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Body Mass Index, Weight Discrimination, and Psychological, Behavioral, and Interpersonal
Responses to the Coronavirus Pandemic

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What is already known about this subject

- Obesity is a risk factor for complications of COVID-19, the respiratory disease caused by the novel coronavirus.
- Weight discrimination often has stronger associations with health outcomes than BMI.
- Effective responses to the pandemic are important for public health and mental health and may be shaped by both BMI and weight discrimination.

What this study adds

- Weight discrimination was associated with greater concerns and precautionary behavior but also less trust and community connection.
- BMI was primarily unrelated to psychological, behavioral, and interpersonal responses to the coronavirus pandemic.
- Weight discrimination but not BMI predicts psychological, behavioral, and interpersonal responses to the pandemic.

How might your results change the direction of research or the focus of clinical practice?

- Messaging on the risk of complications associated with COVID-19 for individuals with higher BMI may need to be improved to better communicate risks of the disease. At the same time, caution must be taken to not stigmatize individuals with higher BMI even further.

Abstract

Objective: To examine whether body mass index (BMI) and weight discrimination are associated with psychological, behavioral, and interpersonal responses to the coronavirus pandemic.

Methods: Using a prospective design, participants (N=2,094) were first assessed in early February 2020 before the coronavirus crisis in the United States and again in mid-March 2020 during the President's 15 Days to Slow the Spread guidelines. Weight, height, and weight discrimination were assessed in the February survey. Psychological, behavioral, and interpersonal responses to the coronavirus were assessed in the March survey.

Results: Pre-pandemic experiences with weight discrimination were associated with greater concerns about the virus, engaging in more preventative behaviors, less trust in people and institutions to manage the outbreak, and greater perceived declines in connection to one's community. BMI tended to be unrelated to these responses.

Conclusions: Despite the risks of complications of COVID-19 associated with obesity, individuals with higher BMI were neither more concerned about the virus nor taking more behavioral precautions than individuals in other weight categories. Weight discrimination, in contrast, may heighten vigilance to threat, which may have contributed to both positive (greater concern, more precautionary behavior) and negative (less trust, declines community connection) responses to the pandemic.

Keywords: COVID-19; Coronavirus Pandemic; Weight Discrimination; Trust; Precautionary Behaviors

Introduction

Obesity has been identified as one risk factor for complications of COVID-19, the disease caused by the novel coronavirus (1, 2). Much of the work on obesity and COVID-19 has focused on epidemiological and biological aspects of the disease. Yet, there are also significant psychological (3), behavioral (4), and interpersonal (5) consequences of the current crisis. Such responses, including concerns about the virus, engagement in preventative behaviors, trust in institutions to manage the crisis, and maintaining strong interpersonal relationships will be key to both public health efforts to control the virus spread and to maintain mental health. Higher body mass index (BMI) may shape these responses to the pandemic, especially given the direct health risks associated with obesity for complications of COVID-19.

For many health-related outcomes, the social experience of body weight in the form of unfair treatment because of weight (i.e., weight discrimination) has been found to be a stronger predictor than higher BMI itself (6, 7). The same may be true of coronavirus-related responses. To that end, the present research uses a prospective design to examine how BMI and experiences with weight discrimination measured just prior to the crisis prospectively predict concerns about the coronavirus, behavioral precautions taken to protect the self and reduce the spread, trust in individuals and institutions to manage the crisis, and perceived changes in relationship quality during the acute phase of the coronavirus pandemic.

Method

Participants and Procedures

Participants were from an on-going online study of health and well-being of adults living in the United States. Participants were recruited by Dynata (dyanata.com) and directed to a Qualtrics survey. Participants completed a questionnaire in early February 2020 that included items on weight and height and weight discrimination (Wave 1). Participants were invited to complete another survey in mid-March 2020 during the President's 15 Days to Slow the Spread guidelines, which included several measures related to the coronavirus (Wave 2). The overall project was preregistered prior to data collection (<https://osf.io/q8cpd/>); the analyses reported in this paper

were not preregistered. A total of 2,094 participants with valid data at both waves were included in the analysis. See Supplemental Material for attrition analysis.

Measures

Wave 1. BMI was derived as kg/m² from reported weight and height and categorized into CDC-defined categories of underweight (BMI<18.50), overweight (BMI between 25-29.99) and obesity (BMI>=30)¹, compared to normal weight (BMI between 18.50 and 24.99). Biologically implausible values (BMI<12 or BMI>70) were removed from the dataset (*n*=4). Weight discrimination was measured with the item, “Have you ever been treated unfairly because of your weight?” (yes/no)(9).

Wave 2. Participants were asked 13 items about their concerns about the coronavirus (e.g., “How concerned are you about becoming severely ill or dying from the disease caused by the coronavirus?”) on a scale from 1 (*not at all concerned*) to 5 (*extremely concerned*) (alpha=.89). Participants reported the CDC-recommended behavioral precautions they were taking to avoid the coronavirus (e.g., wash hands often). The sum of eight behaviors was taken across items (alpha=.73). Participants rated their trust in 13 groups/institutions to manage the outbreak (e.g., “To manage the outbreak of the coronavirus in the United States, how much do you trust the following: Others in your community? State Government?”) on a scale from 1 (*strongly distrust*) to 5 (*strongly trust*). The mean was taken across the 13 items (alpha=.86). Participants also reported on changes in their relationship quality. Specifically, for participants with a romantic partner, they reported on changes in satisfaction, irritation, and disagreements with their partner since the outbreak on a scale from 1 (*less than before*) to 3 (*more than before*). Items were reverse scored when necessary and the mean taken in the direction of declines in relationship quality (alpha=.66). Participants also reported whether they felt emotionally closer to their partner, and, for all participants, changes in their feelings of emotional closeness to their family, friends, and community since the outbreak began. Each item was rated on a scale from 1 (*less than before*) to 3 (*more than before*). See Supplemental Table S1 for items for all outcome measures.

¹ Note that we used the CDC-defined BMI category of obesity, not the medical definition of obesity.

Covariates. Participants reported their age in years, gender identity, race, ethnicity, and level of education. Additional information included political affiliation and state location. The state data were coded in two ways. First, location was coded into a variable that compared 10 “hot spot” states that have the highest per capita deaths due to COVID-19 against all other states. Second, location was coded into the four Census-defined regions of the country (Northeast, Midwest, South, West).

Analytic Strategy

Linear regression was used to examine the association between BMI categories and weight discrimination and each of the coronavirus responses, controlling for sociodemographic covariates (all predictors and covariates entered simultaneously).

Results

Descriptive statistics are shown in Table 1. Participants who reported weight discrimination at Wave 1 reported more concerns over the coronavirus, engaged in more preventative behaviors, and also had less trust in people and institutions to manage the outbreak at Wave 2 (Table 2). BMI category was unrelated to concerns, preventative behaviors, and trust, except for one negative association between underweight and precautionary behavior.

Across the sample, 66.3% ($n=1,389$) of participants reported being in a romantic relationship. Weight discrimination was associated with greater perceived declines in relationship quality since the coronavirus outbreak (Table 2) but was unrelated to perceived changes in emotional closeness to partner (Table 3). In the full sample, weight discrimination was also associated with feeling less emotionally close to one’s community; it was unrelated to changes in perceived emotional closeness to family or friends. BMI category was unrelated to changes in the quality of one’s social relationships, except for one association between the overweight category and less relationship quality decline. The associations for weight discrimination in all analyses were similar if BMI as a continuous variable was used instead of BMI categories. There was no relation between continuous BMI and any of the coronavirus responses (Supplemental Table S2). The pattern of associations was the same if political affiliation or state location (either as hot spot states or Census-defined regions) was included as additional covariates (Supplemental Tables S3-S5).

Discussion

The present study suggests that in this sample of adults across the United States, the experience of weight discrimination, but not BMI, is associated with psychological, behavioral, and interpersonal responses to the coronavirus pandemic. Previous experiences with weight discrimination were associated with having more concerns about the virus and engaging in more precautionary behavior to prevent infection but also to less trust and greater perceived disruption in close relationships. BMI was largely unrelated to these responses.

Weight discrimination is associated routinely with worse health outcomes, independent of BMI (6). In the present research, weight discrimination was associated with both more adaptive (e.g., engaging in more preventative behaviors) and less adaptive (e.g., perceived declines in relationship quality) responses to the coronavirus outbreak. Individuals who have experienced weight discrimination tend to have more anxiety (8), and, in the current context, this anxiety may have translated into greater concerns over the effects of the coronavirus. Interestingly, although weight discrimination has been associated previously with greater engagement in high-risk health behaviors (9), it was associated with engaging in more CDC-recommended behaviors to reduce the spread of the coronavirus. Weight discrimination may increase sensitivity to threats in the environment, as with other forms of stigma (10), which we speculate could translate into proactive, protective behavior in some cases. This pattern suggests an adaptive response to the pandemic. At the same time, weight discrimination was also associated with less trust in others to manage the crisis and with perceived declines in quality of close relationships. In the context of healthcare, weight discrimination has been associated with less trust in medical authorities perhaps because of the poor treatment many of these individuals have endured (11). Individuals who have experienced weight discrimination are also vulnerable to loneliness (12), and weight stigma has been associated with more difficulties in interpersonal relationships (13). The association with perceived decline in the current study may also reflect, in part, worse relationship quality prior to the pandemic. Unfair treatment may be an interpersonal violation that lowers trust and increases disconnection from one's community when confronted with a significant threat.

In contrast to weight discrimination, BMI was essentially unrelated to responses during the acute phase of the pandemic. Despite being at risk for complications from COVID-19 associated with

obesity (1, 14), individuals with higher BMI were no more concerned about the pandemic than individuals with normal weight. Further, although previous research has found fairly consistent evidence that individuals with obesity are more likely to engage in some preventative behaviors, such as flu vaccinations (15), participants with higher BMI were no more or less likely than individuals with lower BMI to engage in behaviors to protect themselves and others against the coronavirus. Given the risks of complications from COVID-19, precautionary behaviors may be especially important for individuals with higher BMI. Finally, although BMI has been associated with problems in interpersonal relationships (16), the declines in relationship quality observed during the acute phase of the pandemic were nearly completely unrelated to higher BMI.

The present research suggests that, as with many health-related outcomes, experiences with weight discrimination had stronger associations with responses to the pandemic than BMI, including engaging in more precautionary behaviors. Future research will need to address limitations, such as whether this pattern extends to other populations and to other pandemic-related responses. The pattern of associations for BMI category also suggests that the risk of complications associated with COVID-19 for individuals with higher BMI may need to be better communicated to the public. At the same time, caution must be taken to not stigmatize individuals with obesity even further.

References

1. Malavazos AE, Corsi Romanelli MM, Bandera F, Iacobellis G. Targeting the Adipose Tissue in COVID-19. *Obesity (Silver Spring)* 2020.
2. Richardson S, Hirsch JS, Narasimhan M, Crawford JM, McGinn T, Davidson KW, *et al.* Presenting characteristics, comorbidities, and outcomes among 5700 patients hospitalized with COVID-19 in the New York City area. *JAMA* 2020.
3. Xiang YT, Jin Y, Cheung T. Joint international collaboration to combat mental health challenges during the coronavirus disease 2019 pandemic. *JAMA Psychiatry* 2020.
4. Wilder-Smith A, Freedman DO. Isolation, quarantine, social distancing and community containment: pivotal role for old-style public health measures in the novel coronavirus (2019-nCoV) outbreak. *J Travel Med* 2020;27.
5. Miller G. Social distancing prevents infections, but it can have unintended consequences. *Science* 2020.
6. Tomiyama AJ, Carr D, Granberg EM, Major B, Robinson E, Sutin AR, *et al.* How and why weight stigma drives the obesity 'epidemic' and harms health. *BMC Med* 2018;16: 123.
7. Sutin AR, Stephan Y, Terracciano A. Weight discrimination and risk of mortality. *Psychological Science* 2015;26: 1803-1811.
8. Alimoradi Z, Golboni F, Griffiths MD, Broström A, Lin CY, Pakpour AH. Weight-related stigma and psychological distress: A systematic review and meta-analysis. *Clin Nutr* 2019.

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9. Sutin AR, Terracciano A. Perceived weight discrimination and high-risk health-related behaviors. *Obesity* 2017;25: 1183-1186.
 10. Pinel EC. You're just saying that because I'm a woman: Stigma consciousness and attributions to discrimination. *Self & Identity* 2004;3: 39-51.
 11. Alberga AS, Edache IY, Forhan M, Russell-Mayhew S. Weight bias and health care utilization: A scoping review *Primary Healthcare Res & Develop* 2019;20: 1-14.
 12. Sutin AR, Stephan Y, Carretta H, Terracciano A. Perceived discrimination and physical, cognitive, and emotional health in older adulthood. *Am J Geriatric Psychiatry* 2015;23: 171-179.
 13. Boyes AD, Latner JD. Weight stigma in existing romantic relationships. *J Sex Marital Ther* 2009;35: 282-293.
 14. Lighter J, Phillips M, Hochman S, Sterling S, Johnson D, Francois F, *et al.* Obesity in patients younger than 60 years is a risk factor for Covid-19 hospital admission. *Clin Infect Dis* 2020.
 15. Harris JA, Moniz MH, Iott B, Power R, Griggs JJ. Obesity and the receipt of influenza and pneumococcal vaccination: a systematic review and meta-analysis. *BMC Obes* 2016;3: 24.
 16. Puhl RM, Heuer CA. The stigma of obesity: A review and update. *Obesity* 2009;17: 941-964.

Table 1

Means (standard deviation) or Percentages (n) for All Study Variables

Variable	Full Sample	Obesity		Weight Discrimination	
		No	Yes	No	Yes
Age in years	51.03 (16.58)	50.27 (17.05)	53.00 (15.16)	52.09 (16.51)	44.83 (15.66)
Gender (male) ^a	51.1% (1070)	52.2% (786)	48.4% (284)	54% (966)	34.2% (104)
Race (African American)	16.6% (347)	16.3% (245)	17.4% (102)	16.5% (295)	17.1% (52)
Ethnicity (Latinx)	10.7% (224)	10.2% (154)	11.9% (70)	9.9% (177)	15.5% (47)
Education ^b	4.18 (1.51)	4.30 (1.48)	3.85 (1.53)	4.23 (1.50)	3.87 (1.52)
Body mass index					
Underweight	4.7% (98)	6.5% (98)	0%	4.3% (77)	6.9% (21)
Normal weight	33.6% (703)	46.6% (703)	0%	36.6% (655)	15.1% (46)
Overweight	33.7% (706)	46.8% (706)	0%	35.9% (642)	21.1% (64)
Obesity	28% (587)	0%	100% (587)	23.1% (414)	56.9% (173)
Weight discrimination (yes)	14.5% (304)	8.7% (131)	29.5% (173)	0%	100%
Coronavirus concerns	2.89 (.90)	2.88 (.89)	2.90 (.90)	2.85 (.89)	3.12 (.90)
Precautionary behaviors (sum)	5.58 (1.91)	5.60 (1.93)	5.53 (1.86)	5.53 (1.93)	5.86 (1.76)

Trust to manage outbreak	3.24 (.70)	3.26 (.68)	3.16 (.74)	3.27 (.68)	3.04 (.78)
Relationship quality decline ^c	1.88 (.39)	1.86 (.38)	1.91 (.39)	1.87 (.38)	1.95 (.40)
Emotionally closeness to					
Partner ^c	2.22 (.53)	2.22 (.54)	2.20 (.52)	2.22 (.52)	2.19 (.59)
Family ^d	2.18 (.51)	2.17 (.52)	2.19 (.50)	2.18 (.51)	2.17 (.55)
Friends ^d	2.09 (.50)	2.08 (.50)	2.10 (.49)	2.09 (.48)	2.08 (.58)
Community ^d	2.02 (.51)	2.03 (.51)	1.98 (.50)	2.03 (.50)	1.91 (.65)

Note. N=2,094. ^a Gender identity was coded as identified as male (=0) compared to identified as female, transgender, and other/unknown (=1). ^b Education was reported on a scale from 1 (less than high school) to 7 (PhD or equivalent). ^cn=1,386 in a committed romantic relationship. ^dn=2,086 due to missing data.

Table 2

Linear Regression Predicting Psychological, Behavioral and Interpersonal Responses to the Coronavirus Pandemic from Body Mass Index and Weight Discrimination

Predictor	Coronavirus Concerns		Precautionary Behavior		Trust to Manage Outbreak		Relationship Quality Decline ^a	
	β (95% CI)	<i>p</i>	β (95% CI)	<i>p</i>	β (95% CI)	<i>p</i>	β (95% CI)	<i>p</i>
Age	-.18 (-.23, -.14)	.000	.04 (.00, .09)	.065	.07 (.03, .12)	.002	-.06 (-.12, .00)	.052
Gender (male)	-.03 (-.07, .02)	.209	-.15 (-.20, -.11)	.000	-.01 (-.05, .04)	.687	.02 (-.04, .08)	.530
Race (African American)	.03 (-.01, .08)	.167	.00 (-.04, .05)	.829	-.05 (-.09, .00)	.044	-.04 (-.11, .01)	.129
Ethnicity (Latinx)	.03 (-.01, .08)	.136	.05 (.01, .10)	.021	-.04 (-.08, .01)	.082	-.05 (-.11, .00)	.076
Education	.10 (.06, .15)	.000	.04 (.00, .09)	.042	-.02 (-.06, .03)	.473	.03 (-.03, .08)	.348
Body mass index								
Underweight	.04 (.00, .09)	.062	-.05 (-.10, -.01)	.025	.04 (.00, .089)	.052	-.02 (-.08, .04)	.597
Overweight	.01 (-.04, .06)	.652	.02 (-.03, .07)	.475	.00 (-.05, .05)	.904	-.06 (-.12, .00)	.045
Obesity	.03 (-.02, .08)	.303	-.04 (-.09, .02)	.177	-.04 (-.09, .02)	.174	.01 (-.05, .08)	.672
Weight discrimination	.07 (.03, .12)	.001	.06 (.02, .10)	.008	-.10 (-.14, -.05)	.000	.06 (.01, .12)	.037

Note. $N=2,094$. ^a $n=1,389$ for relationship quality decline. Coefficients are standardized beta coefficients (95% Confidence Intervals) from linear regression.

Table 3

Regression Analysis Predicting Perceived Change in Emotional Closeness from Body Mass Index and Weight Discrimination

Predictor	Partner ^a		Family and Relatives		Friends		Community	
	β (95% CI)	<i>p</i>	β (95% CI)	<i>p</i>	β (95% CI)	<i>p</i>	β (95% CI)	<i>p</i>
Age	.09 (.03, .16)	.003	.11 (.06, .16)	.000	.09 (.04, .14)	.000	.04 (-.01, .09)	.087
Gender (male)	-.06 (-.12, .00)	.042	-.06 (-.11, -.02)	.008	-.02 (-.06, .03)	.484	.00 (-.04, .05)	.849
Race (African American)	.06 (.01, .13)	.026	.00 (-.04, .05)	.873	.02 (-.03, .06)	.744	-.05 (-.10, -.01)	.022
Ethnicity (Latinx)	-.04 (-.11, .01)	.099	.00 (-.04, .05)	.817	.00 (-.05, .04)	.809	-.04 (-.09, .00)	.050
Education	.01 (-.05, .07)	.732	.02 (-.03, .06)	.478	.03 (-.02, .07)	.206	.03 (-.01, .08)	.142
Body mass index								
Underweight	.03 (-.02, .09)	.259	-.03 (-.07, .02)	.240	.00 (-.04, .05)	.865	.02 (-.03, .06)	.463
Overweight	.03 (-.03, .10)	.316	-.01 (-.06, .04)	.630	-.04 (-.09, .01)	.143	-.03 (-.08, .02)	.272
Obesity	.00 (-.06, .07)	.946	.00 (-.06, .05)	.912	.00 (-.06, .05)	.919	-.03 (-.08, .02)	.292
Weight discrimination	-.01 (-.07, .05)	.828	.01 (-.04, .05)	.759	.01 (-.04, .05)	.324	-.07 (-.12, -.03)	.002

Note. $N=2,086$. ^a $n=1,386$ in a committed romantic relationship. Coefficients are standardized beta coefficients (95% Confidence Intervals) from linear regression.