8%)	113 (13.1%)			
White	177 (71.7%)	614 (71.2%)			
Hispanic/ Latinx	13 (5.3%)	46 (5.3%)			
Bi- or mult- racial or other	10 (4.0%)	24 (2.8%)			
Education (n, %)			10.14	.071	.10
Less than high school	0 (0.0%)	3 (0.3%)			
High school graduate	30 (12.1%)	62 (7.2%)			
Some college	45 (18.2%)	149 (17.2%)			
Associates degree	24 (9.7%)	101 (11.7%)			
Bachelors degree	117 (47.4%)	399 (46.2%)			
Advanced degree	31 (12.6%)	150 (17.4%)			
Annual household income			32.92	<.001	.17
<\$10,000	15 (6.1%)	39 (4.6%)			
\$10,000- \$39,999	94 (38.4%)	190 (22.3%)			
\$40,000- \$69,999	75 (30.6%)	280 (32.9%)			
\$70,000- \$99,000	38 (15.5%)	190 (22.3%)			
>\$100,000	23 (9.4%)	152 (17.9%)			
BMI (M, SD)	26.28 (5.86)	25.99 (5.98)	0.43	.512	.00

Notes: BMI = Body Mass Index. For the February 2019 cohort, the descriptives for gender are reported here whereas the descriptives for biological sex were reported in Cummings et al. (2020). Also, the descriptives reported for race/ethnicity differ from what were reported in Cummings et al. (2020) because here we report descriptives orthogonally (i.e., participants who selected multiple race/ethnicities were re-categorized into the “other” category).

foods including eating to cope (Burgess et al., 2014). Participants read examples of highly processed foods and then reported how often they ate these foods for certain reasons on a 4-point Likert scale from 1 (“Almost never/Never”) to 4 (“Almost always/Always”). For the current study, only the eating to cope subscale was administered and the prompt was revised so that participants responded based on their eating behavior in the past seven days (March 25th-March 31st). A sample item from this subscale is “Because it helps you when you feel depressed or nervous.”

Items were averaged ($\alpha = 0.93$).

2.3.2. National Cancer Institute’s Dietary Screener Questionnaire³

The 26-item National Cancer Institute’s Dietary Screener Questionnaire measures frequency of intake of selected food and drinks in the past month (Boggiano et al., 2017); in the current study, items to assess added sugars intake (i.e., from soda, fruit drinks, cookies/cake/pie, doughnuts, ice cream, sugar/honey in coffee/tea, candy, cereal) were administered. Publicly available scoring algorithms coupling item frequency responses with portion size information were used to generate estimated portion intake of added sugars per day (tsp.).

2.3.3. Modified Yale Food Addiction Scale 2.0 (mYFAS 2.0)

The 13-item mYFAS 2.0 measures addictive-like responses to highly processed foods based on the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.) criteria for substance use disorders (Schulte & Gearhardt, 2017). For the current study, the prompt was revised so that participants responded based on their experiences in the past month (March 1st-31st, 2020). Sample items include “I had such strong urges to eat certain foods that I couldn’t think of anything else,” and “I had significant problems in my life because of food and eating. These may have been problems with my daily routine, work, school, friends, family, or health.” Participants rated items on an 8-point Likert scale from 1 (“Never”) to 8 (“Every day”). Symptoms of food addiction were calculated by determining whether item ratings met the “diagnostic” threshold for each symptom, and then summing those values.

2.3.4. Modified Impact of Event Scale – revised (IES-R)

The 22-item IES-R measures subjective stress in response to a specific traumatic event (Weiss & Marmar, 1997). For the current study, the prompt was modified to emphasize the ongoing nature of the COVID-19 pandemic and to ask participants to indicate how distressing each difficulty had been for them in the past seven days (March 25th-March 31st). Items were also modified to reflect the ongoing nature of the COVID-19 pandemic (e.g., “I had trouble staying asleep” was modified to “I am having trouble staying asleep”). In addition, three not-applicable items were removed (“Any reminder brought back feelings about it,” “I found myself acting or feeling like I was back at that time,” and “I tried to remove it from my memory”). Participants rated items on a 5-point Likert scale from 1 (“Not at all”) to 5 (“Extremely”). Items were averaged ($\alpha = 0.96$).

2.3.5. Drinking Motives Questionnaire – revised (DMQ-R)

The 20-item DMQ-R measures motivations for drinking alcohol including drinking to cope (Cooper, 1994). Participants reported how often they drank alcohol for certain reasons on a 4-point Likert scale from 1 (“Almost never/Never”) to 4 (“Almost always/Always”). For the current study, only the drinking to cope subscale was administered and the prompt was revised so that participants responded based on their drinking behavior in the past seven days (March 25th-March 31st). A sample item from this subscale is “To forget your worries.” Items were averaged ($\alpha = 0.95$).

2.3.6. Drinking frequency and quantity items

To assess drinking frequency, participants responded to “During the past seven days, how many days did you consume alcohol?” by selecting from a range of zero to seven days. To assess drinking quantity, participants viewed images of 1-standard-drink equivalents that listed the ounces in each drink type. Participants then freely reported on the ounces of beer, wine, and spirits that they drank on a typical day during

³ Participants also responded to items to assess fruit and vegetable intake and questions on cooking behavior. Details on those data, and hypotheses regarding those data, are not reported here because they are beyond the scope of the current paper

the past seven days. Inspection of these drinking quantity data revealed large inconsistencies in the free responses (e.g., responses ranged from 1 to 840 with some respondents reporting drinks rather than ounces). Due to the inconsistencies in the drinking quantity data, only drinking frequency data were analyzed in the current study.

2.3.7. Perceived vulnerability to disease (PVD)

The 15-item PVD questionnaire assesses individual differences in chronic concerns about the transmission of infectious diseases (Duncan et al., 2009). The questionnaire yields two subscales: (1) germ aversion, or emotional discomfort in contexts that connote an especially high potential for pathogen transmission, and (2) perceived infectability, or beliefs about one’s own susceptibility to infectious diseases. A sample item from the germ aversion subscale is “It really bothers me when people sneeze without covering their mouths,” and a sample item from the perceived infectability subscale is “I have a history of susceptibility to infectious diseases.” Participants rated items on a 7-point Likert scale from 1 (“Strongly disagree”) to 7 (“Strongly agree”). Items from respective subscales were averaged ($\alpha_{germaversion} = 0.73$ and $\alpha_{perceivedinfectability} = .86$).

2.3.8. Demographics

Participants indicated the state they resided in. Participants also reported their political party affiliation, age, gender, race/ethnicity, education level, annual household income, height, and weight.

2.3.9. Exploratory items

Participants responded to the following: “During the past 7 days, how many days have you engaged in at least 30 min of exercise, to the point of being at least moderately out of breath?” “During the past 7 days, how aware have you been of the policies regarding the coronavirus pandemic issued by the state you reside in?” “During the past 7 days, how much have you been abiding by the policies regarding the coronavirus pandemic issued by the state you reside in?” “How vulnerable do you feel to getting coronavirus?” “If you were to get coronavirus, how vulnerable do you feel to being seriously ill or dying from coronavirus?” “Have you been tested for coronavirus?” “Were your test results positive or negative for coronavirus?” “Have you been in close contact with someone who has tested positive for coronavirus?” “During the past 7 days, what kinds of food have you been eating?”

2.4. Analytic plan

Data and syntax are publicly available at: <https://osf.io/myfts/>. All variables of interest were assessed for normality. Added sugars intake showed skew (>1) and kurtosis (>3) and this variable was thus log-transformed for analysis. For the first aim, we revised the analytical plan from the preregistration because of differences in age, gender, and annual household income between cohorts (see Table 1). A stepwise regression controlling for these differences and including a dummy-code to compare between cohorts (0 = February 2019, 1 = March 2020) was conducted. For the second aim, bivariate correlations were conducted. We followed up with multiple regressions predicting variables of interest from COVID-19 stress and potential moderators (main effect and interaction with COVID-19 stress). Categorical moderators were dummy-coded (Stay-at-home: 0 = State of residence did not have stay-at-home policies as of March 24th, 2020, 1 = State of residence did have stay-at-home policies as of March 24th, 2020; Political party: 0 = Republicans, 1 = Democrats; Gender: 0 = Men, 1 = Women). For simple effects analysis, median splits were used for continuous moderators. All analyses were conducted in SPSS Version 25 (IBM Corporation, Armonk, NY). Analyses of additional demographic moderators and exploratory items are presented in the Supplemental Materials.

3. Results

3.1. Did the March 2020 cohort show greater eating to cope, added sugars intake, and food addiction symptoms compared to the February 2019 cohort?

Table 2 presents estimates from regression analyses. Controlling for cohort differences in demographics, there were no differences in eating to cope and food addiction symptoms between cohorts. However, there was a trend difference in added sugars intake between cohorts. In the March 2020 cohort, participants ate an estimated 14% more added sugars compared to in the February 2019 cohort.

3.2. Was COVID-19 stress positively associated with eating to cope, added sugars intake, food addiction symptoms, drinking to cope, and drinking frequency?

Table 3 present estimates from bivariate correlations among these variables within the March 2020 cohort. There were large positive associations between COVID-19 stress and eating to cope, food addiction symptoms, and drinking to cope. There were small positive correlations between COVID-19 stress and added sugars intake and drinking frequency. As would be expected, there also were large associations between eating/drinking to cope and food addiction symptoms.

3.3. Were positive associations between COVID-19 stress and variables of interest stronger among those residing in states with stay-at-home orders, those high in perceived vulnerability to disease, older adults, and Democrats?

For significant interactions, see Table 4 for estimates from tests for simple effects.

Table 2
Eating to cope, added sugars intake, and food addiction symptoms predicted by cohort.

	b	SE _b	β	p	95% CI		ΔR^2
					Lower	Upper	
Eating to Cope							
Step 1							.08
Age	-0.03	0.00	-.26	<.001	-0.03	-0.02	
Gender	-0.14	0.07	-.06	.051	-0.29	0.00	
Income	-0.10	0.03	-.09	.002	-0.16	-0.04	
Step 2							.08
Cohort	-0.13	0.09	-.04	.159	-0.30	0.05	
Added Sugars Intake (Log-transformed)							
Step 1							.07
Age	-0.02	0.00	-.19	<.001	-0.02	-0.01	
Gender	-0.28	0.06	-.14	<.001	-0.39	-0.17	
Income	-0.06	0.03	-.06	.030	-0.11	-0.01	
Step 2							.07
Cohort	0.13	0.07	.06	.062	-0.01	0.27	
Food Addiction Symptoms							
Step 1							.08
Age	-0.06	0.01	-.22	<.001	-0.08	-0.05	
Gender	-0.93	0.21	-.13	<.001	-1.34	-0.52	
Income	-0.24	0.09	-.08	.010	-0.42	-0.06	
Step 2							.08
Cohort	-0.23	0.26	-.03	.367	-0.73	0.27	

Notes: Gender (0 = Men, 1 = Women) and sample (0 = February 2019 Cohort, 1 = March 2020 Cohort) were dummy-coded.

Table 3

Means, standard deviations, & correlations among COVID-19 stress and variables of interest within March 2020 cohort.

	<i>M(SD) [min-max] or %</i>	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1. COVID-19 stress	2.31 (1.03) [1–5]	.64***	.28***	.69***	.61***	.24***	.04	-.02	.34***	-.24***	-.12**	-.08*
2. Eating to cope	2.24 (1.23) [1–5]		.33***	.68***	.61***	.19***	.03	-.03	.26***	-.25***	-.13**	-.07
3. Added sugars intake	8.78 (13.31) [0–113.39]			.34***	.29***	.09**	-.02	-.06	.19***	-.23***	-.15***	-.16***
4. FA symptoms	2.00 (3.42) [0–11]				.61***	.21***	.02	-.09*	.26***	-.21***	-.16***	-.15***
5. Drinking to cope	2.00 (1.28) [1–5]					.47***	.05	-.12***	.23***	-.25***	-.13***	-.16***
6. Drinking frequency	1.65 (1.98) [0–7]						-.01	-.07	.07*	-.09**	-.08	-.12***
7. Stay-at-home order	65.2% Yes 34.8% No							-.00	.09**	-.06	.14***	-.05
8. Germ aversion	4.84 (1.08) [1–7]								.10**	.13***	-.08*	.17***
9. Perceived infect.	3.45 (1.24) [1–7]									-.17***	.02	.03
10. Age	39.32 (12.86) [18–82]										-.08*	.07
11. Political party	45.3% Dem. 30.5% Rep.											.04
12. Gender	51.9% Women 47.2% Men											

Notes: FA = food addiction, infect. = infectability. Stay-at-home order was dummy coded (0 = State of residence did not have stay-at-home order as of March 24th, 2020, 1 = State of residence did have stay-at-home order as of March 24th, 2020). Political party was dummy coded (0 = Republicans, 1 = Democrats). Gender was dummy coded (0 = Men, 1 = Women). * $p < .05$, ** $p < .01$, *** $p < .001$.

3.3.1. Stay-at-home orders

Associations between COVID-19 stress and drinking frequency differed based on whether someone resided in a state with a stay-at-home order as of March 24th, 2020 [$b = 0.32$ (0.13), $p = .014$]. The association between COVID-19 stress and drinking frequency was stronger among those residing in a state with a stay-at-home order. Associations between COVID-19 stress and eating to cope, added sugars intake, food addiction symptoms, and drinking to cope did not differ based on whether someone resided in a state with a stay-at-home order as of March 24th, 2020.

3.3.2. Perceived vulnerability to disease⁴

Germ aversion. Associations between COVID-19 stress and eating to cope [$b = -0.09$ (0.03), $p = .009$], food addiction symptoms [$b = -0.48$ (0.09), $p < .001$], and drinking to cope [$b = -0.15$ (0.03), $p < .001$] differed based on germ aversion. Associations between COVID-19 stress and eating to cope, food addiction symptoms, and drinking to cope were weaker among those reporting higher compared to lower germ aversion. Associations between COVID-19 stress and added sugars intake and drinking frequency did not differ by germ aversion.

Perceived infectability. Associations between COVID-19 stress and food addiction symptoms [$b = 0.17$ (0.08), $p = .027$] differed based on perceived infectability. Associations between COVID-19 stress and food addiction symptoms were stronger among those reporting higher compared to lower perceived infectability. Associations between COVID-19 stress and eating to cope, added sugars intake, drinking to cope, and drinking frequency did not differ by perceived infectability.

3.3.3. Age

Associations between COVID-19 stress and food addiction symptoms [$b = -0.02$ (0.01), $p = .019$], drinking to cope [$b = -0.01$ (0.00), $p = .046$], and drinking frequency [$b = -0.01$ (0.01), $p = .033$] differed based on age. Associations between COVID-19 stress and food addiction symptoms, drinking to cope, and drinking frequency were weaker among older adults. Associations between COVID-19 stress and eating to cope and added sugars intake did not differ by age.

3.3.4. U.S. political party affiliation

Associations between COVID-19 stress and eating to cope [$b = -0.21$

(0.07), $p = .004$], food addiction symptoms [$b = -0.92$ (0.19), $p < .001$], and drinking to cope [$b = -0.24$ (0.08), $p = .001$] differed by U.S. political party affiliation. Associations between COVID-19 stress and eating to cope, food addiction symptoms, and drinking to cope were weaker among Democrats compared to Republicans. Associations between COVID-19 stress and added sugars intake and drinking frequency did not differ by U.S. political party affiliation.

3.4. Were positive associations between COVID-19 stress and eating to cope, added sugars intake, and food addiction symptoms stronger among women, and were the positive associations between COVID-19 stress and drinking to cope and drinking frequency stronger among men?

For significant interactions, see Table 4 for estimates from tests for simple effects. Associations between COVID-19 stress and eating to cope [$b = -0.25$ (0.06), $p < .001$], food addiction symptoms [$b = -0.88$ (0.17), $p < .001$], and drinking to cope [$b = -0.30$ (0.07), $p < .001$] differed by gender. Associations between COVID-19 stress and eating to cope and food addiction symptoms were weaker among women compared to men. The association between COVID-19 stress and drinking to cope was stronger among men compared to women. Associations between COVID-19 stress and added sugars intake and drinking frequency did not differ by gender.

4. Discussion

Despite predictions that there would be increases in eating to cope and food addiction symptoms among individuals during the COVID-19 pandemic (Cherikh et al., 2020; Creswell, 2020; Muscogiuri, Barrea, et al., 2020; Nelson, 2020; Pellechia, 2020; Rehm et al., 2020), there was no evidence that average levels increased during the early stages of the pandemic (March 31st, 2020) from pre-pandemic levels among U.S. adults. These results may underscore that eating to cope and food addiction symptoms are patterns of behavior that develop over longer periods of time (Ashcroft et al., 2008; Avena et al., 2008). The current study was conducted two months after the first case of COVID-19 emerged in the U.S., and studies conducted at later time points during the ongoing COVID-19 pandemic may find different results.

There was evidence (albeit statistical significance was at the trend level) that U.S. adults ate about 14% more added sugars after the emergence of COVID-19 compared to before the pandemic. Since this increase in added sugars intake was found without a simultaneous increase in eating to cope, the reason for this acute shift in eating behavior might be independent of the high levels of stress among U.S. adults

⁴ Since perceived vulnerability to disease was measured in the February 2019 and March 2020 cohorts, we also preregistered testing differences in perceived vulnerability to disease between cohorts. These results are presented in Table S1 in Supplemental Materials

Table 4
Simple effects of COVID-19 stress within March 2020 cohort.

	b	SE _b	β	p	95% CI		R ²
					Lower	Upper	
Stay-at-home Order as of March 24th, 2020							
Drinking Frequency							
No stay-at-home order	0.33	0.09	.17	<.001	0.16	0.49	.03
Stay-at-home order	0.64	0.10	.33	<.001	0.45	0.83	.11
Perceived Vulnerability to Disease – Germ Aversion							
Eating to Cope							
Lower germ aversion	0.83	0.04	.74	<.001	0.75	0.90	.54
Higher germ aversion	0.68	0.05	.54	<.001	0.58	0.78	.29
Food Addiction Symptoms							
Lower germ aversion	2.75	0.12	.77	<.001	2.53	2.98	.60
Higher germ aversion	1.79	0.12	.57	<.001	1.56	2.03	.33
Drinking to Cope							
Lower germ aversion	0.84	0.04	.69	<.001	0.75	0.92	.47
Higher germ aversion	0.63	0.05	.51	<.001	0.53	0.73	.26
Perceived Vulnerability to Disease – Perceived Infectability							
Food Addiction Symptoms							
Lower perceived infectability	1.46	0.12	.53	<.001	1.23	1.69	.28
Higher perceived infectability	2.57	0.13	.70	<.001	2.32	2.82	.49
Age							
Food Addiction Symptoms							
Younger adults	2.47	0.13	.69	<.001	2.21	2.72	.48
Older adults	2.02	0.12	.64	<.001	1.79	2.25	.40
Drinking to Cope							
Younger adults	0.78	0.05	.63	<.001	0.69	0.87	.40
Older adults	0.68	0.05	.53	<.001	0.57	0.78	.28
Drinking Frequency							
Younger adults	0.52	0.08	.30	<.001	0.36	0.68	.09
Older adults	0.29	0.11	.13	.008	0.08	0.50	.02
U.S. Political Party Affiliation							
Eating to Cope							
Republicans	0.88	0.04	.77	<.001	0.80	0.97	.60
Democrats	0.68	0.05	.55	<.001	0.57	0.78	.30
Food Addiction Symptoms							
Republicans	2.94	0.15	.78	<.001	2.64	3.23	.62
Democrats	2.02	0.13	.64	<.001	1.77	2.27	.41
Drinking to Cope							
Republicans	0.90	0.05	.74	<.001	0.80	0.99	.55
Democrats	0.65	0.05	.52	<.001	0.54	0.76	.28
Gender							
Eating to Cope							
Men	0.88	0.04	.77	<.001	0.81	0.95	.59
Women	0.63	0.05	.50	<.001	0.53	0.73	.25
Food Addiction Symptoms							
Men	2.74	0.12	.77	<.001	2.51	2.97	.59
Women	1.86	0.12	.59	<.001	1.62	2.09	.35
Drinking to Cope							
Men	0.88	0.04	.74	<.001	0.80	0.96	.55
Women	0.58	0.05	.46	<.001	0.48	0.69	.21

during the pandemic (American Psychological Association, 2020). For instance, U.S. adults may have eaten more added sugars during the pandemic by proxy of purchasing more nonperishable, processed food to reduce exposure to COVID-19. Nonperishable foods are often processed

and high in added sugars (Monteiro et al., 2019).

At the individual level, those who reported higher levels of COVID-19 stress reported higher levels of eating to cope, added sugars intake, food addiction symptoms, drinking to cope, and drinking frequency. Thus, for U.S. adults who have a tendency to eat/drink to cope or who have symptoms of addiction, subjective stress from the pandemic may have exacerbated these tendencies and symptoms. There was no evidence that stay-at-home orders amplified the observed links between COVID-19 stress and eating among U.S. adults; yet, the association between COVID-19 stress and greater drinking frequency was stronger among individuals who resided in states with stay-at-home orders. It is possible that stay-at-home orders did not amplify eating in response to stress because the U.S. has a “toxic” food environment that encourages overeating, which can spillover into the home food environment (Brownell, 2002). On the other hand, under stay-at-home orders, individuals may have experienced a more noticeable shift in alcohol environments, which may have disrupted norms around typical days of the week and times of the day for drinking (Reich et al., 2015). Experiencing those changes, along with perceiving stress, could lead individuals to drink more frequently.

As predicted, the strength of associations between COVID-19 stress and eating and drinking behaviors differed for certain groups of U.S. adults. In accordance with prior work showing that those who report high levels of vulnerability to disease generally have stronger behavioral reactions to pathogen threats, the association between COVID-19 stress and food addiction symptoms was stronger among those with high perceived infectability (Ackerman et al., 2018). For those high in germ aversion, however, there were weaker associations between COVID-19 stress and eating to cope, food addiction symptoms, and drinking to cope. At least two possible reasons exist for this difference. First, germ aversion is moderately related to pathogen disgust and triggered by disgust-related cues (Ackerman et al., 2018; Duncan et al., 2009). Disgust is associated with reduced food intake (Houben & Havermans, 2012), which may lead germ-averse individuals to cope with COVID-19 stress through means other than eating. Second, prior studies have found that germ aversion, but not perceived infectability, is associated with greater dislike of fat people and fear of oneself becoming fat (Duncan et al., 2009; Magallares et al., 2015; Park et al., 2007). Individuals high in germ aversion might have countered urges to cope by consuming food or alcohol because of the fear of becoming fat.

In contrast to our hypothesis, associations between COVID-19 stress and food addiction symptoms, drinking to cope, and drinking frequency were weaker among older compared to younger adults. However, these results are consistent with findings from the broader literature on coping, which demonstrate that older compared to younger adults worry less, practice more adaptive coping strategies, and practice fewer maladaptive coping strategies (Hunt et al., 2003). Despite COVID-19 infection posing a more serious threat to older adults (Centers for Disease Control and Prevention, 2020), older adults may have more adaptively coped with the stress of COVID-19 because of general tendencies to handle stress more adaptively.

Also in contrast to our hypothesis, associations between COVID-19 stress and eating to cope, food addiction symptoms, and drinking to cope were weaker among Democrats compared to Republicans. In the early stages of the pandemic, Democrats compared to Republicans engaged in more health-promoting behaviors including hand washing and social distancing (Kushner Gadarian et al., 2020). Outside of the context of the pandemic, nationally representative data indicate that Democrats compared to Republicans eat fewer processed foods (Kannan & Veazie, 2018). Democrats compared to other political groups are also more likely to support policy aimed at reducing obesity and to recognize obesity as a disease (Lee & Kim, 2017; Puhl & Liu, 2015). Thus, Democrats may have engaged in less eating/drinking to cope compared to Republicans because of these tendencies toward health-promoting behaviors, typical patterns of eating well, and general concerns about obesity. It is also possible that Democrats used some maladaptive coping

strategies that were independent of eating/drinking and not measured in the current study (e.g., increased media consumption, withdrawal from social relationships).

Consistent with prior work, the association between COVID-19 stress and drinking cope was stronger among men compared to women (Pohorecky, 1991). However, inconsistent with prior work, associations between COVID-19 stress and eating to cope, and between COVID-19 stress and food addiction symptoms, were weaker among women compared to men (Greeno & Wing, 1994). There are a few possible explanations for these findings. Some research suggests that men compared to women are more likely to cope with stress by problem solving via cognitive and behavioral efforts, but one cannot solve the COVID-19 pandemic (Matud, 2004). It is thus possible the unique conditions of this stressor led men towards atypical coping strategies. Indeed, during the Persian Gulf War missile crisis, when chemical warfare required that Israeli civilians stay indoors during attacks, Israeli men shifted their typical coping strategies and were less likely to cope with stress by problem solving (Ben-Zur & Zeidner, 1996). Another possible explanation is that—in contrast to other types of stressors—the COVID-19 pandemic has created fear of weight gain from being sedentary during quarantine (Pearl, 2020), and fear of weight gain generally is higher among women compared to men (Slof-Op't Landt et al., 2017). As a result, women might have been especially motivated to reduce over-eating during this pandemic.

These results should be interpreted in light of study strengths and weaknesses. This is the first study to compare levels of eating to cope, added sugars intake, and food addiction symptoms after the emergence of the COVID-19 pandemic in the U.S. to pre-pandemic levels using validated measures. This approach improved upon existing studies because respondents did not retrospectively determine what their behavior was like before and after the pandemic (Ammar et al., 2020; Branley-Bell & Talbot, 2020; Cherikh et al., 2020; Rolland et al., 2020). Nonetheless, the current study design did not repeatedly measure behaviors in the same individuals from February 2019 to March 2020 but rather compared between two independent samples. The samples were recruited with a near-identical sampling procedure; however, demographic differences between samples emerged. Although these differences were controlled for in analysis, unaccounted differences between the samples may have impacted the results. Moreover, drinking to cope and drinking frequency were not measured in both cohorts, and associations between COVID-19 stress and variables of interest were cross-sectional. Thus, conclusions about shifts in drinking behavior after the emergence of COVID-19 pandemic in the U.S., and causal conclusions about the effect of COVID-19 stress on eating and drinking behaviors, cannot be inferred from this study.

The crowdsourced sampling procedure introduces potential sampling bias. There may be underrepresentation of certain groups in the U.S. (e.g., Republicans, individuals with less education) in the current study sample, so future research with U.S. nationally representative or at-risk samples is warranted. The current study also exclusively focused on eating and drinking behaviors in response to stress from the COVID-19 pandemic; however, people cope with stress in several ways not examined here, and the pandemic may impact other health-related behaviors (e.g., smoking cigarettes, sleep). For instance, Italian adults showed reduced sleep quality and increased body mass index after 40 days of quarantine (Barrea et al., 2020). Future research might consider examining associations between COVID-19 stress and other types of coping strategies and health-related behaviors. That kind of research may provide a comprehensive understanding of the effect of the COVID-19 pandemic on health and wellbeing.

In sum, the current study did not find evidence that average levels of eating to cope and food addiction symptoms increased among U.S. adults after the emergence of the COVID-19 pandemic; however, there was small evidence that U.S. adults ate more added sugars. Additionally, results suggest that, for U.S. adults who eat/drink to cope or who have food addiction symptoms, stress from the pandemic may exacerbate

these tendencies and symptoms. Certain U.S. adults—in particular, individuals with higher perceived infectability, younger adults, Republicans, and men—might especially use some maladaptive coping strategies in response to stress from the pandemic. Future longitudinal research will shed light on the long-term impact of the COVID-19 pandemic on eating and drinking behaviors.

Ethical statement

The University of Michigan Institutional Review Board approved the research procedure in accordance with the provisions of the World Medical Association Declaration of Helsinki (HUM00158499 and HUM00179638). All participants provided informed consent before participating in the described studies.

Declaration of competing interest

None.

Acknowledgements

The Eunice Kennedy Shriver National Institute of Child Health and Human Development provided funds for the present research and supported Jenna R. Cummings (T32HD079350, Intramural Research Program). The National Institutes of Diabetes and Digestive And Kidney Diseases supported Julia A. Wolfson (K01DK119166). The content of this manuscript is solely the responsibility of the authors and does not necessarily represent the official views of the funding agencies.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.appet.2021.105163>.

References

- Ackerman, J. M., Hill, S. E., & Murray, D. R. (2018). The behavioral immune system: Current concerns and future directions. *Social and Personality Psychology Compass*, 12 (2), Article e12371. <https://doi.org/10.1111/spc3.12371>
- Adam, T. C., & Epel, E. S. (2007). Stress, eating and the reward system. *Physiology & Behavior*, 91, 449–458. <https://doi.org/10.1016/j.physbeh.2007.04.011>
- American Psychological Association. (2020). *Stress in the time of COVID-19: Volume one*. Retrieved June 24th, 2020 from <https://www.apa.org/news/press/releases/stress/2020/stress-in-america-covid.pdf>.
- Ammar, A., Brach, M., Trabelsi, K., Chtourou, H., Boukhris, O., Masmoudi, L., Bouaziz, B., Bentlage, E., How, D., Ahmed, M., Muller, P., Muller, N., Aloui, A., Hammouda, O., Paineiras-Domingos, L. L., Braakman-Jansen, A., Wrede, C., Bastoni, S., Pernambuco, C. S., & Hoekelmann, A. (2020). Effects of COVID-19 home confinement on eating behaviour and physical activity: Results of the ECLB-COVID19 international online survey. *Nutrients*, 12, 1583. <https://doi.org/10.3390/nu12061583>
- Ashcroft, J., Semmler, C., Carnell, S., van Jaarsveld, C. H., & Wardle, J. (2008). Continuity and stability of eating behaviour traits in children. *European Journal of Clinical Nutrition*, 62(8), 985–990. <https://doi.org/10.1038/sj.ejcn.1602855>
- Avena, N. M., Rada, P., & Hoebel, B. G. (2008). Evidence for sugar addiction: Behavioral and neurochemical effects of intermittent, excessive sugar intake. *Neuroscience & Biobehavioral Reviews*, 32(1), 20–39.
- Barrea, L., Pugliese, G., Framondi, L., Di Matteo, R., Laudisio, D., Savastano, S., Colao, A., & Muscogiuri, G. (2020). Does sars-cov-2 threaten our dreams? Effect of quarantine on sleep quality and body mass index. *Journal of Translational Medicine*, 18(1), 318.
- Ben-Zur, H., & Zeidner, M. (1996). Gender differences in coping reactions under community crisis and daily routine conditions. *Personality and Individual Differences*, 20(3), 331–340.
- Boggiano, M. M., Wenger, L. E., Burgess, E. E., Tatum, M. M., Sylvester, M. D., Morgan, P. R., & Morse, K. E. (2017). Eating tasty foods to cope, enhance reward, socialize or conform: What other psychological characteristics describe each of these motives? *Journal of Health Psychology*, 22(3), 280–289.
- Boggiano, M. M., Wenger, L. E., Turan, B., Tatum, M. M., Morgan, P. R., & Sylvester, M. D. (2015). Eating tasty food to cope. Longitudinal association with BMI. *Appetite*, 87, 365–370. <https://doi.org/10.1016/j.appet.2015.01.008>
- Branley-Bell, D., & Talbot, C. V. (2020). Exploring the impact of the COVID-19 pandemic and UK lockdown on individuals with experience of eating disorders. *Journal of Eating Disorders*, 8, 44. <https://doi.org/10.1186/s40337-020-00319-y>

- Brownell, K. D. (2002). The environment and obesity. In C. G. Fairburn, & K. D. Brownell (Eds.), *Eating disorders and obesity: A comprehensive handbook* (2nd ed. ed., pp. 433–438). New York, NY: Guilford Publications.
- Buhrmester, M., Kwang, T., & Gosling, S. D. (2011). Amazon's mechanical Turk: A new source of inexpensive, yet high-quality, data? *Perspectives on Psychological Science*, 6(1), 3–5. <https://doi.org/10.1177/1745691610393980>
- Burgess, E. E., Turan, B., Lokken, K. L., Morse, A., & Boggiano, M. M. (2014). Profiling motives behind hedonic eating. Preliminary validation of the palatable eating motives scale. *Appetite*, 72, 66–72. <https://doi.org/10.1016/j.appet.2013.09.016>
- Calvillo, D. P., Ross, B. J., Garcia, R. J., Smelter, T. J., & Rutchick, A. M. (2020). Political ideology predicts perceptions of the threat of covid-19 (and susceptibility to fake news about it). *Social Psychological and Personality Science*, 11(8), 1119–1128. <https://doi.org/10.1177/1948550620940539>
- Centers for Disease Control and Prevention. (2020a). *Previous U.S. COVID-19 case data*. Retrieved June 19th, 2020 from <https://www.cdc.gov/coronavirus/2019-ncov/cas-es-updates/previouscases.html>.
- Centers for Disease Control and Prevention. (2020b). *Coronavirus disease 2019 (COVID-19): Older adults*. Retrieved June 19th, 2020 from <https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/older-adults.html>.
- Cherikh, F., Frey, S., Bel, C., Attanasi, G., Alifano, M., & Ianneli, A. (2020). Behavioral food addiction during lockdown: Time for awareness, time to prepare the aftermath. *Obesity Surgery*. <https://doi.org/10.1007/s11695-020-04649-3>
- Cooper, M. L. (1994). Motivation for alcohol use among adolescents: Development and validation of a four-factor model. *Psychological Assessment*, 6(2), 117–128.
- Creswell, J. (2020). 'I just need the comfort': Processed foods make a pandemic comeback. Retrieved June 24th, 2020 from <https://www.nytimes.com/2020/04/07/business/coronavirus-processed-foods.html>.
- Cummings, J. R., Joyner, M. A., & Gearhardt, A. N. (2020). Development and preliminary validation of the anticipated effects of food scale. *Psychology of Addictive Behaviors*, 34(2), 403–413. <https://doi.org/10.1037/adb0000544>
- Duncan, L. A., Schaller, M., & Park, J. H. (2009). Perceived vulnerability to disease: Development and validation of a 15-item self-report instrument. *Personality and Individual Differences*, 47(6), 541–546. <https://doi.org/10.1016/j.paid.2009.05.001>
- Greeno, C., & Wing, R. (1994). Stress-induced eating. *Psychological Bulletin*, 115(3), 444. <https://doi.org/10.1037/0033-2909.115.3.444>
- Houben, K., & Havermans, R. C. (2012). A delicious fly in the soup. The relationship between disgust, obesity, and restraint. *Appetite*, 58(3), 827–830.
- Hunt, S., Wisocki, P., & Yanko, J. (2003). Worry and use of coping strategies among older and younger adults. *Journal of Anxiety Disorders*, 17(5), 547–560. [https://doi.org/10.1016/S0887-6185\(02\)00229-3](https://doi.org/10.1016/S0887-6185(02)00229-3)
- Kannan, V. D., & Veazie, P. J. (2018). Political orientation, political environment, and health behaviors in the United States. *Preventive Medicine*, 114, 95–101. <https://doi.org/10.1016/j.ypmed.2018.06.011>
- Kushner Gadarian, S., Goodman, S. W., & Pepinsky, T. B. (2020). Partisanship, health behavior, and policy attitudes in the early stages of the COVID-19 pandemic. Available at: SSRN: <https://ssrn.com/abstract=3562796> <https://doi.org/10.2139/ssrn.3562796>.
- Lee, T. K., & Kim, H. K. (2017). Differential effects of message framing on obesity policy support between democrats and republicans. *Health Communication*, 32(12), 1481–1490.
- Magallares, A., Jauregui-Lobera, I., Carbonero-Carreño, R., Ruiz-Prieto, I., Bolanos-Rios, P., & Cano-Escoriaza, A. (2015). Perceived vulnerability to disease and antifat attitudes in a sample of children and teenagers. *Eating and Weight Disorders - Studies on Anorexia, Bulimia and Obesity*, 20(4), 483–489.
- Matud, M. P. (2004). Gender differences in stress and coping styles. *Personality and Individual Differences*, 37(7), 1401–1415.
- Mervosh, S., Lu, D., & Swales, V. (2020). See which states and cities have told residents to stay home. Retrieved March 31st, 2020 from [ve/2020/us/coronavirus-stay-at-home-order.html?action=click&module=Top Stories&pgtype=Homepage](https://www.nytimes.com/interacti).
- Monteiro, C. A., Cannon, G., Levy, R. B., Moubarac, J. C., Louzada, M. L., Rauber, F., Khandpur, N., Cediel, G., Neri, D., Martinez-Steele, E., Baraldi, L. G., & Jaime, P. C. (2019). Ultra-processed foods: What they are and how to identify them. *Public Health Nutrition*, 22(5), 936–941. <https://doi.org/10.1017/S1368980018003762>
- Muscogiuri, G., Barrea, L., Savastano, S., & Colao, A. (2020). Nutritional recommendations for COVID-19 quarantine. *European Journal of Clinical Nutrition*, 1–2.
- Muscogiuri, G., Pugliese, G., Barrea, L., Savastano, S., & Colao, A. (2020). Commentary: Obesity: The "achilles heel" for COVID-19? *Metabolism - Clinical and Experimental*, 108, 154251.
- Nelson, T. (2020). *Uncomfortable times, we're buying more junk food*. Retrieved June 24th, 2020 from <https://www.myrecipes.com/news/coronavirus-buying-more-junk-food>.
- Park, J. H., Schaller, M., & Crandall, C. S. (2007). Pathogen-avoidance mechanisms and the stigmatization of obese people. *Evolution and Human Behavior*, 28(6), 410–414.
- Pearl, R. L. (2020). Weight stigma and the "quarantine-15". *Obesity*, 28(7). <https://doi.org/10.1002/oby.22850>
- Pellechia, T. (2020). *Nielsen says beverage alcohol retail sales are soaring during the crisis*. Retrieved June 24th, 2020 from <https://www.forbes.com/sites/thomaspellechia/2020/03/25/nielsen-says-beverage-alcohol-retail-sales-are-soaring-during-the-crisis/-6e33b5842444>.
- Pohorecky, L. A. (1991). Stress and alcohol interaction: An update of human research. *Alcoholism: Clinical and Experimental Research*, 15(3), 438–459. <https://doi.org/10.1111/j.1530-0277.1991.tb00543.x>
- Puhl, R. M., & Liu, S. (2015). A national survey of public views about the classification of obesity as a disease. *Obesity*, 23(6), 1288–1295.
- Rehm, J., Kilian, C., Ferreira-Borges, C., Jernigan, D., Monteiro, M., Parry, C. D. H., Sanchez, Z. M., & Mantney, J. (2020). Alcohol use in times of the COVID 19: Implications for monitoring and policy. *Drug and Alcohol Review*, 39(4), 301–304. <https://doi.org/10.1111/dar.13074>
- Reich, R. R., Cummings, J. R., Greenbaum, P. E., Moltisanti, A. J., & Goldman, M. S. (2015). The temporal "pulse" of drinking: Tracking 5 years of binge drinking in emerging adults. *Journal of Abnormal Psychology*, 124(3), 635–647. <https://doi.org/10.1037/abn0000061>
- Rolland, B., Haesebaert, F., Zante, E., Benyamina, A., Haesebaert, J., & Franck, N. (2020). Global changes and factors of increase in caloric/salty food, screen, and substance use, during the early COVID-19 containment phase in France: A general population online survey. *JMIR Public Health and Surveillance*, 6(3), Article e19630. <https://doi.org/10.2196/19630>
- Schulte, E. M., & Gearhardt, A. N. (2017). Development of the modified Yale food addiction scale version 2.0. *European Eating Disorders Review*, 25(4), 302–308. <https://doi.org/10.1002/erv.2515>
- Sinha, R., & Jastreboff, A. M. (2013). Stress as a common risk factor for obesity and addiction. *Biological Psychiatry*, 73(9), 827–835. <https://doi.org/10.1016/j.biopsych.2013.01.032>
- Slof-Op't Landt, M. C. T., van Furth, E. F., van Beijsterveldt, C. E. M., Bartels, M., Willemsen, G., de Geus, E. J., Ligthart, L., & Boomsma, D. I. (2017). Prevalence of dieting and fear of weight gain across ages: A community sample from adolescents to the elderly. *International Journal of Public Health*, 62, 911–919. <https://doi.org/10.1007/s00038-017-0948-7>
- Thompson, F. E., Midthune, D., Kahle, L., & Dodd, K. W. (2017). Development and evaluation of the national cancer institute's dietary screener questionnaire scoring algorithms. *Journal of Nutrition*, 147(6), 1226–1233. <https://doi.org/10.3945/jn.116.246058>
- Weiss, D. S., & Marmar, C. R. (1997). The impact of event scale - revised. In J. P. Wilson, & T. M. Keane (Eds.), *Assessing psychological trauma and PTSD: A practitioner's handbook* (pp. 399–411). New York: Guilford Press.