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Perceived Weight Discrimination and Risk of Incident Dementia

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Acknowledgement: Research reported in this publication was supported by the National Institute On Aging of the National Institutes of Health under Award Number R01AG053297 and R03AG051960. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

Conflict of interest: The authors have no conflicts of interest to report.

Word Count: 1,497

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Abstract

Body mass index (BMI) and obesity have a complex relation with risk of dementia that evolves over the lifespan. Research in other domains indicates that the social experience of body weight, not just BMI, is associated with worse health outcomes. The present research uses data from the Health and Retirement Study ($N=12,053$) to test whether weight discrimination is associated with increased risk of dementia over an up to 10-year follow-up independent of BMI and other relevant clinical and behavioral risk factors. Participants who reported weight discrimination had a 40% increased risk of incident dementia (Hazard Ratio=1.40; 95% Confidence Interval=1.12-1.74), controlling for age, sex, race, ethnicity, education. The association between weight discrimination and incident dementia held controlling for BMI, diabetes, hypertension, depressive symptoms, smoking, physical activity, and genetic risk status. The present research indicates that the stigma associated with weight is associated with dementia risk independent from obesity. This research highlights that the detrimental effect of obesity on cognitive health in older adulthood may occur through the adverse social experience of body weight in addition to the biological consequences of excess weight.

Body mass index (BMI) and adiposity are implicated in Alzheimer's disease, but the relation is not straightforward. BMI in midlife increases dementia risk, whereas late-life BMI is associated with less risk (1); although not all find the relation for midlife obesity (2). Work on adiposity and dementia has focused on the risk associated with excess weight and potential physiological mechanisms. Body weight, however, has interpersonal implications that are independently associated with worse health outcomes. Individuals who experience unfair treatment on the basis of their weight, for example, are more inflamed, carry a greater burden of disease, and experience more symptoms of anxiety and depression (3). Such experiences are even associated with risk of premature mortality, an association that holds accounting for BMI (4). The present research examines whether weight discrimination likewise increases risk of incident dementia independent of BMI and other risk factors implicated in both discrimination and dementia.

Method

Participants and procedure

Participants were from the Health and Retirement Study (HRS; <http://hrsonline.isr.umich.edu>). At every assessment, participants signed a consent form approved by the Institutional Review Board at the University of Michigan. A random half of the total HRS sample first reported on weight discrimination in 2006; the other half first reported it in 2008. These assessments were combined as baseline. Cognition was assessed at regular two-year interviews with the modified Telephone Interview for Cognitive Status (TICS_m)(5) through the 2016 assessment. Participants without dementia (TICS_m>6) at baseline and who had at least one follow-up cognitive assessment over the up to 10-year follow-up were selected for analysis (see below). A total of 13,067 participants met the inclusion criteria at baseline. Of these participants,

1,014 did not have follow-up data, including 722 participants who died. The remaining 292 participants without follow-up data were older and had fewer years of education than the 12,053 participants included in the analysis. There were no differences in gender, race, Hispanic ethnicity, or weight discrimination.

Measures

Weight discrimination. A measure of everyday discrimination was included in the Leave-Behind Questionnaire that participants completed in either 2006 or 2008. After rating items about the experience of discrimination, participants attributed those experiences to personal attributes, including weight (yes/no)(6).

Cognitive status. HRS administered the TICSm every two years. Three tasks were used from the TICSm: immediate and delayed recall of 10 words (range 0–20 points), serial 7 subtraction (range 0–5 points), and backward counting (range 0–2 points). Participants were classified into either dementia ($\text{TICSm} \leq 6$) or not dementia ($\text{TICSm} \geq 7$), a cutoff validated against a comprehensive neuropsychological assessment and clinical diagnosis of dementia (5). The TICSm in the HRS has been used to track national trends in dementia (7).

Covariates. Clinical covariates were BMI (kg/m^2) categorized into underweight, overweight, class 1 obesity, and class 2-3 obesity (all compared to normal weight) and physician-reported diagnosis of hypertension (yes/no) and diabetes (yes/no). Depressive symptoms were measured as the sum of eight items from the Center for Epidemiologic Studies Depression scale (CESD). Behavioral covariates were frequency of moderate physical activity (ranging from 1=hardly ever or never to 4=more than once a week) and smoking status (yes/no). Covariates were measured at baseline. In addition, participants were asked to report the heaviest amount they had ever weighed (excluding pregnancy). This report was used to calculate highest-ever

BMI used in sensitivity analyses ($n=11,830$ due to missing data). A subset of participants ($n=9,808$) had genetic information on *APOE* risk status; any $\epsilon 4$ risk variant (i.e., $\epsilon 2/\epsilon 4$, $\epsilon 3/\epsilon 4$, $\epsilon 4/\epsilon 4$) was contrasted against all other variants. Finally, we included attributions to discrimination based on race, sex, and age to determine whether the associations were independent of these common forms of discrimination.

Analytic strategy

Cox proportional hazard models were used to test whether weight discrimination was associated with dementia risk. Weight discrimination at baseline was entered as predictor of incident dementia over the up to 10-year follow-up period. Time was measured in years from baseline and coded as time-to-incidence. For participants who did not develop dementia, cases were censored at the last available cognitive assessment. Model 1 controlled for socio-demographic covariates (age, sex, race, ethnicity, education). Model 2 controlled for these covariates and BMI categories. Model 3 controlled for these covariates and clinical (diabetes, hypertension, depressive symptoms) and behavioral (physical activity, smoking) risk factors. Model 4 controlled for genetic risk. We also tested whether the association was moderated by age, sex, race, ethnicity, education, genetic risk, or BMI.

Results

Table 1 shows the descriptive statistics for the sample. Over the up to 10-year follow-up (88,966 person-years), 1,108 participants (9%) developed dementia. Perceived weight discrimination was associated with a 40% increased risk of dementia controlling for socio-demographic covariates (Table 2, Model 1). This association was similar controlling for either

BMI categories at baseline (Model 2) or heaviest-ever BMI (HR=1.38, 95% CI=1.10-1.73)¹. The association remained significant controlling for clinical and behavioral covariates (Model 3) and genetic risk (Model 4). Results were similar when BMI as a continuous variable was included as a covariate instead of categories. This association was not moderated by age, gender, race, ethnicity, education, genetic risk, or BMI. Finally, results were similar when discrimination based on race, sex, and age were included in the model (HR=1.41, 95% CI=1.11-1.79) and there was no significant interaction between weight discrimination and these common forms of discrimination on dementia risk.

Discussion

Weight discrimination was associated with a 40% increased risk of developing dementia over the 8-10 year follow-up. This finding suggests that there were approximately 40% more cases of incident dementia than would be expected based on the baseline profile of participants who reported weight discrimination (e.g., age, education, BMI, etc.). There are two noteworthy findings. First, weight discrimination is a risk factor for dementia that is independent of BMI. Obesity in middle age may (1) or may not (2) increase dementia risk, but higher BMI in older adulthood tends to be associated with less risk (1, 2). Our results are consistent with previous findings that overweight and obesity in older adults are generally protective. Since weight discrimination is most prevalent among individuals with obesity (8), individuals with obesity who were discriminated against because of their weight face a risk they would not have had if they had not been treated unfairly. This result indicates that the social experience of body weight, in addition to the biomedical consequences of obesity, may increase dementia risk.

¹ The association remained significant if waist circumference was used instead of BMI (HR=1.44, 95% CI=1.12-1.84; *n*=11,047 due to missing data on waist circumference).

Second, the relation between weight discrimination and dementia risk was also not due completely to other clinical and behavioral risk factors for dementia that are also associated with weight discrimination. Diabetes, for example, is a consistent predictor of incident dementia (9), and individuals who have experienced weight discrimination have difficulty managing their blood sugar (10). Depressive symptoms have likewise been implicated in both weight discrimination (11) and dementia (12). Inclusion of these covariates reduced, but did not eliminate, the association between discrimination and dementia risk.

There are likely other factors associated with weight discrimination that contribute to its relation with dementia. Social engagement, for example, is protective of cognitive function: Individuals with frequent and meaningful social connections tend to preserve their cognition longer across old age (13). The stigma associated with obesity, particularly discrimination, can erode social connections and leave individuals disconnected and lonely (14). In addition, individuals who experience weight discrimination in healthcare settings may avoid going to the doctor promptly when a problem occurs and risk doing more damage to their bodies than if they had sought treatment immediately. Over time, avoidance of healthcare and lack of trust in healthcare professionals may be associated with greater cognitive decline. In addition, weight discrimination is a social stressor that increases cortisol reactivity (15); sustained elevated cortisol damages the hippocampus and may impair memory function (16).

A few previous studies examined the association between discrimination and cognitive function and the results have been mixed. Perceived racial discrimination has been associated with worse cognitive function when discrimination and cognition were measured at the same time (17). Longitudinally, perceived experiences with discrimination (in general) have been associated with greater declines in memory over four years (18), whereas discrimination specific

to weight has been found to be unrelated to change in memory over a similar timeframe (14). Difference in findings between previous work on weight discrimination and cognition and the current findings may be due to length of follow-up (4 versus 10 years), sample size ($N=6,450$ versus $N=12,053$), and cognitive outcome (cognitive decline versus dementia). Further, severe cognitive impairment has a stronger signal than cognitive decline, as the latter tends to be more gradual and confounded by learning effects.

Strengths of this research include a large sample and an up to 10-year follow-up. One limitation is a performance-based measure of dementia rather than a clinical diagnosis. In other domains, however, similar associations have been found for dementia derived from performance measures (19) and a clinical diagnosis (20). A second limitation is we did not have BMI from measured height and weight in midlife. Although such a measurement would be ideal, accounting for reported heaviest-ever weight did not alter the pattern of relations. Still, the present research indicates that the social experience of body weight, independent of measured adiposity, increases dementia risk.

Acknowledgement

Research reported in this publication was supported by the National Institute On Aging of the National Institutes of Health under Award Number R01AG053297 and R03AG051960. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health. The Health and Retirement Study is conducted by the University of Michigan with funding from the National Institute on Aging (U01AG009740).

Conflict of Interest

The authors have no conflicts of interest to report.

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Table 1

Descriptive Statistics for the Total Sample and by Cognitive Status at Follow-up

| Variable | Full Sample | Weight Discrimination | |
|-------------------------|---------------|-----------------------|--------------|
| | | No | Yes |
| Age (years) | 67.31 (10.05) | 67.71 (10.01) | 62.89 (9.42) |
| Gender (female) | 60% | 59% | 69% |
| Race (African American) | 12% | 12% | 13% |
| Race (Other) | 4% | 4% | 5% |
| Race (white) | 84% | 84% | 82% |
| Ethnicity (Hispanic) | 8% | 8% | 6% |
| Education (years) | 12.84 (2.92) | 12.83 (2.94) | 12.89 (2.74) |
| Body Mass Index | | | |
| Underweight | 1% | 1% | 1% |
| Normal weight | 24% | 26% | 4% |
| Overweight | 38% | 40% | 14% |
| Class 1 Obesity | 23% | 22% | 28% |
| Class 2 and 3 Obesity | 14% | 11% | 52% |
| Hypertension (yes) | 57% | 56% | 68% |
| Diabetes (yes) | 20% | 18% | 34% |
| Depressive Symptoms | 1.31 (1.87) | 1.22 (1.80) | 2.22 (2.37) |
| Smoking (yes) | 13% | 13% | 13% |
| Physical Activity | 3.12 (1.17) | 3.16 (1.15) | 2.75 (1.28) |
| APOE $\epsilon 4^a$ | 26% | 26% | 25% |

Note. $N=12,053$; $n=11,041$ did not report weight discrimination and $n=1,012$ reported weight discrimination. Depressive symptoms are measured as the sum of eight symptoms (range 0-8) and physical activity is measured on a scale from 1= hardly ever or never to 4=more than once a week.

^a $N=9,808$ for APOE risk status due to missing genetic information on some participants.

Table 2

Results of the Cox Regression Predicting Risk of Incident Dementia

| | Model 1 | Model 2 | Model 3 | Model 4 ^a |
|--------------------------------------|--------------------|--------------------|--------------------|----------------------|
| Age (years) | 1.09 (1.08-1.10)** | 1.09 (1.08-1.10)** | 1.09 (1.08-1.10)** | 1.10 (1.09-1.11)** |
| Gender (female) | .98 (.87-1.11) | .96 (.85-1.09) | .92 (.81-1.04) | .92 (.80-1.05) |
| Race (African American) ^b | 2.75 (2.39-3.18)** | 2.79 (2.41-3.22)** | 2.61 (2.26-3.02)** | 2.71 (2.29-3.21)** |
| Race (Other) ^b | 1.51 (1.14-1.99)** | 1.50 (1.14-1.98)** | 1.56 (1.18-2.05)** | 1.65 (1.21-2.25)** |
| Ethnicity (Hispanic) | 1.19 (.96-1.48) | 1.19 (.96-1.48) | 1.10 (.88-1.37) | 1.18 (.92-1.51)** |
| Education (years) | .84 (.83-.86)** | .84 (.83-.86)** | .86 (.84-.87)** | .86 (.84-.88)** |
| Body Mass Index ^c | | | | |
| Underweight (yes) | -- | 1.08 (.58-2.04) | 1.08 (.58-2.04) | .83 (.37-1.87) |
| Overweight (yes) | -- | .81 (.70-.95)** | .81 (.69-.94)** | .86 (.73-1.03) |
| Class 1 Obesity (yes) | -- | .89 (.75-1.05) | .87 (.73-1.04) | .94 (.77-1.14) |
| Class 2 and 3 Obesity (yes) | -- | .82 (.66-1.02) | .73 (.58-.91)** | .70 (.54-.91)** |
| Depressive Symptoms | -- | -- | 1.10 (1.07-1.13)** | 1.10 (1.07-1.14)** |
| Hypertension (yes) | -- | -- | .98 (.86-1.12) | .97 (.84-1.12) |
| Diabetes (yes) | -- | -- | 1.32 (1.15-1.52)** | 1.29 (1.10-1.51)** |
| Smoking (yes) | -- | -- | 1.38 (1.14-1.66)** | 1.33 (1.07-1.65)** |
| Physical Activity | -- | -- | .92 (.88-.97)** | .91 (.86-.96)** |
| APOE e4 (yes) | -- | -- | -- | 1.70 (1.48-1.95)** |
| Weight Discrimination (yes) | 1.40 (1.12-1.74)** | 1.44 (1.15-1.81)** | 1.29 (1.03-1.63)* | 1.41 (1.08-1.82)** |

Note. $N=12,053$ with $n=1,108$ with incident dementia for Models 1 and 2.

^a $N=9,808$, with $n=882$ incident dementia for Model 3 because of available genetic information.

^bWhite is the reference group.

^cNormal weight is the reference group.

* $p<.05$.

** $p<.01$.