Overweight people have low levels of implicit weight bias, but overweight nations have high levels of implicit weight bias

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Abstract

Context. Although a greater degree of personal obesity is associated with *weaker* negativity toward overweight people on both explicit (i.e., self-report) and implicit (i.e., indirect behavioral) measures, overweight people still prefer thin people on average.

Object. We investigated whether the national and cultural context – particularly the national prevalence of obesity – predicts attitudes toward overweight people independent of personal identity and weight status.

Methods. Data were collected from a total sample of 338,121 citizens from 71 nations in 22 different languages on the Project Implicit website (https://implicit.harvard.edu/) between May 2006 and October 2010. We investigated the relationship of the explicit and implicit weight bias with the obesity both at the individual (i.e., across individuals) and national (i.e., across nations) level. Explicit weight bias was assessed with self-reported preference between overweight and thin people; implicit weight bias was measured with the Implicit Association Test (IAT). The national estimates of explicit and implicit weight bias were obtained by averaging the individual scores for each nation. Obesity at the individual level was defined as Body Mass Index (BMI) scores, whereas obesity at the national level was defined as three national weight indicators (national BMI, national percentage of overweight and underweight people) obtained from publicly available databases.

Results. Across individuals, greater degree of obesity was associated with *weaker* implicit negativity toward overweight people compared to thin people. Across nations, in contrast, a greater degree of national obesity was associated with *stronger* implicit negativity toward overweight people compared to thin people.

Conclusions. This result indicates a different relationship between obesity and implicit weight bias at the individual and national levels.

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Introduction

Overweight and obese individuals face prejudice and discrimination in many areas of daily life. This stigmatization threatens overweight and obese individuals' psychological and physical health by increasing the risk for depression, anxiety, low self-esteem, and body dissatisfaction. The psychological toll of weight stigmatization can be devastating. Overweight youth who are stigmatized about their weight are 2-3 times more likely to engage in suicidal thoughts and behaviors compared with their overweight peers who are not stigmatized. Obese individuals who experience weight stigma are more likely to engage in unhealthy eating behaviors and lower levels of physical activity and are less likely to undergo age-appropriate preventive cancer screenings. Indeed, negativity toward overweight and obese people is also shown in the health care setting by physicians, nurses, medical students, dietitians and psychologists. Similarly, coworkers, employers, teachers, peers, friends, family members and romantic partners show weight bias.

The pervasiveness of weight bias is further highlighted by the fact that, although overweight and obese people show less weight bias than normal and underweight people on both implicit (i.e., indirect behavioral) and explicit (i.e., self-report) measures of preferences between thin and overweight people, they still prefer thin people on average. This suggests that overweight and obese people might find it difficult to identify with and prefer their group because of weight stigmatization. Thus, factors other than the individual's identity - which promotes strong tendencies to prefer one’s own groups and social characteristics - might be shaping weight preferences.

One of those factors could be the cultural context. Culture powerfully shapes the beliefs and behavior of its members. Existing studies show some variations in weight bias across nations. For example, opposing the overall trend, in some nations (e.g., Niger, Jamaica, Belize, Puerto Rico and Fiji Islands) obesity is associated with more positive than negative characteristics.

In the present research, we investigated whether the national and cultural context – particularly the national prevalence of obesity – predicts attitudes toward overweight and obese people independent of personal identity and weight status.
Overweight and obese people’s persisting negativity toward their own group could be partly influenced by negativity toward overweight people at the national level. In particular, the relationship between weight bias and obesity across nations could be exactly the opposite of what observed at the individual level. For an overweight or obese individual, the valuation of oneself, one’s groups, and one’s characteristics predicts greater *positivity* toward obesity than a normal or underweight individual. For a nation with a high prevalence of overweight and obese people, the negative social and health consequences of obesity may predict greater *negativity* toward obesity than a nation with low prevalence of overweight people.

The social consequences of obesity are well known. Health and beauty are conventionally associated with thinness. In nations with a high prevalence of overweight and obese people, the starker contrast of models of health and beauty with the general population may amplify the desirability and social status of the thin ideal.

Likewise, the health consequences of obesity are well understood. Obesity increases the likelihood of various diseases, particularly heart disease, type 2 diabetes, obstructive sleep apnea, certain types of cancer, and osteoarthritis and the risk of many physical conditions such as high blood pressure, high blood cholesterol and high triglyceride levels.

To test this possibility, we assessed the explicit (i.e., self-reported) and implicit (i.e., non-conscious) weight bias of citizens from 71 nations and investigated their relationship with the obesity comparing across individuals and nations.

**Materials and Methods**

**Procedure**

Data were collected among volunteers at the Project Implicit website ([https://implicit.harvard.edu](https://implicit.harvard.edu)) between May 2006 and October 2010. Project Implicit offers visitors an opportunity to participate in research and receive educational feedback on a variety of social attitudes and stereotypes. Participants selected the weight study from among a list of options. The study was available in the following 22 languages: Bosnian, Chinese, Czech, Dutch, English, Flemish, French, German, Hebrew, Hungarian,
Stimuli used in the study were translated from English to different languages and validated by native speakers. The weight study included a demographic questionnaire, a questionnaire about weight attitudes and beliefs, and an Implicit Association Test (IAT) presented in a randomized order. All together, the study required about 10 minutes to complete.

Participants
A sample of 338,121 individuals from 71 nations\(^1\) met our inclusion criteria: (a) reported a country of citizenship, (b) came from a country of citizenship that was represented in the compiled national indicators, and (c) that country had at least 100 study sessions from which to calculate weight bias. Mean sample size by country was 4,762 (SD=26,842) with the smallest samples being Costa Rica (N=104), Egypt (N=106), and Lebanon (N=108) and the largest being the United States (N=226,613). 70.5% of those reporting gender were female, and the mean age was 27.8 (SD=10.64; age=18-89). A breakdown by nation of the demographic and descriptive statistics from Project Implicit website appears in Table S1.

Measures
Implicit Association Test
The IAT measured association strengths between the concepts thin and fat and the attributes good and bad. The IAT has been used in hundreds of published research studies assessing social preferences and has amassed a large literature clarifying its extraneous influences, and construct and predictive validity. In particular, several previous studies have shown that the IAT is an effective experimental tool to assess the weight bias.

The IAT procedure followed the standard described by Nosek, Greenwald, and Banaji, and used the stimuli reported by Nosek et al. Participants categorized pictures or words representing the four categories – thin, fat, good, bad - in two different sorting conditions. Stimuli representing the four categories were presented one at a time in the center of the

\(^1\) For the convenience of analyses and presentation, we list some territories as nations.
computer screen, and participants categorized each of them by pressing one of two keys.

In one condition, participants categorized pictures representing thin people and good
words (i.e., joy, love, peace, wonderful, pleasure, glorious, laughter and happy) with one
response key, while categorizing pictures representing overweight people and bad words
(i.e., agony, terrible, horrible, nasty, evil, awful, failure and hurt) by using another
response key. In the other condition, participants categorized the same pictures and words
but with a different key configuration: this time pictures of thin people and bad words
were categorized with one key whereas pictures of overweight people and good words
with the other. The order of these conditions was randomized across participants. The
difference in average categorization latency between the two conditions is an indicator of
association strengths between the weight and evaluative categories. For example, faster
categorization when thin people and good shared a response key (and overweight people
and bad shared a response key) compared to the reverse indicated an implicit preference
for thin people compared to overweight people.

Following Greenwald, Nosek and Banaji, IAT scores were computed for each participant
by dividing the difference in mean response latency between the two IAT conditions by
the participant’s latency standard deviation inclusive of the two conditions. The IAT
score could range from +2 to -2, with zero indicating no relative preference between thin
people and overweight people. More positive scores indicated stronger associations of
thin people with good and overweight people with bad compared to associations of thin
people with bad and overweight people with good, and they were interpreted as an
implicit preference for thin people over overweight people. Conversely, more negative
scores indicated stronger associations of thin people with bad and overweight people with
good compared to associations of thin people with good and overweight people with bad,
and they were interpreted as an implicit preference for overweight people over thin
people.

The following data cleaning features were employed: responses faster than 350
milliseconds were removed, responses slower than 10,000 milliseconds were removed,
and errors were replaced with the mean of the correct responses in that response block
plus a 600 millisecond penalty. In addition to the data cleaning procedures described by
Nosek et al., IAT scores were disqualified for any of the following criteria suggestive of
careless participation: (1) going too fast (< 350 ms) on more than 10% of the total test trials, (2) making more than 30% erroneous responses across the critical blocks. 10.15% of IATs were removed based on these exclusion criteria.

**Self-report measure**

Participants were asked to select which statement best described them from the following seven options: a) “I strongly prefer thin people to fat people”, b) “I moderately prefer thin people to fat people”, c) “I slightly prefer thin people to fat people”, d) “I prefer thin people and fat people equally”, e) “I slightly prefer fat people to thin people”, f) “I moderately prefer fat people to thin people”, g) “I strongly prefer fat people to thin people”. These were coded as scores from -3 to +3 with more positive scores indicating stronger preferences for thin people over overweight people.

**Data analyses**

To investigate the relationship between obesity and weight bias at the individual level, we regressed the explicit and implicit individual weight bias with the individual Body Mass Index (BMI) scores. The individual BMI was obtained by converting heights and weights self-reported by the participants in the weight questionnaire at the Project Implicit website.

At the national level, we regressed the national estimates of implicit and explicit weight bias - obtained by averaging the individual scores for each nation from the Project Implicit sample - on three national weight indicators (national BMI, national percentage of overweight and underweight people) one at a time. The national weight indicators were obtained from different sources. National BMI was obtained from the Global Burden of Metabolic Risk Factors Collaborating Group, whereas national percentages of underweight (BMI<18.5) and overweight (BMI>24.9) people were obtained from the World Health Organization. Notably, the national weight indicators from public databases were positively correlated with the respective national estimates obtained from the Project Implicit (national BMI vs. national estimates of BMI: $r = 0.517$, $P < 0.0001$; national percentage of underweight people vs. national estimates of percentage of underweight people: $r = 0.464$ $P < 0.001$; national percentage of overweight people vs.
national estimates of percentage of overweight people, \( r = 0.529, P < 0.0001 \). These results indicate that our sample’s distribution of obesity across nations was positively related to other estimates of the distribution of obesity across nations.

Nations were included in the regression models depending on the availability of national weight indicators (Table S2). We considered 67 countries in the regression with national BMI, 49 countries in the regression with national percentages of underweight people and 59 countries in the regression with national percentages of overweight people. Given the variability of sample sizes across nations (N=104-226,613), regression analyses were weighted so that the more reliable estimates from larger samples carried more weight than those from smaller samples. Following prior practice, we first constructed inverse variance weights for both the IAT and explicit data as the inverse of the standard errors. We then log-transformed the IAT and the explicit weights and we averaged them to arrive at a single weighting variable. The SPSS code that we used for the weighting is provided in the SI. Note that very similar results are observed using unweighted analyses (Table S3, S4 and S5). Further, we ran the regressions again with an alternate weighting strategy that substantially reduced the weight of the larger samples (dividing by sample size – 2). This alternate weighting strategy replicated the effects with the implicit measures and introduced a significant effect with the explicit measures (Table S6). We conservatively refrain from elaborating on the latter positive result as it is not observed consistently across weighting strategies.

To test the robustness of the relationships between weight bias and the weight indicators at the national level, we subjected the data to an increasingly stringent series of tests. First, we removed two high leverage country outliers (i.e., India and Vietnam) identified by regression diagnostics. In the regression diagnostic, we calculated studentized deleted residuals, centered leverage values and Cook’s D statistics for each of the three primary regression analyses. We considered for the BMI (N=67), percentage of underweight (N=49) and overweight people (N=59) regressions respectively the following thresholds for each index according to UCLA guidelines for regression diagnostics: studentized deleted residuals > |2|; centered leverage values and Cook’s D > 0.06, 0.08, 0.07. In each of three focal unweighted and weighted regressions India and Vietnam emerged as extreme leverage outliers (see SI for SPSS code). Next, we tested
whether the relationship between weight bias and the weight indicators would survive after accounting for national differences in health, economic or cognitive factors, by adding 4 nation-level covariates to the regressions model. Specifically, we included the life expectancy at birth as a health indicator of national differences in public health, medical care and diet; the Gross Domestic Product (GDP) per capita and health expenditure per capita as economic national indicators of wealth and total expenditure on health respectively; and finally the Intelligence Quotient (IQ) as a cognitive factor of national differences in cognitive and intellectual abilities. Nation-level covariates were obtained from public databases. Life expectancy at birth was obtained from the Central Intelligence Agency’s “World Factbook”, GDP per capita was obtained from the Central Intelligence Agency’s “World Factbook”, health expenditure per capita was obtained from the World Health Organization and IQ was obtained from a recent study conducted by Rindermann and Thompson. Nations were included depending on the availability of national indicators (Table S2). We considered 65 countries in the regression with national BMI, 47 countries in the regression with national percentages of underweight people and 57 countries in the regression with national percentages of overweight people.

Results

Overall, the sample showed a preference for thin people over overweight people both with explicit measures (Explicit mean = 1.00, SD = 1.09, Cohen’s $d = 0.92$) and with the IAT (IAT mean = 0.43, SD = 0.42, Cohen’s $d = 1.02$). Explicit and implicit preferences were positively correlated ($r = 0.21$, $P < 0.0001$). Moreover, without exception, each of the 71 nations showed explicit and implicit weight bias favoring thin people over overweight people, with considerable variability across nations (Table S1).

At the individual level, across all participants in the entire sample, BMI scores were negatively related with explicit ($\beta = -0.26$, $t(302,737) = -149.91$, $P < 0.0001$) and implicit ($\beta = -0.16$, $t(291,354) = -87.52$, $P < 0.0001$) weight bias (Fig. 1). Higher BMI scores were associated with weaker explicit and implicit negativity toward overweight people compared to thin people. However, overweight and obese people still showed
explicit and implicit preferences for thin people compared to overweight people. Moreover, BMI scores were negatively – though not always significantly – correlated with both explicit (mean $r = -0.15$) and implicit (mean $r = -0.13$) weight bias in every nation except Bolivia and Vietnam implicitly, and Lithuania and Albania explicitly (Table S7).

An opposite relationship between obesity and implicit weight bias was found at the national level. Results of the regressions showed that greater obesity in a nation was associated with stronger implicit negativity toward overweight people compared to thin people [national BMI: $\beta = 0.54$, $t(66) = 5.15$, $P < 0.0001$; national percentage of underweight people: $\beta = -0.60$, $t(48) = -5.08$, $P < 0.0001$; national percentage of overweight people: $\beta = 0.60$, $t(58) = 5.71$, $P < 0.0001$; Fig. 2]. However, the same was not true for explicit weight biases. Indeed, no significant effect was found when in the regression models the implicit measures were replaced by explicit measures. The relationship between obesity and implicit weight bias at the national level persisted after removing the outliers, [BMI: $\beta = 0.43$, $t(64) = 3.81$, $P < 0.0001$; national percentage of underweight people: $\beta = -0.49$, $t(46) = -3.76$, $P < 0.0001$; national percentage of overweight people: $\beta = 0.51$, $t(56) = 4.42$, $P < 0.0001$] and after including 4 nation-level covariates to the models [BMI: $\beta = 0.36$, $t(64) = 3.04$, $P < 0.01$; national percentage of underweight people: $\beta = -0.45$, $t(46) = -3.13$, $P < 0.01$; national percentage of overweight people: $\beta = 0.51$, $t(56) = 4.31$, $P < 0.0001$]. None of the covariates was a significant predictor (Table 1). However, after removing the health expenditure per capita from the regression models, which was highly correlated with GDP ($r = 0.87$, $P < 0.0001$; Table S8), we found that the GDP was a significant predictor of implicit weight preferences in each three regression models with national weight indicators. When, instead, we removed GDP from regression then health expenditure per capita was a significant predictor of implicit weight bias, but only in the regression model with percentage of underweight people (Table 2). This result indicated that richer nations showed stronger weight bias but importantly it did not account for the relationship between the weight indicators and implicit preferences. Notably, no statistically significant effect emerged when implicit measures were replaced by explicit measures in all conducted regression analyses (Table 1 and 2).
Conclusion

To summarize, we found that (a) each of the 71 nations investigated showed implicit and explicit preferences for thin people compared to overweight people, (b) at the individual level, higher obesity (i.e., increased individual BMI scores) was associated with weaker implicit and explicit weight bias but on average overweight people still showed persistent preferences for thin people (c) at the national level, higher obesity (i.e., increased national BMI scores and percentages of overweight people) was associated with stronger implicit weight bias whereas no relation was observed with explicit measures, and (d) independent of weight indicators, national wealth was a significant predictor, with richer nations showing stronger implicit preferences for thin people compared to overweight people.

Our results suggest that the degree of negativity toward overweight and obese people at the national level is in sharp contrast to individuals’ social identity factors that promote preferences for oneself and one’s group identities and characteristics. Whereas the relationship between obesity and weight bias was negative across individuals, it was positive across nations. This is an instance of Simpson’s paradox, in which a relation present at one level of analysis (across individuals) is reversed when examined at another level of analysis (across national aggregates of individuals). Unlike some social groups that are evaluated more positively when they are present in greater numbers, the increased prevalence of obesity in a nation does not seem to attenuate negative implicit social attitudes toward overweight people but exaggerates them. As a consequence, for example, an obese person living in the United States (where a relatively high proportion of the population is overweight) is, on average, likely to have an implicit preference for thin people over overweight people that is as strong as a thin person living in India (where a relatively small proportion of the population is overweight).

The mechanism for this effect is not indicated directly by these data or by existing theories concerning stigmatized groups. The most obvious theoretical context for the national results is the contact hypothesis. This hypothesis anticipates that contact with members of stigmatized groups should lead to more positive attitudes, if certain conditions of contact are met such as equal status and interdependence. Fifty years of
research provides strong evidence for contact as a means of reducing prejudice; social
contact is now a standard intervention for reducing prejudice and improving intergroup
relations.

Curious challenge for the present data is that the national results are exactly
opposite the expectations of the standard form of the contact hypothesis. Higher
prevalence of obesity was associated with greater implicit negativity toward overweight
people. This interesting reversal is not unprecedented. Some prior research suggests that
nations with a high prevalence of obesity may show more negative attitudes toward
overweight people because high concentrations of stigmatized populations in specific
geographic areas (e.g., neighborhood, county or state) increase the negative disposition
toward stigmatized groups than people residing in areas with low concentrations of
stigmatized populations. Another study provide suggestive evidence of a complementary
relationship between contact and context in line with the conditions necessary for contact
to be effective. People who reside in an area with a high proportion of stigmatized
populations may form more negative feelings about those groups, unless they also have
frequent, positive contact with them. At the same time, people that have frequent contact,
such as medical doctors, show persistently high implicit negativity toward overweight
people. As such, the characteristic of contact may not be the only explanatory variable for
understanding variation across nations.

No existing theoretical frameworks provide a basis for anticipating these results.
Here we offer more speculative explanations that will require additional research to
clarify the mediating mechanisms of the present results. For example, it may be that
greater prevalence of obesity in a nation increases the negativity toward overweight and
obese people by eliciting more frequent national discussion about the health risks and
medical costs of obesity, with the effect of exacerbating the stigmatization of obesity.
Alternatively, the high prevalence of obesity in a nation may reinforce the desirability of
the thin ideal or of being normal weight, and likewise the weight bias, by promoting
continuously advertisements for diet plans, healthy foods, and gym memberships against
the demographic trend of increasing obesity. Further, the association of thinness with
social status – health and beauty – may produce even stronger negativity against obesity
when this signal of status is rarer.
Similarly, the wealth in a nation may alter the meaning of obesity as an indicator of status. In wealthy nations, obesity may be negatively related with wealth perhaps because high-fat foods are cheaper than alternatives. In this context, being overweight may be perceived as being of a lower economic income. In less wealthy nations, obesity may be positively associated with wealth because access to food resources indicates high economic status. Thus, the different social contextualized meaning of obesity may account for the observed relationship between wealth and implicit weight preferences across nations. These explanations suggest that the national context, such as the prevalence of obesity and wealth in a nation, may influence the attitudes toward obesity.

It is important to point out that while we have offered a clear directional interpretation – that the prevalence of obesity and wealth influence implicit weight bias – the data themselves are correlational. The data cannot unambiguously support a causal conclusion. However, the reversal causal scenario strikes us as implausible – that implicit weight bias causes variation in prevalence of obesity and wealth across nations. Also, while we included four potential covariates to test the robustness of the present relationships, it is possible that other variables could still be identified that account for part or most of the observed relationship.

As these effects were observed implicitly, but not explicitly, they suggest that the influence of prevalence of obesity on weight bias at the national level may be consciously denied or rejected. Explicit attitudes indicate evaluations that people are able and willing to report while implicit attitudes are inferred with behavioral measures that assess associations that exist in memory and may thus be less influenced by conscious intentions. Indeed, implicit weight attitudes – in addition to being modestly positively related with explicit weight attitudes – can differ in important ways from self-reported evaluations. Furthermore, a recent study showed that self-report measures for investigating cross-national differences is weakened by factors compromising the validity of self-report. In particular, the reference-group effect is the tendency for people to respond to subjective self-report items by comparing themselves with standards from their culture. This compromises the sensitivity of detecting differences across nations. This is less likely to affect the implicit measures because participants’ evaluations are
estimated from behavioral performance, not based on introspective processes that involve such decision-making biases.

Taken together, our results point to the subtle influence of national factors in shaping social evaluations. Formation and change of implicit attitudes is not just a matter of influencing intentions; it also requires consideration of the social realities that shape minds without intention.

**Conflict of interest**

This project was supported by Project Implicit, Inc. Nosek and Greenwald are officers of Project Implicit, a non-profit organization that includes in its mission “To develop and deliver methods for investigating and applying phenomena of implicit social cognition, including especially phenomena of implicit bias based on age, race, gender or other factors.”
References


Fig. 1. Scatter plots of relations of implicit (IAT) and explicit weight bias with BMI at the individual level.  
Note. Each point in the plots represents the average preference of participants as a function of their BMI. The weight bias scores ranges from +2 to -2 for the IAT and from +3 to -3 for the explicit, with 0 indicating no relative preference between thin people over overweight people. More positive scores indicate a preference for thin people over overweight people, while more negative scores indicate a preference for overweight people over thin people. Vertical bars signify standard error. Data for participants with BMI greater than 60 were not included in the plot (0.15%). The regression line was computed on the original and not on the average data.

Fig. 2. Scatter plots of relations of implicit (IAT) and explicit weight bias as a function of three weight indicators (BMI, percentage of overweight and underweight people) at the national level.  
Note. The weight bias scores ranges from +2 to -2 for the IAT and from +3 to -3 for the explicit, with 0 indicating no relative preference between thin people over overweight people. More positive scores indicate a preference for thin people over overweight people, while more negative scores indicate a preference for overweight people over thin people.

Table 1. Weighted regression models predicting the implicit (IAT) and explicit weight bias at the national level.

Table 2. Weighted regression models predicting the implicit (IAT) and explicit weight bias at the national level removing GDP or health expenditure.