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Social deprivation, gender, and obesity: multiple stigma? Results of a population survey from Germany

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Social deprivation, gender, and obesity: multiple stigma? Results of a population survey from Germany

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Social deprivation, gender, and obesity: multiple stigma? Results of a population survey from Germany

Objectives: Individuals with obesity are subject to stigmatization, resulting in discrimination. There are studies focusing on obesity stigma in the German public. Nevertheless, these often do not account for social conditions that also may be associated with stigmatization. Following an intersectional approach, social categories such as gender and socio-economic position (SES) can interact and form a basis for multiple stigma within the context of obesity. The present study analyses differences in public obesity stigma depending on gender and SES, as well as possible interdependencies between these social categories.

Design: Representative cross-sectional telephone survey.

Participants: 692 randomly selected adults (≥ 18 years of age) in Germany.

Methods: Different vignettes were presented, depicting a lawyer (male/female) or a janitor/cleaner (male/female) with obesity. Following the vignette, different components of stigma were assessed: (1) fat phobia (stereotypes), (2) emotional reactions to an obese person, and (3) desire for social distance. Associations between gender, SES, and stigma components were tested in multiple linear regression analyses.

Results: A low SES in the obesity vignette (janitor/cleaner) was significantly associated with higher fat phobia scores as well as desire for social distance, compared to the vignette with an obese person with a high SES (lawyer). Being a male with obesity was significantly associated with more pronounced negative emotional reactions and greater desire for social distance. There were no significant interaction effects between gender and SES.

Conclusions: Although no interaction effects of gender and SES became apparent in the sample under study, to a certain extent the results do support the hypothesis of multiple stigma. Being male or of low SES was significantly associated with more pronounced negative attitudes in the German public. Following the concept of intersectionality, we assume that obesity stigma can exacerbate pre-existing inequalities. This needs to be considered in development and implementation of prevention and anti-stigma measures.

Keywords: stigma; multiple stigma; attitudes; obesity; Germany; differences; socioeconomic status; occupational position; gender

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STRENGTHS AND LIMITATIONS OF THIS STUDY

- This is the first study addressing social deprivation and gender in the context of public obesity stigma.
- Analyses are based on a national telephone survey not only relying on landline but also incorporating mobile-only users all over Germany.
- Vignette manipulation was used to identify additive stigma effects. If we were to separate obesity stigma from the stigma of different social categories, a neutral control vignette would have been necessary.
- Vignettes are a frequently used method in stigma research, however, they need to be short and bear the risk of not conveying a holistic picture of an individual of different social categories with obesity.

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INTRODUCTION

The share of people who are overweight or obese has increased continuously over the past decades.[1] In Germany, the current Health Interview and Examination Survey for Adults reports a prevalence rate of obesity (defined as Body Mass Index (BMI) ≥ 30kg/m^2) of approximately 24%.[2] The etiology of obesity is often multi-faceted, different factors such as behavioral, biological, psychosocial, context-related or prenatal conditions concur.[3] However, poor diet and sedentary behavior are often erroneously seen as the primary reason for overweight.[4] This in turn lays the focus on individual responsibility and fosters public stereotypes of laziness and weak will. According to attribution theory, believing the condition to be under a person's control determines greater stigmatizing reactions.[5] The public misconception of causes of overweight and obesity is common and contributes to the expression of weight stigma.[6] In excess body weight, individuals with overweight or obesity display a physical 'mark' that sets them apart from others. Link and Phelan [7] have provided a process model, in which stigma is conceptualized as several distinct, but interrelated steps: differences between social groups are distinguished and *labeled*. These labels are linked to *stereotypes* (undesired characteristics) that form the basis of a *separation* of 'us' and 'them'. Thusly-labeled individuals experience *status loss* and *discrimination* in a context in which power is exercised.

There is a public recognition of obesity as a chronic condition and it is a classified disease in some countries (but not Germany).[8] Nevertheless, obese individuals experience discrimination in daily life, which in turn reinforces negative stereotypes, again nourishing stigmatizing processes.[7] Ascribing negative attributes such as unintelligent, lack of self-discipline or emotionally instable [9,10] to persons who are obese, activates processes that result in discrimination in different settings. This could be shown for the education and employment sector as well as personal relationships.[10] Furthermore, stigmatizing attitudes and discrimination are present in the health care sector, possibly leading to the avoidance of necessary treatment out of fear of stigmatization.[11] The adverse health consequences of weight bias have been shown on psychological (e.g. depression, self-esteem) and physical (eating behavior, physical activity, cardiovascular health outcomes) level.[10] Moreover, the stigma adherent to obesity can impede prevention efforts.[6]

For Germany, a study found that about one fourth of the general public displays definite stigmatizing attitudes regarding the 'Weight Control/Blame" subscale from the Antifat Attitudes Test.[12] Moreover, high levels of responsibility for becoming obese are attributed

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to the individual, which is associated with the belief that this individual should be liable for treatment costs to a great extent.[13] Sikorski et al. examined emotional reactions and social distance towards individuals with obesity and found that the most rejected domains represented personal ability as well as social interaction.[14]

Beyond the prevalent public stigma of obesity, research has identified gender differences in weight stigma. Studies reported higher weight bias internalization [15] and greater risk for weight/height discrimination [16] among women. In children and adolescents, girls with overweight have been found to be subject to teasing and social marginalization.[17,18] Similar results are also presented by Fikkan and Rothblum,[19] who found women with obesity to be more stigmatized in education and employment sectors than men. However, gender differences in weight-based stigmatization are only scarcely researched, and results are not consistent. One study found evidence that men stigmatize and are being stigmatized because of overweight just as women are.[20]

Over the past years, stigma research has paid increased attention to multiple social identities and their interaction to influence stigmatization. This intersectional approach allows examining how multiple social categories, e.g. being categorized as ‘female’, ‘black’ or both, interact to produce or protect against health risks or discrimination.[15] A similar approach is referred to as ‘multiple stigma’ [21] or ‘double disadvantage’.[22] These concepts suggest that a person can belong to different, possibly stigmatized social groups which exerts additive or cumulative effects.[23] When it comes to weight stigma at the intersection of gender and race, the few studies have come to different results. While Himmelstein et al. [15] examined no divergences in stigma as a function of race or gender, Puhl et al. found that African American females who are obese evoked higher ratings of dislike and social distance than Caucasian obese females. However, there were no differences in ratings for male and female targets.[24]

So far, there is no study focusing on possible additive or multiple effects of gender and levels of socio-economic position (SES) in the context of obesity stigma. This is astonishing, as there are inequalities in how obesity is distributed among the population in countries with a Western lifestyle.[25] This also holds true for Germany, where obesity is more common among children and adults who are of low SES. Moreover, especially women in this group appear to be excessively affected by obesity.[26]

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Against this background, we analyze differences in public stigma towards low vs. high SES persons with obesity and female vs. male persons with obesity. Moreover, by incorporating the interaction of gender x SES, we examine possible interdependencies and their associations with public obesity stigma.

METHODS

Study design and sample

Analyses are based on a national telephone survey (computer assisted telephone interview (CATI)), conducted between March and April 2017. The sampling was based on data of the Association of German Market and Social Research (ADM), which includes registered as well as non-registered telephone numbers via random digital dialing. Around 13% of adults (age 16 years and older) in Germany do not have access to landline and solely use a mobile phone.[27] This is why we incorporated a share of 30% mobile numbers in the initial sample. To ensure a sample representative of the German population, all regions in Germany were included.

Regarding mobile numbers, target persons were owner or main user of the mobile phone. The connection was considered a neutral drop-out if the respondent was younger than 18 years. In households that were contacted via landline, the Kish-Selection-Grid [28] was applied to randomly select a person from this household. In the beginning of the interview, respondents were informed that the survey's focus was on nutrition, health, and wellbeing.

The overall sample of this study were N=1,401 persons. To obtain this number, 2,849 people were randomly selected. Of these, n=862 (30.25%) refused to participate in the interview. Further n=586 (20.57%) could not be reached. This led to a total response rate of 49.18%. Previous telephone interview studies have reached similar rates [29,30] and the response can be regarded satisfactory for telephone surveys in Germany.[31] The study made use of the experimental manipulation of different vignettes. In present analyses, those vignettes depicting a lawyer (male/female) or a janitor/cleaner (male/female) with obesity were used, resulting in a subsample of n=692 under study.

The Ethics Commission of the Medical Association in Hamburg approved this study (No. PV5421). Since the interviews were telephone-based, the respondents were verbally informed about the study and asked for consent to participate. Participants' consent and refusal were documented.

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Instruments

Vignette manipulation

Vignettes have been frequently applied in the social sciences to investigate attitudes or intended behavior.[32] In stigma research, they have been used to convey realistic pictures of an individual, e.g. with depression, schizophrenia, or obesity.[33,34]

In the present study, all vignettes conveyed the same information, while two characteristics were varied: sex (female/male) and occupational position (low, cleaner/high, lawyer). This resulted in four different vignettes that described an obese individual (please see appendix for vignettes). Weight and height were stated, yielding a BMI of approximately 32 kg/m^2. This was further emphasized by the comment that the person 'is strongly overweight'. A trained speaker audio-recorded the case stories. To neutralize possible interviewer effects, the files were directly played to the respondents from the computer via telephone line. Preceding the presentation of the vignette there was a set of questions related to respondents' own experience with overweight. This was weight and height, if the respondent has ever been overweight, tried to lose weight or has personal contact to persons with obesity. Following the vignette, four blocks of vignette-related questions were posed.

Public obesity stigma

To assess stigmatizing attitudes, the short form of the Fat Phobia Scale (FPS) by Bacon et al. [35] was used. It is comprised of 14 items and constitutes the first factor of the original 50-item scale.[36] The short version demonstrated excellent reliability and was strongly correlated with the long form. Moreover, the 14-item-scale accounted for the largest amount of variance in factor analysis.[35] On a 5-point semantic differential scale, 14 pairs of adjectives are introduced that capture common beliefs about people who are obese. The FPS short form has been translated and applied in the German-speaking area by Luck-Sikorski et al..[34] Principal component analysis with varimax rotation yielded a 4-factorial solution, with the eigenvalue of the fourth factor barely exceeding 1. Similar to a validation study for the German short version of the FPS, the first factor explained the greatest share of variation (25.58%) (second factor 10.80%, third factor 8.19%, fourth factor 7.31%) which is why a one factorial solution is supported.[37] According to Bacon et al. [35] items were inverted where necessary, so that higher scores indicate greater fat phobia. By adding up scores, a sum score of FPS was obtained (ranging from 14 to 70). Dividing this by the number of items led to a mean FPS score ranging from 1 to 5, where values < 2.5 indicate positive attitudes and values

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≥ 2.5 represent negative attitudes toward a person with obesity.[38] Cronbach's α for the FPS was 0.77.

Emotional reactions were assessed by nine items representing different ways of emotionally responding to the person described in the vignette. Six items were derived from a scale used in studies on mental illness stigma,[39] while three items were developed based on common stereotypes of obesity. The items were coded from 1 'completely disagree' to 4 'completely agree'. A principal component analysis with varimax rotation yielded two different factors. The first factor, termed negative emotional reactions, was comprised of the six items 'I react angrily', 'I feel annoyed', 'This triggers incomprehension with me', 'I feel repelled', 'I feel disgust', and 'I think this is unaesthetic'. The items "I feel pity", "I feel sympathy", and "I want to help" loaded on the second factor of positive emotional reactions. Together, the two factors accounted for 50.9 % of variance. Two sum scores were computed, Cronbach's α was 0.78 for negative (6 items), and 0.47 for positive emotional reactions (3 items).

Desire for social distance was assessed by a scale developed by Link et al.,[40] a modified version of the Bogardus Social Distance Scale.[41] The instrument contains seven items that represent different social relationships (e.g. neighbor, colleague, or child-carer). On a 4-point Likert-scale, respondents were asked to indicate to what extent they would accept the person described in the vignette. A principal component analysis with varimax rotation was carried out; yielding a single factor that explained 55.1 % of variance. Cronbach's α was 0.86. Again, a sum score was computed, with higher scores indicating greater desire for social distance.

Statistical analyses

The analyses were performed using SPSS 22.[42] To test for significant mean differences between groups regarding single items and scales, Mann-Whitney-U tests were applied. Determinants of stigmatizing attitudes were introduced to regression models. We analyzed two main effects presented in the vignette: occupational position (cleaner/lawyer) and gender (female/male). To take into account possible interdependencies, the interaction effect of occupational position x gender was also introduced to the models. Moreover, all models were controlled for respondents' characteristics. Age and BMI were entered as continuous variables. The respondents' occupational position was expressed in skill levels according to the International Standard Classification of Occupation (ISCO-08).[43] Other variables were the respondents' sex and personal contact to individuals who are obese.

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In all analyses, the response options 'prefer not to say' and 'don't know' were treated as missing values. Exact p values are reported, values of $p < 0.05$ were regarded as statistically significant.

RESULTS

Sociodemographic characteristics of the analyzed sample are briefly presented in table 1. The sex ratio is relatively even, and almost half of the respondents work in occupational positions that are regarded skill level 2 when referring to ISCO.[43] Regarding weight status, more than 50% of the respondents are either overweight or obese. The share of those who are overweight/obese corresponds to numbers obtained by other representative studies in Germany.[2] The vast majority has personal contact to someone who is overweight.

Table 1 Sociodemographic characteristics and weight status of the sample (n=627-692)

Gender (female)	48.9%
Mean age (standard deviation)	50.9 (18.0)
Age groups	
18 - ≤ 24 years	8.1%
25 - ≤ 39 years	20.0%
40 - ≤ 59 years	35.1%
60 - ≤ 64 years	12.6%
≥ 65 years	24.2%
Occupational position (ISCO-08)	
Skill level 1: *Simple/routine physical or manual tasks*	7.0%
Skill level 2: *Operating machinery and electronic equipment*	45.5%
Skill level 3: *Complex technical and practical tasks*	27.1%
Skill level 4: *Complex problem-solving, decision-making, creativity*	20.3%
Weight status according to BMI	
Underweight (≤ 18.49)	2.1%
Normal weight (18.50 – 24.99)	42.5%
Overweight (25.00 – 29.99)	34.2%
Obese (≥ 30.00)	21.2%
Contact to someone who is overweight (yes)	84.4%

In tables 2-4, differences in the mean stigma values depending on occupational position and gender presented in the vignette are reported.

Regarding the fat phobia items, the adjectives insecure and low self-esteem were ascribed to the female vignette significantly more often (table 2). In contrast, lazy, slow, and self-indulgent were significantly more often attributed to the male vignette. Contrasting low and high occupational position, a homogenous picture emerged. A low occupational position was significantly associated with greater negative attitudes, expressing individual responsibility

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(no willpower, poor self-control, weak) as well as insecurity and low self-esteem when compared to a high occupational position.

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Table 2 Fat phobia (FPS) single items and scale; differences according to gender and occupational position in the vignette (mean values (standard deviation))

Pair of adjectives	Gender			Occupational position		
	Female	Male	p*	Low	High	p*
Industrious ... lazy[1]	2.55 (0.92)	2.83 (0.81)	**<0.001**	2.68 (0.87)	2.69 (0.89)	0.667
Has willpower ... no willpower[1]	3.28 (0.97)	3.21 (1.04)	0.602	3.48 (0.98)	3.03 (0.97)	**<0.001**
Attractive ... unattractive[1]	3.33 (1.00)	3.42 (0.94)	0.160	3.43 (1.05)	3.32 (0.90)	0.149
Good self-control ... poor self-control[1]	3.10 (1.03)	3.17 (0.98)	0.440	3.30 (0.99)	2.97 (1.00)	**<0.001**
Fast ... slow[1]	3.25 (1.01)	3.47 (0.99)	**0.002**	3.32 (1.06)	3.39 (0.96)	0.592
Having endurance ... having no endurance[1]	3.41 (1.13)	3.37 (1.04)	0.297	3.39 (1.10)	3.40 (1.07)	0.688
Active ... inactive[1]	3.36 (0.98)	3.38 (1.06)	0.328	3.38 (1.06)	3.35 (0.97)	0.650
Strong ... weak[1]	3.15 (0.99)	3.18 (1.02)	0.914	3.33 (1.03)	3.01 (0.94)	**<0.001**
Self-sacrificing ... self-indulgent[1]	3.19 (0.91)	3.41 (0.86)	**<0.001**	3.32 (0.90)	3.28 (0.89)	0.375
Dislikes food ... likes food	4.05 (0.88)	4.15 (0.90)	0.093	4.08 (0.90)	4.12 (0.88)	0.584
Shapely ... shapeless[1]	3.41 (1.15)	3.21 (1.17)	0.098	3.40 (1.16)	3.31 (1.17)	0.753
Undereats ... overeats[1]	3.87 (0.91)	3.95 (0.90)	0.306	3.91 (0.93)	3.90 (0.89)	0.883
Secure ... insecure[1]	3.01 (1.06)	2.81 (1.03)	**0.027**	3.24 (1.02)	2.61 (0.98)	**<0.001**
High self-esteem ... low self-esteem[1]	3.10 (1.05)	2.83 (1.05)	**<0.001**	3.28 (1.00)	2.67 (1.02)	**<0.001**
FPS[1]	3.31 (0.48)	3.32 (0.50)	0.995	3.34 (0.51)	3.32 (0.46)	**<0.001**

[1]Semantic differential scales and mean FPS ranging from 1 to 5, values > 2.50 indicate greater fat phobia; *Mann-Whitney-U test

Regarding emotional reactions (table 3), the comparison of gender in the vignette showed that males with obesity evoked significantly greater negative reactions on five out of six items as well as on the subscale for negative emotions. Females with obesity, in contrast, were met with a greater share of pity. In terms of occupational position, a cleaner/janitor evoked significantly greater feelings of anger and incomprehension than a lawyer did. However, respondents simultaneously expressed greater feelings of pity and the desire to help someone with a low occupational position.

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Table 3 Emotional reactions single items and scales; differences according to gender and occupational position in the vignette (mean values (standard deviation))

	Gender			Occupational position		
	Female	Male	p*	Low	High	p*
Annoyed[1]	1.56 (0.72)	1.59 (0.70)	0.290	1.65 (0.79)	1.50 (0.62)	0.056
Angry[1]	1.36 (0.64)	1.55 (0.71)	**<0.001**	1.52 (0.71)	1.38 (0.64)	**0.005**
Incomprehension[1]	1.88 (0.89)	2.04 (0.83)	**0.006**	2.05 (0.87)	1.87 (0.85)	**0.012**
Revolted[1]	1.46 (0.69)	1.67 (0.75)	**<0.001**	1.62 (0.78)	1.50 (0.67)	0.114
Disgust[1]	1.41 (0.66)	1.53 (0.66)	**0.002**	1.51 (0.69)	1.42 (0.94)	0.078
Unaesthetic[1]	2.01 (0.94)	2.15 (0.87)	**0.022**	2.08 (0.87)	2.07 (0.95)	0.919
Negative emotional reactions scale[2]	9.67 (3.06)	10.54 (3.24)	**0.001**	10.43 (3.23)	9.74 (3.05)	**0.012**
Sympathy[1]	2.58 (0.81)	2.53 (0.78)	0.769	2.54 (0.82)	2.57 (0.77)	0.884
Pity[1]	2.24 (0.94)	2.09 (0.90)	**0.020**	2.23 (0.92)	2.11 (0.92)	**0.034**
Want to help[1]	2.20 (0.93)	2.26 (0.86)	0.414	2.34 (0.93)	2.12 (0.85)	**0.011**
Positive emotional reactions scale[3]	6.97 (1.96)	6.86 (1.74)	0.692	7.08 (2.01)	6.97 (1.96)	**0.004**

[1]Single items ranging from 1 to 4; [2]Negative emotional reaction scales comprised of six items; sum scale ranging from 6 to 24; [3]Positive emotional reaction scale comprised of three items; sum scale ranging from 3 to 12; *Mann-Whitney-U test

A consistent picture emerged when comparing desire for social distance according to the person's gender in the vignette (table 4). Males with obesity were met with significantly greater levels of rejection in all aspects of social distance. Only regarding the item 'neighbor', there were no significant differences between the sexes in the obesity vignette. Similarly, a person who is obese and of low occupational position evoked greater desire for social distance concerning four of six items.

Table 4 Desire for social distance single items and scale; differences according to gender and occupational position in the vignette (mean values (standard deviation))

	Gender			Occupational position		
	Female	Male	p*	Low	High	p*
Tenant[1]	1.71 (0.92)	1.96 (0.86)	**<0.001**	1.98 (0.98)	1.68 (0.78)	**0.001**
Colleague[1]	1.39 (0.57)	1.48 (0.61)	**0.012**	1.43 (0.54)	1.42 (0.63)	0.546
Neighbor[1]	1.52 (0.74)	1.56 (0.69)	0.155	1.54 (0.71)	1.54 (0.72)	0.649
Childcare[1]	1.70 (0.75)	1.95 (0.91)	**<0.001**	1.98 (0.90)	1.66 (0.74)	**<0.001**
In-law[1]	1.79 (0.90)	1.90 (0.79)	**0.003**	1.98 (0.89)	1.71 (0.78)	**<0.001**
Introduce friend[1]	1.74 (0.82)	2.25 (0.95)	**<0.001**	2.08 (0.92)	1.88 (0.90)	**0.008**
Recommend for job[1]	1.83 (0.84)	2.04 (0.81)	**<0.001**	2.03 (0.83)	1.83 (0.82)	**0.011**
Desire for social distance scale	11.66 (4.12)	13.15 (4.00)	**<0.001**	13.03 (4.14)	11.72 (4.03)	**<0.001**

[1]Single items ranging from 1 to 4; [2]Desire for social distance scale comprised of 7 items, sum scale ranging from 7 to 28; *Mann-Whitney-U test

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Table 5 Linear regression analyses: associations between stigma components and occupational position and gender presented in the vignette

	FPS[1]			Scale prosocial			Scale anger/disgust			Social Distance		
	B	β	95% CI	B	ß	95% CI	B	ß	95% CI	B	ß	95% CI
Low occupational position vignette (ref. lawyer)	**0.171**	**0.173**	**0.052 - 0.287****	0.035	0.010	-0.393 - 0.464	0.304	0.047	-0.405 - 1.014	**1.122**	**0.135**	**0.217 - 2.026***
Female gender in vignette (ref. male)	-0.002	-0.002	-0.115 - 0.112	-0.146	-0.039	-0.556 - 0.264	**-0.977**	**-0.151**	**-1.655 - -0.299****	**-1.201**	**-0.145**	**-2.068 - -0.334****
Interaction gender * occupational position in vignette	-0.021	-0.019	-0.182 - 0.139	0.539	0.126	-0.048 - 1.125	0.238	0.032	-0.730 - 1.205	-0.215	-0.023	-1.451 - 1.021

*p<0.05; **p<0.01; ***p<0.001; [1]mean Fat Phobia Score ranging from 1 to 5; the model is adjusted for respondents' gender, age, BMI, occupational position as well as contact to an individual with obesity

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The results of multiple linear regression analyses are reported in table 5. While controlling for respondents' characteristics, a significant main effect of occupational position emerged regarding fat phobia. Being a janitor or cleaner with obesity was associated with significantly increased fat phobia compared to lawyers. Regarding positive emotional reactions, there were no significant associations with either gender or occupational position. However, male obese were confronted with more negative emotions than female obese. In terms of desire for social distance, both main effects attained statistical significance. Being either a male or a janitor/cleaner with obesity was significantly associated with greater desire for social distance. In none of the models did the interaction effect of gender x occupational position attain statistical significance (table 5).

DISCUSSION

The concept of multiple stigma suggests that a person can belong to different potentially stigmatized groups, experiencing an aggregation of disadvantages and discrimination.[23] Applying this approach to the present study, this would mean that because of their group affiliation (e.g. being female and of low SES) individuals suffer multiple stigma when confronted with the burden of obesity. Similarly, the framework of intersectionality describes the interdependent relationship between different social identities and structural inequities.[44] Multiple social categories interact and produce or protect against discrimination. In light of this, obesity stigma can reinforce pre-existing inequalities because of socio-economic position and / or gender.

The present study is one of the first to analyze the possible multiple stigma of gender, SES, and obesity. Following an intersectional approach, it was analyzed whether main effects or the interaction of social categories possibly reinforce obesity stigma, implying a double or multiple disadvantage for certain individuals. While there were no statistically significant interaction effects of categories, we found distinct differences in public obesity stigma dependent on gender with regard to most stigma components under study. Males with obesity were met with greater fat phobia and negative emotional reactions and tended to be more rejected in terms of social distance. This contradicts previous studies that found (young) women who are overweight or obese to be met with greater stigmatization than men.[15–19] However, these results can aid in shedding light on a research gap that has recently come into focus again. Although Harris et al. [45] were able to show that stereotypes of obesity can be as severe for men as for women already in 1982, females have often been the center of attention in obesity stigma research. The predominance of overly thin women in the media

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and the promotion of a slim beauty ideal for females can have different effects on the stigmatization of women and men with obesity.[20] Nevertheless, over the past years, a trim and muscular male body image has come to the fore in most Western societies, shaping a new perspective on body image dissatisfaction and obesity stigma also among men.[46,47] Men have been found to be similarly stigmatized as women for being heavy,[20] and the concern about body image is associated with increased eating pathology in both men and women. [48]

Regarding SES and obesity, the study revealed differences in public attitudes in all stigma components under study. Those of low SES were rated less favorably with regard to fat phobia, negative emotional reactions, and desire for social distance when compared to persons with high SES. In contrast to differences depending on gender, individuals with low SES were also met with significantly greater prosocial feelings. It is possible that, next to being obese, the status of a cleaner/janitor is linked to characteristics (e.g. economic hardship) that evoke pity among respondents. Nonetheless, there were no significant association between prosocial feelings of the respondents and SES in the vignette. Following the concept of intersectionality, and against the background of a disproportionate distribution of obesity (higher prevalence among females of low SES), one could have expected significant interaction effects in multivariate analyses. We were not able to verify this assumption. However, significant main effects of gender and SES indicate a double stigma to the disadvantage of males as well as individuals with low socio-economic position who suffer from obesity.

Some limitations need to be mentioned and discussed when evaluating our findings. More than half of the individuals eligible for the study were not available or refused to participate. Although participation rates around 50% can be regarded satisfactory for telephone surveys,[31] we cannot rule out selection bias due to non-response. With respect to internal consistency, Cronbach's α for most scales was good or acceptable. Only the subscale of positive emotional reactions exhibited inacceptable reliability, which could be due to the relatively small number of items. In this case, it is recommended to use the mean inter-item correlation as an indicator for acceptability, which was 0.22 in the present sample. A satisfactory range is said to be 0.2 to 0.4.[49] Furthermore, no conclusions on causal relationships can be drawn as our data are based on a cross-sectional design. Similar to other studies in stigma research, we used vignettes to explore possible multiple stigma of obesity. On the one hand, these should not be too long. On the other hand, only varying one sentence to express different social conditions might have been too short to convey a holistic picture of

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the individual, or to be kept in mind throughout the whole interview. Moreover, due to time constraints, every respondent only received one vignette. The lack of a neutral control condition impedes the interpretation of results, e.g. regarding fat phobia items and low socio-economic position. Therefore, it remains unclear whether respondents associate adjectives such as low self-esteem or insecurity with the fact that the individual in the vignette is obese or pursues the profession of a janitor when compared to a lawyer.

To our knowledge, this is the first population-based study examining the multiple stigma of gender, SES, and obesity. Differences in public stigma based on gender and SES indicate that obesity can exacerbate pre-existing inequalities. The presence of obesity stigma could be shown in many domains of daily life, e.g. education, work, personal, and health care.[10,11] Stigmatization due to excess body weight is a risk factor for physical and psychological health problems such as depression, body dissatisfaction, and low self-esteem. Moreover, instead of motivating individuals to lose weight, stigma is associated with additional weight gain [6] and underutilization of health care.[11] This implies a vicious circle of mutually reinforcing negative conditions. The manifold effects of weight-based stigma require actions in all kinds of professional disciplines, e.g. among physicians, dieticians, and scientists in various fields. To encounter stigma, the topic should be the subject of discussion in obesity intervention measures, and antistigma messages have to be incorporated into obesity prevention campaigns. Moreover, our results underline the need to consider the individual social dimension of obesity stigma. If affected by obesity, some individuals seem to suffer double. In acknowledging the interrelation of social conditions and existing structures, future research should derive tailored measures to encounter obesity stigma and its related adverse physical and psychological health outcomes.

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DECLARATIONS

Ethical approval

Ethics Commission of the Medical Association Hamburg approved the data collection procedure (No. PV5421).

Consent to participate

Participants provided verbal informed consent.

Availability of data and material

Data are available by request from the corresponding author.

Competing interests

None declared.

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Contributors

ACM undertook the statistical analyses and wrote the first draft of the manuscript. OvdK conceived the study design and contributed to the manuscript. TJK and CLS contributed to the questionnaire and critically revised the manuscript.

Patient involvement

No patients were involved in this study.

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APPENDIX

Female vignettes

Diana D. is *a lawyer* and 46 years old. With a height of 5'5 and a weight of 200 pounds, she is severely overweight.

Diana D. is *a cleaner* and 46 years old. With a height of 5'5 and a weight of 200 pounds, she is severely overweight.

Male vignettes

John D. is *a lawyer* and 46 years old. With a height of 5'9 and a weight of 230 pounds, he is severely overweight.

John D. is *a janitor* and 46 years old. With a height of 5'9 and a weight of 230 pounds, he is severely overweight.

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Social deprivation, gender and obesity: multiple stigma? Results of a population survey from Germany

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Social deprivation, gender and obesity: multiple stigma? Results of a population survey from Germany

Objectives: Individuals with obesity are subject to stigmatization, resulting in discrimination. Studies focusing on obesity stigma often do not account for social conditions that also may be associated with stigmatization. Following an intersectional approach, social categories such as gender and socio-economic status (SES) can interact and form a basis for multiple stigma. The present study analyses differences in public obesity stigma depending on gender and SES, as well as possible interdependencies between these social categories.

Design: Representative cross-sectional telephone survey.

Participants: 692 randomly selected adults (≥ 18 years) in Germany.

Methods: Different vignettes were presented, depicting a lawyer (male/female) or a janitor/cleaner (male/female) with obesity. Following the vignette, different components of stigma were assessed: (1) fat phobia, (2) emotional reactions to a person with obesity, and (3) desire for social distance. Associations between gender, SES, and stigma components were tested in multiple linear regression analyses.

Results: A low SES in the obesity vignette (janitor/cleaner) was significantly associated with higher fat phobia scores as well as desire for social distance, compared to the vignette with a person with obesity and a high SES (lawyer). Being a male with obesity was significantly associated with more pronounced negative emotional reactions and greater desire for social distance. There were no significant interaction effects between gender and SES.

Conclusions: Results support the hypothesis of multiple stigma. Being male or of low SES was significantly associated with more pronounced negative attitudes in the German public. Following the concept of intersectionality, our findings indicate that obesity stigma can exacerbate pre-existing inequalities. This needs to be considered in development and implementation of prevention and anti-stigma measures.

Keywords: stigma; multiple stigma; attitudes; obesity; Germany; differences; socioeconomic status; occupational position; gender

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STRENGTHS AND LIMITATIONS OF THIS STUDY

- This is the first study analyzing socio-economic status (SES) and gender in the context of public obesity stigma.
- Analyses are based on a national telephone survey not only relying on landline but also including mobile-only users all over Germany.
- Pre-recorded audio vignettes were used to identify additive stigma effects. For a separation of obesity stigma from the stigma associated with gender and SES, a neutral control vignette would have been necessary.
- Although vignettes are a frequently used method in stigma research, they need to be short and bear the risk of not conveying a holistic picture of an individual with obesity and different social characteristics.

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INTRODUCTION

The proportion of people who are overweight or obese has increased continuously over the past decades.[1] In Germany, the current Health Interview and Examination Survey for Adults reports a prevalence rate of obesity (defined as Body Mass Index (BMI) $\geq$ 30kg/m^2) of approximately 24%.[2] The etiology of obesity is often multi-faceted, different factors such as behavioral, biological, psychosocial, context-related or prenatal conditions concur.[3] However, poor diet and sedentary behavior are often erroneously seen as the primary reason for overweight.[4] This in turn lays the focus on individual responsibility and fosters public stereotypes of laziness and weak will. According to attribution theory, believing the condition to be under a person's control determines greater stigmatizing reactions.[5] The public misconception of causes of overweight and obesity is common and contributes to the expression of obesity stigma.[6] Individuals with overweight or obesity display a physical 'mark' that sets them apart from others. Link and Phelan [7] have provided a process model, in which stigma is conceptualized as several distinct, but interrelated steps: differences between social groups are distinguished and *labeled*. These labels are linked to *stereotypes* (undesired characteristics) that form the basis of a *separation* of 'us' and 'them'. Thusly-labeled individuals experience *status loss* and *discrimination* in a context in which power is exercised.

There is a public recognition of obesity as a chronic condition and it is a classified disease in some countries (but not Germany).[8] Nevertheless, individuals with obesity experience discrimination in daily life, which in turn reinforces negative stereotypes and stigmatizing processes.[7] Ascribing negative attributes such as unintelligent, lack of self-discipline or emotionally instable [9,10] to persons who are obese, activates processes that result in discrimination in different settings. This could be shown for the education and employment sector as well as personal relationships.[10] Furthermore, stigmatizing attitudes and discrimination are present in the health care sector, possibly leading to the avoidance of necessary treatment.[11] The adverse health consequences of obesity stigma have been shown on psychological (e.g. depression, self-esteem) and physical (eating behavior, physical activity, cardiovascular health outcomes) levels.[10]

For Germany, a study found that about one fourth of the general public displays stigmatizing attitudes regarding the 'Weight Control/Blame" subscale from the Antifat Attitudes Test.[12] High levels of responsibility for becoming obese are attributed to the individual, which is associated with the belief that the individual should be liable for treatment costs to a great

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extent.[13] Sikorski et al. examined emotional reactions and social distance towards individuals with obesity and found that the most rejected domains were personal ability as well as social interaction.[14]

In terms of gender differences, studies reported higher weight bias internalization [15] and greater risk for weight/height discrimination [16] among women. In children and adolescents, girls with overweight have been found to be subject to teasing and social marginalization.[17,18] Similar results are presented by Fikkan and Rothblum,[19] who found women with obesity to be more stigmatized in education and employment sectors than men. However, gender differences in obesity stigma have rarely been examined, and results are not consistent.[20]

Over the past years, stigma research has paid increased attention to multiple social identities and their interaction to influence stigmatization. This intersectional approach allows examining how multiple social categories, e.g. being categorized as 'female', 'black' or both, interact to produce or protect against health risks or discrimination.[15] A similar approach is referred to as 'multiple stigma' [21] or 'double disadvantage'.[22] These concepts suggest that a person can belong to different, possibly stigmatized social groups which exerts cumulative effects.[23] When it comes to obesity stigma at the intersection of gender and race, the few studies have come to different results. While in a study of Himmelstein et al. [15] no divergences in stigma as a function of race or gender emerged, Puhl et al. found that African American females who are obese evoked higher ratings of dislike and social distance than Caucasian females with obesity.[24]

So far, there is no study focusing on possible additive or multiple effects of gender and socio-economic status (SES) in the context of obesity stigma. This is astonishing, as there are socio-economic inequalities in the prevalence of obesity.[25] This also holds true for Germany, where obesity is more common among children and adults who are of low SES. Especially women in this group appear to be excessively affected by obesity.[26]

Against this background, we analyze differences in public stigma towards low vs. high SES persons as well as female vs. male persons with obesity. By incorporating the interaction of gender x SES, we additionally examine possible interdependencies and their associations with obesity stigma.

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METHODS

Study design and sample

Analyses are based on a national telephone survey (computer assisted telephone interview (CATI)), conducted between March and April 2017. The sampling was based on data of the Association of German Market and Social Research (ADM), which includes registered as well as non-registered telephone numbers via random digital dialing. Already in 2010, around 13% of adults (age 16 years and older) in Germany did not have access to landline and solely used a mobile phone.[27] As this proportion has increased since 2010 and in order to increase the probability to reach persons who are rarely at home, we incorporated a share of 30% mobile numbers in the initial sample. To ensure a sample representative of the German population, all regions in Germany were included.

Regarding mobile numbers, target persons were owner or main user of the mobile phone. The connection was considered a neutral drop-out if the respondent was younger than 18 years. In households that were contacted via landline, the Kish-Selection-Grid [28] was applied to randomly select a person from this household. To this aim, the interviewer collected the age and gender of everyone in the household that was eligible for the survey and then randomly selected the respondent from that list. In the beginning of the interview, respondents were informed that the survey's focus was on nutrition, health, and wellbeing.

The overall sample of this study consisted of N=1,401 persons. To obtain this number, 2,849 people were randomly selected (net sample). Of these, n=862 (30.25%) refused to participate in the interview. Further n=586 (20.57%) could not be reached. This led to a total response rate of 49.18%. Previous telephone interview studies have reached similar rates [29,30] and the response can be regarded satisfactory for telephone surveys in Germany.[31] In the study, eight different vignettes were used. The present analyses focus on four vignettes depicting a lawyer (male/female) or a janitor/cleaner (male/female) with obesity, resulting in a subsample of n=692 under study.

The Ethics Commission of the Medical Association in Hamburg approved this study (No. PV5421). Since the interviews were telephone-based, the respondents were verbally informed about the study and asked for consent to participate. Participants' consent and refusal were documented. As we used data from a population survey, patients were not involved in the development and design of the research question and the study.

Instruments

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Vignette manipulation

Vignettes have been frequently applied in the social sciences to investigate attitudes or intended behavior.[32] In stigma research, they have been used to convey realistic pictures of an individual, e.g. with depression, schizophrenia, or obesity.[33,34]

In the present study, all pre-recorded audio vignettes conveyed the same information, while two characteristics were varied: gender (female/male) and occupational position as an indicator of SES (low = janitor or cleaner / high = lawyer). This resulted in four different case stories that described an individual with obesity (please see appendix). One vignette was randomly assigned to each respondent, resulting in about 175 respondents per vignette. Weight and height were stated, yielding a BMI of approximately 32 kg/m^2. This was further emphasized by the comment that the person 'is severely overweight'. A trained speaker audio-recorded the case stories. To neutralize possible interviewer effects, the files were directly played to the respondents from the computer via telephone line. Preceding the presentation of the vignette, there was a set of questions related to respondents' own experience with overweight. This was self-reported weight and height, if the respondent has ever been overweight, tried to lose weight or has personal contact to persons with obesity.

Obesity stigma

To assess stigmatizing attitudes toward the person described in the vignette, the short form of the *Fat Phobia Scale (FPS)* by Bacon et al. [35] was used. It is comprised of 14 items and constitutes the first factor of the original 50-item scale.[36] The short version demonstrated excellent reliability and was strongly correlated with the long form. Moreover, the 14-item-scale accounted for the largest amount of variance in factor analysis.[35] On a 5-point semantic differential scale, 14 pairs of adjectives are introduced that capture common beliefs about people who are obese. The FPS short form has been translated and applied in the German-speaking area by Luck-Sikorski et al..[34] Principal component analysis with varimax rotation yielded a 4-factorial solution, with the eigenvalue of the fourth factor barely exceeding 1. Similar to a validation study for the German short version of the FPS, the first factor explained the greatest share of variation (25.58%, second factor 10.80%, third factor 8.19%, fourth factor 7.31%) which is why a one factorial solution is supported.[37] Following Bacon et al. [35], items were inverted where necessary, so that a higher score indicates greater fat phobia. The sum score was divided by the number of items so that the score ranges from 1 to 5. Values < 2.5 indicate positive attitudes and values ≥ 2.5 represent negative attitudes toward a person with obesity.[38] Cronbach's α for the FPS was 0.77.

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Emotional reactions were assessed by nine items representing different ways of emotionally responding to the person described in the vignette. Six items were derived from a scale used in studies on mental illness stigma,[39] while three items were developed based on common stereotypes of obesity. The items were coded from 1 'completely disagree' to 4 'completely agree'. A principal component analysis with varimax rotation yielded two different factors. The first factor, termed *negative emotional reactions*, was comprised of the six items 'I react angrily', 'I feel annoyed', 'This triggers incomprehension with me', 'I feel repelled', 'I feel disgust', and 'I think this is unaesthetic'. The items "I feel pity", "I feel sympathy", and "I want to help" loaded on the second factor of *positive emotional reactions*. Together, the two factors accounted for 50.9 % of variance. Two sum scores were computed, Cronbach's α was 0.78 for negative (6 items), and 0.47 for positive emotional reactions (3 items).

Desire for social distance was assessed by a scale developed by Link et al.,[40] a modified version of the Bogardus *Social Distance Scale*.[41] The instrument contains seven items that represent different social relationships (e.g. neighbor, colleague, or child-carer). On a 4-point Likert-scale, respondents were asked to indicate to what extent they would accept the person described in the vignette. A principal component analysis with varimax rotation was carried out; yielding a single factor that explained 55.1 % of variance. Cronbach's α was 0.86. Again, a sum score was computed, with higher scores indicating greater desire for social distance.

Statistical analyses

The analyses were performed using SPSS 22.[42] To test for significant mean differences between groups regarding single items and scales, Mann-Whitney-U tests were applied since responses to the stigma items did not follow a normal distribution. Determinants of stigmatizing attitudes were introduced into regression models. We analyzed two main effects presented in the vignette: SES (janitor or cleaner/lawyer) and gender (female/male). To take into account possible interdependencies, the interaction effect of SES x gender was also introduced into the models. All models were controlled for respondents' characteristics. Age and BMI were entered as continuous variables. The respondents' occupational position was expressed in skill levels according to the International Standard Classification of Occupation (ISCO-08).[43] Other variables were the respondents' gender and personal contact to individuals who are obese.

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In all analyses, the response options 'prefer not to say' and 'don't know' were treated as missing values. Exact p values are reported. In view of the number of tests, values of $p < 0.01$ were regarded as statistically significant.

RESULTS

Sociodemographic characteristics of the analyzed sample are briefly presented in table 1. The sex ratio is relatively even, which is similar to the general adult population in Germany according to the official statistics [44]. In terms of age, people aged 25 to 39 are underrepresented and people aged 60 to 64 are overrepresented in the sample compared to the distribution in the official statistics [45]. Almost half of the respondents work in occupational positions that are regarded skill level 2 when referring to ISCO.[43] Regarding weight status, more than 50% of the respondents are either overweight or obese. The share of those who are overweight/obese corresponds to numbers obtained by other representative studies in Germany.[2] The vast majority has or had personal contact to someone who is overweight.

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Table 1 Sociodemographic characteristics and weight status of the sample (n=627-692)

Gender (female)	48.9%
Mean age (standard deviation)	50.9 (18.0)
Age groups	
18 - ≤ 24 years	8.1%
25 - ≤ 39 years	20.0%
40 - ≤ 59 years	35.1%
60 - ≤ 64 years	12.6%
≥ 65 years	24.2%
Occupational position (ISCO-08)	
Skill level 1: *Simple/routine physical or manual tasks*	7.0%
Skill level 2: *Operating machinery and electronic equipment*	45.5%
Skill level 3: *Complex technical and practical tasks*	27.1%
Skill level 4: *Complex problem-solving, decision-making, creativity*	20.3%
Weight status according to BMI	
Underweight (≤ 18.49)	2.1%
Normal weight (18.50 – 24.99)	42.5%
Overweight (25.00 – 29.99)	34.2%
Obese (≥ 30.00)	21.2%
Contact to someone who is overweight (yes)	84.4%

In tables 2-4, differences in the mean stigma values depending on SES and gender presented in the vignette are reported. Regarding the fat phobia items, the adjective low self-esteem was ascribed to the female vignette significantly more often (respective means were 3.10 for the female vignette and 2.83 for the male vignette, table 2). In contrast, lazy, slow, and self-indulgent were significantly more often attributed to the male vignette. Comparing low and high SES, a homogenous picture emerged. A low SES was significantly associated with greater negative attitudes, expressing individual responsibility (no willpower, poor self-control, weak) as well as insecurity and low self-esteem when compared to high SES.

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Table 2 Fat phobia (FPS, single items and scale); differences according to gender and socio-economic status (SES) in the vignette (mean values (standard deviation))

Pair of adjectives	Gender			SES		
	Female (n=337-348)	Male (n=306-316)	p*	Low Janitor/cleaner (n=317-327)	High Lawyer (n=326-337)	p*
Industrious ... lazy[1]	2.55 (0.92)	2.83 (0.81)	**<0.001**	2.68 (0.87)	2.69 (0.89)	0.667
Has willpower ... no willpower[1]	3.28 (0.97)	3.21 (1.04)	0.602	3.48 (0.98)	3.03 (0.97)	**<0.001**
Attractive ... unattractive[1]	3.33 (1.00)	3.42 (0.94)	0.160	3.43 (1.05)	3.32 (0.90)	0.149
Good self-control ... poor self-control[1]	3.10 (1.03)	3.17 (0.98)	0.440	3.30 (0.99)	2.97 (1.00)	**<0.001**
Fast ... slow[1]	3.25 (1.01)	3.47 (0.99)	**0.002**	3.32 (1.06)	3.39 (0.96)	0.592
Having endurance ... having no endurance[1]	3.41 (1.13)	3.37 (1.04)	0.297	3.39 (1.10)	3.40 (1.07)	0.688
Active ... inactive[1]	3.36 (0.98)	3.38 (1.06)	0.328	3.38 (1.06)	3.35 (0.97)	0.650
Strong ... weak[1]	3.15 (0.99)	3.18 (1.02)	0.914	3.33 (1.03)	3.01 (0.94)	**<0.001**
Self-sacrificing ... self-indulgent[1]	3.19 (0.91)	3.41 (0.86)	**<0.001**	3.32 (0.90)	3.28 (0.89)	0.375
Dislikes food ... likes food	4.05 (0.88)	4.15 (0.90)	0.093	4.08 (0.90)	4.12 (0.88)	0.584
Shapely ... shapeless[1]	3.41 (1.15)	3.21 (1.17)	0.098	3.40 (1.16)	3.31 (1.17)	0.753
Undereats ... overeats[1]	3.87 (0.91)	3.95 (0.90)	0.306	3.91 (0.93)	3.90 (0.89)	0.883
Secure ... insecure[1]	3.01 (1.06)	2.81 (1.03)	0.027	3.24 (1.02)	2.61 (0.98)	**<0.001**
High self-esteem ... low self-esteem[1]	3.10 (1.05)	2.83 (1.05)	**<0.001**	3.28 (1.00)	2.67 (1.02)	**<0.001**
FPS[1]	3.31 (0.48)	3.32 (0.50)	0.995	3.40 (0.51)	3.22 (0.46)	**<0.001**

[1]Semantic differential scales and mean FPS ranging from 1 to 5, values > 2.50 indicate greater fat phobia; *Mann-Whitney-U test

Regarding emotional reactions (table 3), the comparison of gender in the vignette showed that males with obesity evoked significantly more negative emotional reactions on four out of six items as well as on the subscale for negative emotions (respective means were 9.67 for the female vignette and 10.54 for the male vignette). In terms of SES, a cleaner/janitor with obesity evoked significantly more feelings of anger but also more positive emotional reactions, compared to a lawyer with obesity.

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Table 3 Emotional reactions (single items and scales); differences according to gender and socio-economic status (SES) in the vignette (mean values (standard deviation))

	Gender			**SES**		
	Female (n=327-350)	Male (n=293-315)	p*	Low Janitor/cleaner (n=299-326)	High Lawyer (n=321-338)	p*
Annoyed[1]	1.56 (0.72)	1.59 (0.70)	0.290	1.65 (0.79)	1.50 (0.62)	0.056
Angry[1]	1.36 (0.64)	1.55 (0.71)	**<0.001**	1.52 (0.71)	1.38 (0.64)	**0.005**
Incomprehension[1]	1.88 (0.89)	2.04 (0.83)	**0.006**	2.05 (0.87)	1.87 (0.85)	0.012
Revolted[1]	1.46 (0.69)	1.67 (0.75)	**<0.001**	1.62 (0.78)	1.50 (0.67)	0.114
Disgust[1]	1.41 (0.66)	1.53 (0.66)	**0.002**	1.51 (0.69)	1.42 (0.94)	0.078
Unaesthetic[1]	2.01 (0.94)	2.15 (0.87)	0.022	2.08 (0.87)	2.07 (0.95)	0.919
Negative emotional reactions scale[2]	9.67 (3.06)	10.54 (3.24)	**0.001**	10.43 (3.23)	9.74 (3.05)	0.012
Sympathy[1]	2.58 (0.81)	2.53 (0.78)	0.769	2.54 (0.82)	2.57 (0.77)	0.884
Pity[1]	2.24 (0.94)	2.09 (0.90)	0.020	2.23 (0.92)	2.11 (0.92)	0.034
Want to help[1]	2.20 (0.93)	2.26 (0.86)	0.414	2.34 (0.93)	2.12 (0.85)	0.011
Positive emotional reactions scale[3]	6.97 (1.96)	6.86 (1.74)	0.692	7.08 (2.01)	6.97 (1.96)	**0.004**

[1]Single items ranging from 1 to 4; [2]Negative emotional reaction scales comprised of six items; sum scale ranging from 6 to 24; [3]Positive emotional reaction scale comprised of three items; sum scale ranging from 3 to 12; *Mann-Whitney-U test

A consistent picture emerged when comparing desire for social distance according to the person's gender in the vignette (table 4). Males with obesity were met with significantly greater levels of rejection in most aspects of social distance. Gender difference was also significant for the desire for social distance scale (13.15 for males and 11.66 for females). Similarly, a person who is obese and has a low SES evoked greater desire for social distance concerning four of seven items. Also, the desire for social distance scale significantly differed between the SES vignettes (13.03 for low SES and 11.72 for high SES).

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Table 4 Desire for social distance (single items and scale); differences according to gender and socio-economic status (SES) in the vignette (mean values (standard deviation))

	Gender			SES		
	Female (n=332-350)	Male (n=292-312)	p*	Low Janitor/cleaner (n=307-324)	High Lawyer (317-338)	p*
Tenant[1]	1.71 (0.92)	1.96 (0.86)	**<0.001**	1.98 (0.98)	1.68 (0.78)	**0.001**
Colleague[1]	1.39 (0.57)	1.48 (0.61)	0.012	1.43 (0.54)	1.42 (0.63)	0.546
Neighbor[1]	1.52 (0.74)	1.56 (0.69)	0.155	1.54 (0.71)	1.54 (0.72)	0.649
Childcare[1]	1.70 (0.75)	1.95 (0.91)	**<0.001**	1.98 (0.90)	1.66 (0.74)	**<0.001**
In-law[1]	1.79 (0.90)	1.90 (0.79)	**0.003**	1.98 (0.89)	1.71 (0.78)	**<0.001**
Introduce friend[1]	1.74 (0.82)	2.25 (0.95)	**<0.001**	2.08 (0.92)	1.88 (0.90)	**0.008**
Recommend for job[1]	1.83 (0.84)	2.04 (0.81)	**<0.001**	2.03 (0.83)	1.83 (0.82)	0.011
Desire for social distance scale	11.66 (4.12)	13.15 (4.00)	**<0.001**	13.03 (4.14)	11.72 (4.03)	**<0.001**

[1]Single items ranging from 1 to 4; [2]Desire for social distance scale comprised of 7 items, sum scale ranging from 7 to 28; *Mann-Whitney-U test

The results of multiple linear regression analyses are reported in table 5. While controlling for respondents' characteristics, a significant main effect of SES emerged regarding fat phobia (β = 0.173). Being a janitor or cleaner with obesity was associated with significantly increased fat phobia compared to lawyers. Regarding positive emotional reactions, there were no significant associations with either gender or SES. However, male persons with obesity were confronted with more negative emotional reactions than females (β = -0.151). In terms of desire for social distance, both main effects were statistically significant. Being either a male or a janitor/cleaner with obesity was significantly associated with greater desire for social distance. In none of the models did the interaction effect of gender x SES attain statistical significance (table 5).

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Table 5 Linear regression analyses: associations between stigma components and socio-economic status (SES) and gender presented in the vignette

	Fat Phobia Scale (n=561)			**Positive emotional reactions (n=607)**			**Negative emotional reactions (n=614)**			**Social Distance (n=608)**		
	B	β	95% CI	B	ß	95% CI	B	ß	95% CI	B	ß	95% CI
Low SES vignette (ref. lawyer)	**0.171**	**0.173**	**0.052 - 0.287***	0.035	0.010	-0.393 - 0.464	0.304	0.047	-0.405 - 1.014	**1.122**	**0.135**	**0.217 - 2.026***
Female gender in vignette (ref. male)	-0.002	-0.002	-0.115 - 0.112	-0.146	-0.039	-0.556 - 0.264	**-0.977**	**-0.151**	**-1.655 - -0.299***	**-1.201**	**-0.145**	**-2.068 - -0.334***
Interaction gender * SES in vignette	-0.021	-0.019	-0.182 - 0.139	0.539	0.126	-0.048 - 1.125	0.238	0.032	-0.730 - 1.205	-0.215	-0.023	-1.451 - 1.021

*p<0.01; **p<0.001; the model is adjusted for respondents' gender, age, BMI, occupational position as well as contact to an individual with obesity

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DISCUSSION

The concept of multiple stigma suggests that a person can belong to different potentially stigmatized groups, experiencing an aggregation of disadvantages and discrimination.[23] Applying this approach to the present study, this would mean that because of their group affiliation (e.g. being female and of low SES) individuals suffer multiple stigma when confronted with the burden of obesity. Similarly, the framework of intersectionality describes the interdependent relationship between different social identities and structural inequities.[46] Multiple social categories interact and produce or protect against discrimination. In light of this, obesity stigma can reinforce pre-existing inequalities because of SES and / or gender.

The present study is one of the first to analyze the possible multiple stigma of gender, SES, and obesity. Following an intersectional approach, it was analyzed whether main effects or the interaction of social categories possibly reinforce obesity stigma, implying a double or multiple disadvantage for certain individuals. While there were no statistically significant interaction effects of categories, we found distinct differences in obesity stigma dependent on gender with regard different stigma components. Males with obesity were met with more negative emotional reactions and social distance. This contradicts some previous studies that found (young) women who are overweight or obese to be met with greater stigmatization than men.[15–19] Although Harris et al. [47] showed that stereotypes of obesity can be as severe for men as for women already in 1982, females have often been the center of attention in obesity stigma research. The predominance of overly thin women in the media and the promotion of a slim beauty ideal for females can have different effects on the stigmatization of women and men with obesity.[20] Nevertheless, over the past years, a trim and muscular male body image has come to the fore in most Western societies, shaping a new perspective on body image dissatisfaction and obesity stigma also among men.[48,49] Men have been found to be similarly stigmatized as women for being heavy,[20] and the concern about body image is associated with increased eating pathology in both men and women. [50]

Regarding SES and obesity, the study revealed significant differences in public attitudes in several stigma components under study. Those of low SES were rated less favorably with regard to fat phobia and desire for social distance when compared to persons with high SES. On the other hand, individuals with low SES were also met with significantly greater

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prosocial feelings. It is possible that, next to being obese, the status of a cleaner/janitor is linked to characteristics (e.g. economic hardship) that evoke pity among respondents. After the adjustment of respondents' characteristics in the multivariate analyses (gender, age, BMI, occupational position as well as contact to an individual with obesity), however, only the associations with fat phobia and social distance were found to be significant.

Following the concept of intersectionality, and against the background of a disproportionate distribution of obesity (higher prevalence among females of low SES), one could have expected significant interaction effects in multivariate analyses. We were not able to verify this assumption. However, significant main effects of gender and SES indicate a double stigma to the disadvantage of males as well as individuals with a low SES who suffer from obesity.

Some limitations need to be mentioned and discussed when evaluating our findings. More than half of the individuals eligible for the study were not available or refused to participate. Although participation rates around 50% can be regarded satisfactory for telephone surveys,[31] we cannot rule out selection bias due to non-response. With respect to internal consistency, Cronbach's α for most scales was good or acceptable. Only the subscale of positive emotional reactions exhibited inacceptable reliability, which could be due to the relatively small number of items. In this case, it is recommended to use the mean inter-item correlation as an indicator for acceptability, which was 0.22 in the present sample. A satisfactory range is said to be 0.2 to 0.4.[51] Furthermore, no conclusions on causal relationships can be drawn as our data are based on a cross-sectional design. Similar to other studies in stigma research, we used vignettes to explore possible multiple stigma of obesity. On the one hand, these should not be too long. On the other hand, only varying one sentence to express different social conditions might have been too short to convey a holistic picture of the individual, or to be kept in mind throughout the whole interview. Moreover, due to time constraints, every respondent only received one vignette. The lack of a neutral control condition impedes the interpretation of results. For example, it remains unclear whether respondents associate adjectives such as low self-esteem or insecurity with the fact that the individual in the vignette is obese or pursues the profession of a janitor when compared to a lawyer. This is a limitation that has to be considered when interpreting our findings as an indication of multiple or double stigma. Finally, sample size may have been too small to detect significant interaction effects.

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Differences in stigma based on gender and SES indicate that obesity can exacerbate pre-existing inequalities. The presence of obesity stigma could be shown in many domains of daily life, e.g. education, work, personal, and health care.[10,11] Stigmatization is a risk factor for physical and psychological health problems such as depression, body dissatisfaction, and low self-esteem. Instead of motivating individuals to lose weight, stigma is associated with additional weight gain [6] and underutilization of health care.[11] This implies a vicious circle of mutually reinforcing negative conditions. The manifold effects of obesity stigma require actions in all kinds of professional disciplines, e.g. among physicians, dieticians, and scientists in various fields. To encounter stigma, the topic should be the subject of discussion in obesity intervention measures, and anti-stigma messages have to be incorporated into obesity prevention campaigns. Our results underline the need to consider the social dimension of obesity stigma. In acknowledging the interrelation of social conditions and existing structures, future research should derive tailored measures to encounter obesity stigma and its related adverse physical and psychological health outcomes.

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DECLARATIONS

Ethical approval

Ethics Commission of the Medical Association Hamburg approved the data collection procedure (No. PV5421).

Consent to participate

Participants provided verbal informed consent.

Availability of data and material

Data are available by request from the corresponding author.

Competing interests

None declared.

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Contributors

ACM undertook the statistical analyses and wrote the first draft of the manuscript. OvdK conceived the study design and contributed to the manuscript. TJK and CLS contributed to the questionnaire and critically revised the manuscript.

Patient involvement

No patients were involved in this study.

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APPENDIX

Female vignettes

Diana D. is *a lawyer* and 46 years old. With a height of 5'5 and a weight of 200 pounds, she is severely overweight.

Diana D. is *a cleaner* and 46 years old. With a height of 5'5 and a weight of 200 pounds, she is severely overweight.

Male vignettes

John D. is *a lawyer* and 46 years old. With a height of 5'9 and a weight of 230 pounds, he is severely overweight.

John D. is *a janitor* and 46 years old. With a height of 5'9 and a weight of 230 pounds, he is severely overweight.

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STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

	Item No	Recommendation	Page
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	5
Objectives	3	State specific objectives, including any prespecified hypotheses	5
Methods			
Study design	4	Present key elements of study design early in the paper	6,7
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	7,8
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	*7,8*
Bias	9	Describe any efforts to address potential sources of bias	6,8
Study size	10	Explain how the study size was arrived at	6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	7,8
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	8
		(*b*) Describe any methods used to examine subgroups and interactions	8
		(*c*) Explain how missing data were addressed	8
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	-
		(*e*) Describe any sensitivity analyses	-
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	6,9
		(b) Give reasons for non-participation at each stage	6
		(c) Consider use of a flow diagram	-
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Table 1
		(b) Indicate number of participants with missing data for each variable of interest	Table 2 Table 3 Table 4 Table 5

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Outcome data	15*	Report numbers of outcome events or summary measures	Table 2 Table 3 Table 4 Table 5
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	Table 2 Table 3 Table 4 Table 5
		(*b*) Report category boundaries when continuous variables were categorized	-
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	-
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	15,16
Discussion			
Key results	18	Summarise key results with reference to study objectives	15,16
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	16,17
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	16,17
Generalisability	21	Discuss the generalisability (external validity) of the study results	17
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	18

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Social deprivation, gender and obesity: multiple stigma? Results of a population survey from Germany

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Social deprivation, gender and obesity: multiple stigma? Results of a population survey from Germany

Objectives: Individuals with obesity are subject to stigmatization, resulting in discrimination. Studies focusing on obesity stigma often do not account for social conditions that also may be associated with stigmatization. Following an intersectional approach, social categories such as gender and socio-economic status (SES) can interact and form a basis for multiple stigma. The present study analyses differences in public obesity stigma depending on gender and SES, as well as possible interdependencies between these social categories.

Design: Representative cross-sectional telephone survey.

Participants: 692 randomly selected adults (≥ 18 years) in Germany.

Methods: Different vignettes were presented, depicting a lawyer (male/female) or a janitor/cleaner (male/female) with obesity. Following the vignette, different components of stigma were assessed: (1) fat phobia, (2) emotional reactions to a person with obesity, and (3) desire for social distance. Associations between gender, SES, and stigma components were tested in multiple linear regression analyses.

Results: A low SES in the obesity vignette (janitor/cleaner) was significantly associated with higher fat phobia scores as well as desire for social distance, compared to the vignette with a person with obesity and a high SES (lawyer). Being a male with obesity was significantly associated with more pronounced negative emotional reactions and greater desire for social distance. There were no significant interaction effects between gender and SES.

Conclusions: Results support the hypothesis of multiple stigma. Being male or of low SES was significantly associated with more pronounced negative attitudes in the German public. Following the concept of intersectionality, our findings indicate that obesity stigma can exacerbate pre-existing inequalities. This needs to be considered in development and implementation of prevention and anti-stigma measures.

Keywords: stigma; multiple stigma; attitudes; obesity; Germany; differences; socioeconomic status; occupational position; gender

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STRENGTHS AND LIMITATIONS OF THIS STUDY

- This is the first study analyzing socio-economic status (SES) and gender in the context of public obesity stigma.
- Analyses are based on a national telephone survey not only relying on landline but also including mobile-only users all over Germany.
- Pre-recorded audio vignettes were used to identify additional stigma effects. To test for a separation of obesity stigma from the stigma associated with gender and SES, a neutral control vignette would have been necessary.
- Although vignettes are a frequently used method in stigma research, they need to be short and bear the risk of not conveying a holistic picture of an individual with obesity and different social characteristics.

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INTRODUCTION

The proportion of people who are overweight or live with obesity has increased continuously over the past decades.[1] In Germany, the current Health Interview and Examination Survey for Adults reports a prevalence rate of obesity (defined as Body Mass Index (BMI) $\geq 30 kg/m^2$) of approximately 24%.[2] The etiology of obesity is multi-faceted, different factors such as behavioral, biological, psychosocial, context-related or prenatal conditions concur.[3] However, poor diet and sedentary behavior are often erroneously seen as the primary reason for overweight.[4] This in turn lays the focus on individual responsibility and fosters public stereotypes of laziness and weak will. According to attribution theory, believing the condition to be under a person's control determines greater stigmatizing reactions.[5] The public misconception of causes of overweight and obesity is common and contributes to the expression of obesity stigma.[6] Individuals with overweight or obesity display a physical 'mark' that sets them apart from others. Link and Phelan [7] have provided a process model, in which stigma is conceptualized as several distinct, but interrelated steps: differences between social groups are distinguished and *labeled*. These labels are linked to *stereotypes* (undesired characteristics) that form the basis of a *separation* of 'us' and 'them'. Thusly-labeled individuals experience *status loss* and *discrimination* in a context in which power is exercised.

There is a public recognition of obesity as a chronic condition and it is a classified disease in some countries (but not Germany).[8] Nevertheless, individuals with obesity experience discrimination in daily life, which in turn reinforces negative stereotypes and stigmatizing processes.[7] Ascribing negative attributes such as unintelligent, lack of self-discipline or emotionally instable [9,10] to persons who are obese, activates processes that result in discrimination in different settings. This could be shown for the education and employment sector as well as personal relationships.[10] Furthermore, stigmatizing attitudes and discrimination are present in the health care sector, possibly leading to the avoidance of necessary treatment.[11] The adverse health consequences of obesity stigma have been shown on psychological (e.g. depression, self-esteem) and physical (eating behavior, physical activity, cardiovascular health outcomes) levels.[10]

One German study found that about one fourth of the general public displays stigmatizing attitudes regarding the 'Weight Control/Blame" subscale from the Antifat Attitudes Test.[12] High levels of responsibility for becoming obese are attributed to the individual, which is associated with the belief that the individual should be liable for treatment costs to a great extent.[13] Sikorski et al. examined emotional reactions and social distance towards individuals

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with obesity and found that the most rejected domains were personal ability as well as social interaction.[14]

In terms of gender differences, studies reported higher weight bias internalization [15] and greater risk for weight/height discrimination [16] among women. In children and adolescents, girls with overweight have been found to be subject to teasing and social marginalization.[17,18] Similar results are presented by Fikkan and Rothblum,[19] who found women with obesity to be more stigmatized in education and employment sectors than men. However, gender differences in obesity stigma have rarely been examined, and results are not consistent.[20]

In recent years, stigma research has paid increased attention to multiple social identities and their interaction to influence stigmatization. This intersectional approach allows examining how multiple social categories, e.g. being categorized as 'female', 'black' or both, interact to produce or protect against health risks or discrimination.[15] This may be referred to as 'multiple stigma' [21] or 'double disadvantage'.[22] These concepts suggest that a person can belong to different, possibly stigmatized social groups which exerts cumulative effects.[23] When it comes to obesity stigma at the intersection of gender and race, few studies have been conducted and results were inconsistent. Himmelstein et al. [15] found no divergences in obesity stigma according to race or gender, whereas Puhl et al. found that African American females with obesity evoked higher ratings of dislike and social distance than Caucasian females with obesity.[24] It has been postulated by Gray that severe and extreme obesity compound pre-existing socioeconomic inequalities in context of vulnerability.[25] However, to date no study has focused on the possible additive or multiple effects of gender and socio-economic status (SES) in the context of obesity stigma. This is astonishing, as there are socio-economic inequalities in the prevalence of obesity.[26] This also holds true for Germany, where obesity is more common among children and adults who are of low SES. Women in this group appear to be excessively affected by obesity.[27]

Against this background, we analyze differences in public stigma towards low vs. high SES persons as well as female vs. male persons with obesity. By incorporating the interaction of gender x SES, we additionally examine possible interdependencies and their associations with obesity stigma.

METHODS

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Study design and sample

Analyses are based on a national telephone survey (computer assisted telephone interview (CATI)), conducted between March and April 2017. The sampling was based on data of the Association of German Market and Social Research (ADM), which includes registered as well as non-registered telephone numbers via random digital dialing. Already in 2010, around 13% of adults (age 16 years and older) in Germany did not have access to landline and solely used a mobile phone.[28] As this proportion has increased since 2010 and in order to increase the probability to reach persons who are rarely at home, a share of 30% mobile numbers was incorporated in the initial sample. To ensure a sample representative of the German population, all regions in Germany were included.

Regarding mobile numbers, target persons were the owner or main user of the mobile phone. The connection was considered a neutral drop-out if the respondent was younger than 18 years. In households that were contacted via landline, the Kish-Selection-Grid [29] was applied to randomly select a person from this household. The interviewer collected the age and gender of everyone in the household that was eligible for the survey and then randomly selected one person from that list. At the start of the interview, respondents were informed that the survey's focus was on nutrition, health, and wellbeing.

The overall sample of this study consisted of 1,401 persons. To obtain this number, 2,849 people were randomly selected (net sample). Of these, 862 persons (30.25%) refused to participate in the interview. Further 586 persons (20.57%) could not be reached. This led to a total response rate of 49.18%. Previous telephone interview studies have reached similar rates [30,31] and the response can be regarded satisfactory for telephone surveys in Germany.[32] In the study, eight different vignettes were used. The present analyses focus on four vignettes depicting a lawyer (male/female) or a janitor/cleaner (male/female) with obesity, resulting in a subsample of n=692 under study.

The Ethics Commission of the Medical Association in Hamburg approved this study (No. PV5421). Since the interviews were telephone-based, the respondents were verbally informed about the study and asked for consent to participate. Participants' consent and refusal were documented. As we used data from a population survey, patients were not involved in the development and design of the research question and the study.

Instruments

Vignette manipulation

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Vignettes have been frequently applied in the social sciences to investigate attitudes or intended behavior.[33] In stigma research, they have been used to convey realistic pictures of an individual, e.g. with depression, schizophrenia, or obesity.[34,35]

In the present study, all pre-recorded audio vignettes conveyed the same information, while two characteristics were varied: gender (female/male) and occupational position as an indicator of SES (low = janitor or cleaner / high = lawyer). This resulted in four different case stories that described an individual with obesity (please see appendix). One vignette was randomly assigned to each respondent, resulting in about 175 respondents per vignette. Weight and height were stated, yielding a BMI of approximately 32 kg/m^2. This was further emphasized by the comment that the person 'is severely overweight'. A trained speaker audio-recorded the case stories. To neutralize possible interviewer effects, the files were directly played to the respondents from the computer via telephone line. Preceding the presentation of the vignette, there was a set of questions related to respondents' own experience with overweight. This was self-reported weight and height, if the respondent has ever been overweight, tried to lose weight or has personal contact to persons with obesity.

Obesity stigma

To assess stigmatizing attitudes toward the person described in the vignette, the short form of the *Fat Phobia Scale (FPS)* by Bacon et al. [36] was used. This comprised 14 items of the original 50-item scale.[37] The short version demonstrated excellent reliability and was strongly correlated with the long form. Moreover, the 14-item-scale accounted for the largest amount of variance in factor analysis.[36] On a 5-point semantic differential scale, 14 pairs of adjectives are introduced that capture common beliefs about people who are obese. The FPS short form has been translated and applied in German by Luck-Sikorski and colleagues.[35] Principal component analysis with varimax rotation yielded a 4-factorial solution, with the eigenvalue of the fourth factor barely exceeding 1. Similar to a validation study for the German short version of the FPS, the first factor explained the greatest share of variation (25.58%, second factor 10.80%, third factor 8.19%, fourth factor 7.31%) which is why a one factorial solution is supported.[38] Following Bacon et al. [36], some items were inverted where necessary, so that a higher score indicates greater fat phobia. The sum score was divided by the number of items so that the score ranges from 1 to 5. Values < 2.5 indicate positive attitudes and values ≥ 2.5 represent negative attitudes toward a person with obesity.[39] Cronbach's α for the FPS was 0.77.

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Emotional reactions were assessed by nine items representing different ways of emotionally responding to the person described in the vignette. Six items were derived from a scale used in studies on mental illness stigma,[40] while three items were developed based on common stereotypes of obesity. The items were coded from 1 'completely disagree' to 4 'completely agree'. A principal component analysis with varimax rotation yielded two different factors. The first factor, termed *negative emotional reactions*, was comprised of the six items 'I react angrily', 'I feel annoyed', 'This triggers incomprehension with me', 'I feel repelled', 'I feel disgust', and 'I think this is unaesthetic'. The items "I feel pity", "I feel sympathy", and "I want to help" loaded on the second factor of *positive emotional reactions*. Together, the two factors accounted for 50.9 % of variance. Two sum scores were computed, Cronbach's α was 0.78 for negative (6 items), and 0.47 for positive emotional reactions (3 items).

Desire for social distance was assessed by a scale developed by Link et al.,[41] a modified version of the Bogardus *Social Distance Scale*.[42] The instrument contains seven items that represent different social relationships (e.g. neighbor, colleague, or child-carer). On a 4-point Likert-scale, respondents were asked to indicate to what extent they would accept the person described in the vignette. A principal component analysis with varimax rotation was carried out; yielding a single factor that explained 55.1 % of variance. Cronbach's α was 0.86. Again, a sum score was computed, with higher scores indicating greater desire for social distance.

Statistical analyses

The analyses were performed using SPSS 22.[43] To test for significant mean differences between groups regarding single items and scales, Mann-Whitney-U tests were applied. This non-parametric test was conducted, since Kolmogorow-Smirnow-Tests revealed that responses to the stigma items did not follow a normal distribution. Determinants of stigmatizing attitudes were introduced into multiple linear regression models. We analyzed two main effects presented in the vignette: SES (janitor or cleaner/lawyer) and gender (female/male). To take into account possible interdependencies, the interaction effect of SES x gender was also introduced into the models. All models were controlled for respondents' characteristics. Age and BMI were entered as continuous variables. The respondents' occupational position was expressed in skill levels according to the International Standard Classification of Occupation (ISCO-08).[44] Other variables were the respondents' gender and personal contact to individuals who are obese.

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In all analyses, the response options 'prefer not to say' and 'don't know' were treated as missing values. Exact p values are reported. In view of the number of tests, values of $p < 0.01$ were regarded as statistically significant.

RESULTS

Sociodemographic characteristics of the analyzed sample are briefly presented in table 1. The male:female ratio is relatively even, which is similar to the general adult population in Germany according to the official statistics [45]. In terms of age, people aged 25 to 39 are underrepresented and people aged 60 to 64 are overrepresented in the sample compared to the distribution in the official statistics [46]. Almost half of the respondents work in occupational positions that are regarded skill level 2 when referring to ISCO.[43] Regarding weight status, more than 50% of the respondents reported overweight or obesity. The share of those with overweight/obesity corresponds to numbers obtained by other representative studies in Germany.[2] The vast majority (84.4%) has or had personal contact to someone who is overweight.

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Table 1 Sociodemographic characteristics and weight status of the sample (n=627-692)

Gender (female)	48.9%
Mean age (standard deviation)	50.9 (18.0)
Age groups	
18 - ≤ 24 years	8.1%
25 - ≤ 39 years	20.0%
40 - ≤ 59 years	35.1%
60 - ≤ 64 years	12.6%
≥ 65 years	24.2%
Occupational position (ISCO-08)	
Skill level 1: *Simple/routine physical or manual tasks*	7.0%
Skill level 2: *Operating machinery and electronic equipment*	45.5%
Skill level 3: *Complex technical and practical tasks*	27.1%
Skill level 4: *Complex problem-solving, decision-making, creativity*	20.3%
Weight status according to BMI	
Underweight (≤ 18.49)	2.1%
Normal weight (18.50 – 24.99)	42.5%
Overweight (25.00 – 29.99)	34.2%
Obese (≥ 30.00)	21.2%
Contact to someone who is overweight (yes)	84.4%

In tables 2-4, differences in the mean stigma values depending on SES and gender presented in the vignette are reported. Regarding the fat phobia items, the adjective low self-esteem was ascribed to the female vignette significantly more often (respective means were 3.10 for the female vignette and 2.83 for the male vignette, table 2). In contrast, lazy, slow, and self-indulgent were significantly more often attributed to the male vignette. Comparing low and high SES, a homogenous picture emerged. A low SES was significantly associated with greater negative attitudes, expressing individual responsibility (no willpower, poor self-control, weak) as well as insecurity and low self-esteem when compared to high SES.

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Table 2 Fat phobia (FPS, single items and scale); differences according to gender and socio-economic status (SES) in the vignette (mean values (standard deviation))

Pair of adjectives	Gender			SES		
	Female (n=337-348)	Male (n=306-316)	p*	Low Janitor/cleaner (n=317-327)	High Lawyer (n=326-337)	p*
Industrious ... lazy[1]	2.55 (0.92)	2.83 (0.81)	**<0.001**	2.68 (0.87)	2.69 (0.89)	0.667
Has willpower ... no willpower[1]	3.28 (0.97)	3.21 (1.04)	0.602	3.48 (0.98)	3.03 (0.97)	**<0.001**
Attractive ... unattractive[1]	3.33 (1.00)	3.42 (0.94)	0.160	3.43 (1.05)	3.32 (0.90)	0.149
Good self-control ... poor self-control[1]	3.10 (1.03)	3.17 (0.98)	0.440	3.30 (0.99)	2.97 (1.00)	**<0.001**
Fast ... slow[1]	3.25 (1.01)	3.47 (0.99)	**0.002**	3.32 (1.06)	3.39 (0.96)	0.592
Having endurance ... having no endurance[1]	3.41 (1.13)	3.37 (1.04)	0.297	3.39 (1.10)	3.40 (1.07)	0.688
Active ... inactive[1]	3.36 (0.98)	3.38 (1.06)	0.328	3.38 (1.06)	3.35 (0.97)	0.650
Strong ... weak[1]	3.15 (0.99)	3.18 (1.02)	0.914	3.33 (1.03)	3.01 (0.94)	**<0.001**
Self-sacrificing ... self-indulgent[1]	3.19 (0.91)	3.41 (0.86)	**<0.001**	3.32 (0.90)	3.28 (0.89)	0.375
Dislikes food ... likes food	4.05 (0.88)	4.15 (0.90)	0.093	4.08 (0.90)	4.12 (0.88)	0.584
Shapely ... shapeless[1]	3.41 (1.15)	3.21 (1.17)	0.098	3.40 (1.16)	3.31 (1.17)	0.753
Undereats ... overeats[1]	3.87 (0.91)	3.95 (0.90)	0.306	3.91 (0.93)	3.90 (0.89)	0.883
Secure ... insecure[1]	3.01 (1.06)	2.81 (1.03)	0.027	3.24 (1.02)	2.61 (0.98)	**<0.001**
High self-esteem ... low self-esteem[1]	3.10 (1.05)	2.83 (1.05)	**<0.001**	3.28 (1.00)	2.67 (1.02)	**<0.001**
FPS[1]	3.31 (0.48)	3.32 (0.50)	0.995	3.40 (0.51)	3.22 (0.46)	**<0.001**

[1]Semantic differential scales and mean FPS ranging from 1 to 5, values > 2.50 indicate greater fat phobia; *Mann-Whitney-U test

Regarding emotional reactions (table 3), the comparison of gender in the vignette showed that males with obesity evoked significantly more negative emotional reactions on four out of six items as well as on the subscale for negative emotions (respective means were 9.67 for the female vignette and 10.54 for the male vignette). In terms of SES, a cleaner/janitor with obesity evoked significantly more feelings of anger but also more positive emotional reactions, compared to a lawyer with obesity.

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Table 3 Emotional reactions (single items and scales); differences according to gender and socio-economic status (SES) in the vignette (mean values (standard deviation))

	Gender			SES		
	Female (n=327-350)	Male (n=293-315)	p*	Low Janitor/cleaner (n=299-326)	High Lawyer (n=321-338)	p*
Annoyed[1]	1.56 (0.72)	1.59 (0.70)	0.290	1.65 (0.79)	1.50 (0.62)	0.056
Angry[1]	1.36 (0.64)	1.55 (0.71)	**<0.001**	1.52 (0.71)	1.38 (0.64)	**0.005**
Incomprehension[1]	1.88 (0.89)	2.04 (0.83)	**0.006**	2.05 (0.87)	1.87 (0.85)	0.012
Revolted[1]	1.46 (0.69)	1.67 (0.75)	**<0.001**	1.62 (0.78)	1.50 (0.67)	0.114
Disgust[1]	1.41 (0.66)	1.53 (0.66)	**0.002**	1.51 (0.69)	1.42 (0.94)	0.078
Unaesthetic[1]	2.01 (0.94)	2.15 (0.87)	0.022	2.08 (0.87)	2.07 (0.95)	0.919
Negative emotional reactions scale[2]	9.67 (3.06)	10.54 (3.24)	**0.001**	10.43 (3.23)	9.74 (3.05)	0.012
Sympathy[1]	2.58 (0.81)	2.53 (0.78)	0.769	2.54 (0.82)	2.57 (0.77)	0.884
Pity[1]	2.24 (0.94)	2.09 (0.90)	0.020	2.23 (0.92)	2.11 (0.92)	0.034
Want to help[1]	2.20 (0.93)	2.26 (0.86)	0.414	2.34 (0.93)	2.12 (0.85)	0.011
Positive emotional reactions scale[3]	6.97 (1.96)	6.86 (1.74)	0.692	7.08 (2.01)	6.97 (1.96)	**0.004**

[1]Single items ranging from 1 to 4; [2]Negative emotional reaction scales comprised of six items; sum scale ranging from 6 to 24; [3]Positive emotional reaction scale comprised of three items; sum scale ranging from 3 to 12; *Mann-Whitney-U test

A consistent picture emerged when comparing desire for social distance according to the person's gender in the vignette (table 4). Males with obesity were met with significantly greater levels of rejection in most aspects of social distance. Gender difference was also significant for the desire for social distance scale (13.15 for males and 11.66 for females). Similarly, a person with obesity and a low SES evoked greater desire for social distance concerning four of seven items. Also, the desire for social distance scale significantly differed between the SES vignettes (13.03 for low SES and 11.72 for high SES).

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Table 4 Desire for social distance (single items and scale); differences according to gender and socio-economic status (SES) in the vignette (mean values (standard deviation))

	Gender			SES		
	Female (n=332-350)	Male (n=292-312)	p*	Low Janitor/cleaner (n=307-324)	High Lawyer (317-338)	p*
Tenant[1]	1.71 (0.92)	1.96 (0.86)	**<0.001**	1.98 (0.98)	1.68 (0.78)	**0.001**
Colleague[1]	1.39 (0.57)	1.48 (0.61)	0.012	1.43 (0.54)	1.42 (0.63)	0.546
Neighbor[1]	1.52 (0.74)	1.56 (0.69)	0.155	1.54 (0.71)	1.54 (0.72)	0.649
Childcare[1]	1.70 (0.75)	1.95 (0.91)	**<0.001**	1.98 (0.90)	1.66 (0.74)	**<0.001**
In-law[1]	1.79 (0.90)	1.90 (0.79)	**0.003**	1.98 (0.89)	1.71 (0.78)	**<0.001**
Introduce friend[1]	1.74 (0.82)	2.25 (0.95)	**<0.001**	2.08 (0.92)	1.88 (0.90)	**0.008**
Recommend for job[1]	1.83 (0.84)	2.04 (0.81)	**<0.001**	2.03 (0.83)	1.83 (0.82)	0.011
Desire for social distance scale	11.66 (4.12)	13.15 (4.00)	**<0.001**	13.03 (4.14)	11.72 (4.03)	**<0.001**

[1]Single items ranging from 1 to 4; [2]Desire for social distance scale comprised of 7 items, sum scale ranging from 7 to 28; *Mann-Whitney-U test

The results of multiple linear regression analyses are reported in table 5. While controlling for respondents' characteristics, a significant main effect of SES emerged regarding fat phobia (β = 0.173). Being a janitor or cleaner with obesity was associated with significantly increased fat phobia compared to lawyers. Regarding positive emotional reactions, there were no significant associations with either gender or SES. However, male persons with obesity were confronted with more negative emotional reactions than females (β = -0.151). In terms of desire for social distance, both main effects were statistically significant. Being either a male or a janitor/cleaner with obesity was significantly associated with greater desire for social distance. In none of the models did the interaction effect of gender x SES attain statistical significance (table 5).

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Table 5 Linear regression analyses: associations between stigma components and socio-economic status (SES) and gender presented in the vignette

	Fat Phobia Scale (n=561)			**Positive emotional reactions (n=607)**			**Negative emotional reactions (n=614)**			**Social Distance (n=608)**		
	B	β	95% CI	B	ß	95% CI	B	ß	95% CI	B	ß	95% CI
Low SES vignette (ref. lawyer)	**0.171**	**0.173**	**0.052 - 0.287***	0.035	0.010	-0.393 - 0.464	0.304	0.047	-0.405 - 1.014	**1.122**	**0.135**	**0.217 - 2.026***
Female gender in vignette (ref. male)	-0.002	-0.002	-0.115 - 0.112	-0.146	-0.039	-0.556 - 0.264	**-0.977**	**-0.151**	**-1.655 - -0.299***	**-1.201**	**-0.145**	**-2.068 - -0.334***
Interaction gender * SES in vignette	-0.021	-0.019	-0.182 - 0.139	0.539	0.126	-0.048 - 1.125	0.238	0.032	-0.730 - 1.205	-0.215	-0.023	-1.451 - 1.021

*p<0.01; **p<0.001; the model is adjusted for respondents' gender, age, BMI, occupational position as well as contact to an individual with obesity

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DISCUSSION

The concept of multiple stigma suggests that a person can belong to different potentially stigmatized groups, experiencing an aggregation of disadvantages and discrimination.[23] Applying this approach to the present study, this would mean that because of their group affiliation (e.g. being female and of low SES) individuals suffer multiple stigma when confronted with the burden of obesity. Similarly, the framework of intersectionality describes the interdependent relationship between different social identities and structural inequities.[47] Multiple social categories interact and produce or protect against discrimination. In light of this, obesity stigma can reinforce pre-existing inequalities because of SES and / or gender.

The present study is the first to analyze the possible multiple stigma of gender, SES, and obesity. Following an intersectional approach, it was analyzed whether main effects or the interaction of social categories possibly reinforce obesity stigma, implying a double or multiple disadvantage for certain individuals. While there were no statistically significant interaction effects of categories, we found distinct differences in obesity stigma dependent on gender with regard different stigma components. Males with obesity were met with more negative emotional reactions and social distance. This contradicts some previous studies that found (young) women with overweight or obesity to be met with greater stigmatization than men.[15–19] The predominance of overly thin women in the media and the promotion of a slim beauty ideal for females can have different effects on the stigmatization of women and men with obesity.[20] Nevertheless, over the past decade, a trim and muscular male body image has come to the fore in most Western societies, shaping a new perspective on body image dissatisfaction and obesity stigma also among men.[48,49] Men have been found to be similarly stigmatized as women for being heavy,[20] and the concern about body image is associated with increased eating pathology in both men and women. [50]

Regarding SES and obesity, the study revealed significant differences in public attitudes in several stigma components under study. Those of low SES were rated less favorably with regard to fat phobia and desire for social distance when compared to persons with high SES. On the other hand, individuals with low SES were also met with significantly greater prosocial feelings. It is possible that, next to obesity, the status of a cleaner/janitor is linked to characteristics (e.g. economic hardship) that evoke pity among respondents. After the adjustment of respondents' characteristics in the multivariate analyses (gender, age, BMI, occupational position as well as contact to an individual with obesity), however, only the associations with fat phobia and social distance were found to be significant.

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Following the concept of intersectionality, and against the background of a disproportionate distribution of obesity (higher prevalence among females of low SES), one could have expected significant interaction effects in multivariate analyses. We were not able to verify this assumption. However, significant main effects of gender and SES indicate a double stigma to the disadvantage of males as well as individuals with a low SES who suffer from obesity.

Some limitations need to be mentioned and discussed when evaluating our findings. More than half of the individuals eligible for the study were not available or refused to participate. Although participation rates around 50% can be regarded satisfactory for telephone surveys,[32] we cannot rule out selection bias due to non-response. With respect to internal consistency, Cronbach's α for most scales was good or acceptable. Only the subscale of positive emotional reactions exhibited limited reliability, which could be due to the relatively small number of items. In this case, it is recommended to use the mean inter-item correlation as an indicator for acceptability, which was 0.22 in the present sample. A satisfactory range is said to be 0.2 to 0.4.[51] Furthermore, no conclusions on causal relationships can be drawn as our data are based on a cross-sectional design. Similar to other studies in stigma research, we used vignettes to explore possible multiple stigma of obesity. On the one hand, these should not be too long. On the other hand, only varying one sentence to express different social conditions might have been too short to convey a holistic picture of the individual, or to be kept in mind throughout the whole interview. Also, vignettes had to be understandable for the general population. Therefore, we decided not to report the BMI and not to use the term 'obese'. In this regard, it can be considered a limitation that the vignettes lack medical accuracy. Moreover, due to time constraints, every respondent only received one vignette. The lack of a neutral control condition impedes the interpretation of results. For example, it remains unclear whether respondents associate adjectives such as low self-esteem or insecurity with the fact that the individual in the vignette presented with obesity or pursues the profession of a janitor when compared to a lawyer. This is a limitation that has to be considered when interpreting our findings as an indication of multiple or double stigma. Finally, sample size may have been too small to detect significant interaction effects.

Differences in stigma based on gender and SES indicate that obesity can exacerbate pre-existing inequalities. The presence of obesity stigma could be shown in many domains of daily life, e.g. education, work, personal, and health care.[10,11] Stigmatization is a risk factor for physical and psychological health problems such as depression, body dissatisfaction, and low self-esteem. Instead of motivating individuals to lose weight, stigma is associated with additional

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weight gain [6] and underutilization of health care.[11] This implies a vicious circle of mutually reinforcing negative conditions. The manifold effects of obesity stigma require actions in all kinds of professional disciplines, e.g. among physicians, dieticians, and scientists in various fields. To counteract stigma, the topic should be the subject of discussion in obesity intervention measures, and anti-stigma messages have to be incorporated into obesity prevention campaigns. Our results underline the need to consider the social dimension of obesity stigma. In acknowledging the interrelation of social conditions and existing structures, future research should derive tailored measures to encounter obesity stigma and its related adverse physical and psychological health outcomes.

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DECLARATIONS

Ethical approval

Ethics Commission of the Medical Association Hamburg approved the data collection procedure (No. PV5421).

Consent to participate

Participants provided verbal informed consent.

Availability of data and material

Data are available by request from the corresponding author.

Competing interests

None declared.

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Contributors

ACM undertook the statistical analyses and wrote the first draft of the manuscript. OvdK conceived the study design and contributed to the manuscript. TJK and CLS contributed to the questionnaire and critically revised the manuscript.

Patient involvement

No patients were involved in this study.

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APPENDIX

Female vignettes

Diana D. is *a lawyer* and 46 years old. With a height of 5'5 and a weight of 200 pounds, she is severely overweight.

Diana D. is *a cleaner* and 46 years old. With a height of 5'5 and a weight of 200 pounds, she is severely overweight.

Male vignettes

John D. is *a lawyer* and 46 years old. With a height of 5'9 and a weight of 230 pounds, he is severely overweight.

John D. is *a janitor* and 46 years old. With a height of 5'9 and a weight of 230 pounds, he is severely overweight.

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STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

	Item No	Recommendation	Page
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	5
Objectives	3	State specific objectives, including any prespecified hypotheses	5
Methods			
Study design	4	Present key elements of study design early in the paper	6,7
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	7,8
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	*7,8*
Bias	9	Describe any efforts to address potential sources of bias	6,8
Study size	10	Explain how the study size was arrived at	6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	7,8
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	8
		(*b*) Describe any methods used to examine subgroups and interactions	8
		(*c*) Explain how missing data were addressed	8
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	-
		(*e*) Describe any sensitivity analyses	-
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	6,9
		(b) Give reasons for non-participation at each stage	6
		(c) Consider use of a flow diagram	-
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Table 1
		(b) Indicate number of participants with missing data for each variable of interest	Table 2 Table 3 Table 4 Table 5

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Outcome data	15*	Report numbers of outcome events or summary measures	Table 2 Table 3 Table 4 Table 5
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	Table 2 Table 3 Table 4 Table 5
		(*b*) Report category boundaries when continuous variables were categorized	-
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	-
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	15,16
Discussion			
Key results	18	Summarise key results with reference to study objectives	15,16
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	16,17
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	16,17
Generalisability	21	Discuss the generalisability (external validity) of the study results	17
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	18

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Social deprivation, gender and obesity: multiple stigma? Results of a population survey from Germany

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Social deprivation, gender and obesity: multiple stigma? Results of a population survey from Germany

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Social deprivation, gender and obesity: multiple stigma? Results of a population survey from Germany

Objectives: Individuals with obesity are subject to stigmatization, resulting in discrimination. Studies focusing on obesity stigma often do not account for social conditions that also may be associated with stigmatization. Following an intersectional approach, social categories such as gender and socio-economic status (SES) can interact and form a basis for multiple stigma. The present study analyses differences in public obesity stigma depending on gender and SES, as well as possible interdependencies between these social categories.

Design: Representative cross-sectional telephone survey.

Participants: 692 randomly selected adults (≥ 18 years) in Germany.

Methods: Different vignettes were presented, depicting a lawyer (male/female) or a janitor/cleaner (male/female) with obesity. Following the vignette, different components of stigma were assessed: (1) fat phobia, (2) emotional reactions to a person with obesity, and (3) desire for social distance. Associations between gender, SES, and stigma components were tested in multiple linear regression analyses.

Results: A low SES in the obesity vignette (janitor/cleaner) was significantly associated with higher fat phobia scores as well as desire for social distance, compared to the vignette with a person with obesity and a high SES (lawyer). Being a male with obesity was significantly associated with more pronounced negative emotional reactions and greater desire for social distance. There were no significant interaction effects between gender and SES.

Conclusions: Results support the hypothesis of multiple stigma. Being male or of low SES was significantly associated with more pronounced negative attitudes in the German public. Following the concept of intersectionality, our findings indicate that obesity stigma can exacerbate pre-existing inequalities. This needs to be considered in development and implementation of prevention and anti-stigma measures.

Keywords: stigma; multiple stigma; attitudes; obesity; Germany; differences; socioeconomic status; occupational position; gender

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STRENGTHS AND LIMITATIONS OF THIS STUDY

- This is the first study analyzing socio-economic status (SES) and gender in the context of public obesity stigma.
- Analyses are based on a national telephone survey not only relying on landline but also including mobile-only users all over Germany.
- Pre-recorded audio vignettes were used to identify additional stigma effects. To test for a separation of obesity stigma from the stigma associated with gender and SES, a neutral control vignette would have been necessary.
- Although vignettes are a frequently used method in stigma research, they need to be short and bear the risk of not conveying a holistic picture of an individual with obesity and different social characteristics.

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INTRODUCTION

The proportion of people who are overweight or live with obesity has increased continuously over the past decades.[1] In Germany, the current Health Interview and Examination Survey for Adults reports a prevalence rate of obesity (defined as Body Mass Index (BMI) $\geq 30 kg/m^2$) of approximately 24%.[2] The etiology of obesity is multi-faceted, different factors such as behavioral, biological, psychosocial, context-related or prenatal conditions concur.[3] However, poor diet and sedentary behavior are often erroneously seen as the primary reason for overweight.[4] This in turn lays the focus on individual responsibility and fosters public stereotypes of laziness and weak will. According to attribution theory, believing the condition to be under a person's control determines greater stigmatizing reactions.[5] The public misconception of causes of overweight and obesity is common and contributes to the expression of obesity stigma.[6] Individuals with overweight or obesity display a physical 'mark' that sets them apart from others. Link and Phelan [7] have provided a process model, in which stigma is conceptualized as several distinct, but interrelated steps: differences between social groups are distinguished and *labeled*. These labels are linked to *stereotypes* (undesired characteristics) that form the basis of a *separation* of 'us' and 'them'. Thusly-labeled individuals experience *status loss* and *discrimination* in a context in which power is exercised.

There is a public recognition of obesity as a chronic condition and it is a classified disease in some countries (but not Germany).[8] Nevertheless, individuals with obesity experience discrimination in daily life, which in turn reinforces negative stereotypes and stigmatizing processes.[7] Ascribing negative attributes such as unintelligent, lack of self-discipline or emotionally instable [9,10] to persons who are obese, activates processes that result in discrimination in different settings. This could be shown for the education and employment sector as well as personal relationships.[10] Furthermore, stigmatizing attitudes and discrimination are present in the health care sector, possibly leading to the avoidance of necessary treatment.[11] The adverse health consequences of obesity stigma have been shown on psychological (e.g. depression, self-esteem) and physical (eating behavior, physical activity, cardiovascular health outcomes) levels.[10]

One German study found that about one fourth of the general public displays stigmatizing attitudes regarding the 'Weight Control/Blame" subscale from the Antifat Attitudes Test.[12] High levels of responsibility for becoming obese are attributed to the individual, which is associated with the belief that the individual should be liable for treatment costs to a great extent.[13] Sikorski et al. examined emotional reactions and social distance towards individuals

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with obesity and found that the most rejected domains were personal ability as well as social interaction.[14]

In terms of gender differences, studies reported higher weight bias internalization [15] and greater risk for weight/height discrimination [16] among women. In children and adolescents, girls with overweight have been found to be subject to teasing and social marginalization.[17,18] Similar results are presented by Fikkan and Rothblum,[19] who found women with obesity to be more stigmatized in education and employment sectors than men. However, gender differences in obesity stigma have rarely been examined, and results are not consistent.[20]

In recent years, stigma research has paid increased attention to multiple social identities and their interaction to influence stigmatization. This intersectional approach allows examining how multiple social categories, e.g. being categorized as 'female', 'black' or both, interact to produce or protect against health risks or discrimination.[15] This may be referred to as 'multiple stigma' [21] or 'double disadvantage'.[22] These concepts suggest that a person can belong to different, possibly stigmatized social groups which exerts cumulative effects.[23] When it comes to obesity stigma at the intersection of gender and race, few studies have been conducted and results were inconsistent. Himmelstein et al. [15] found no divergences in obesity stigma according to race or gender, whereas Puhl et al. found that African American females with obesity evoked higher ratings of dislike and social distance than Caucasian females with obesity.[24] It has been postulated by Gray that severe and extreme obesity compound pre-existing socioeconomic inequalities in context of vulnerability.[25] However, to date no study has focused on the possible additive or multiple effects of gender and socio-economic status (SES) in the context of obesity stigma. This is astonishing, as there are socio-economic inequalities in the prevalence of obesity.[26] This also holds true for Germany, where obesity is more common among children and adults who are of low SES. Women in this group appear to be excessively affected by obesity.[27]

Against this background, we analyze differences in public stigma towards low vs. high SES persons as well as female vs. male persons with obesity. By incorporating the interaction of gender x SES, we additionally examine possible interdependencies and their associations with obesity stigma.

METHODS

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Study design and sample

Analyses are based on a national telephone survey (computer assisted telephone interview (CATI)), conducted between March and April 2017. The sampling was based on data of the Association of German Market and Social Research (ADM), which includes registered as well as non-registered telephone numbers via random digital dialing. Already in 2010, around 13% of adults (age 16 years and older) in Germany did not have access to landline and solely used a mobile phone.[28] As this proportion has increased since 2010 and in order to increase the probability to reach persons who are rarely at home, a share of 30% mobile numbers was incorporated in the initial sample. To ensure a sample representative of the German population, all regions in Germany were included.

Regarding mobile numbers, target persons were the owner or main user of the mobile phone. The connection was considered a neutral drop-out if the respondent was younger than 18 years. In households that were contacted via landline, the Kish-Selection-Grid [29] was applied to randomly select a person from this household. The interviewer collected the age and gender of everyone in the household that was eligible for the survey and then randomly selected one person from that list. At the start of the interview, respondents were informed that the survey's focus was on nutrition, health, and wellbeing.

The overall sample of this study consisted of 1,401 persons. To obtain this number, 2,849 people were randomly selected (net sample). Of these, 862 persons (30.25%) refused to participate in the interview. Further 586 persons (20.57%) could not be reached. This led to a total response rate of 49.18%. Previous telephone interview studies have reached similar rates [30,31] and the response can be regarded satisfactory for telephone surveys in Germany.[32] In the study, eight different vignettes were used. The present analyses focus on four vignettes depicting a lawyer (male/female) or a janitor/cleaner (male/female) with obesity, resulting in a subsample of n=692 under study.

The Ethics Commission of the Medical Association in Hamburg approved this study (No. PV5421). Since the interviews were telephone-based, the respondents were verbally informed about the study and asked for consent to participate. Participants' consent and refusal were documented. As we used data from a population survey, patients were not involved in the development and design of the research question and the study.

Instruments

Vignette manipulation

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Vignettes have been frequently applied in the social sciences to investigate attitudes or intended behavior.[33] In stigma research, they have been used to convey realistic pictures of an individual, e.g. with depression, schizophrenia, or obesity.[34,35]

In the present study, all pre-recorded audio vignettes conveyed the same information, while two characteristics were varied: gender (female/male) and occupational position as an indicator of SES (low = janitor or cleaner / high = lawyer). This resulted in four different case stories that described an individual with obesity (please see appendix). One vignette was randomly assigned to each respondent, resulting in about 175 respondents per vignette. Weight and height were stated, yielding a BMI of approximately 32 kg/m^2. This was further emphasized by the comment that the person 'is severely overweight'. A trained speaker audio-recorded the case stories. To neutralize possible interviewer effects, the files were directly played to the respondents from the computer via telephone line. Preceding the presentation of the vignette, there was a set of questions related to respondents' own experience with overweight. This was self-reported weight and height, if the respondent has ever been overweight, tried to lose weight or has personal contact to persons with obesity.

Obesity stigma

To assess stigmatizing attitudes toward the person described in the vignette, the short form of the *Fat Phobia Scale (FPS)* by Bacon et al. [36] was used. This comprised 14 items of the original 50-item scale.[37] The short version demonstrated excellent reliability and was strongly correlated with the long form. Moreover, the 14-item-scale accounted for the largest amount of variance in factor analysis.[36] On a 5-point semantic differential scale, 14 pairs of adjectives are introduced that capture common beliefs about people who are obese. The FPS short form has been translated and applied in German by Luck-Sikorski and colleagues.[35] Principal component analysis with varimax rotation yielded a 4-factorial solution, with the eigenvalue of the fourth factor barely exceeding 1. Similar to a validation study for the German short version of the FPS, the first factor explained the greatest share of variation (25.58%, second factor 10.80%, third factor 8.19%, fourth factor 7.31%) which is why a one factorial solution is supported.[38] Following Bacon et al. [36], some items were inverted where necessary, so that a higher score indicates greater fat phobia. The sum score was divided by the number of items so that the score ranges from 1 to 5. Values < 2.5 indicate positive attitudes and values ≥ 2.5 represent negative attitudes toward a person with obesity.[39] Cronbach's α for the FPS was 0.77.

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Emotional reactions were assessed by nine items representing different ways of emotionally responding to the person described in the vignette. Six items were derived from a scale used in studies on mental illness stigma,[40] while three items were developed based on common stereotypes of obesity. The items were coded from 1 'completely disagree' to 4 'completely agree'. A principal component analysis with varimax rotation yielded two different factors. The first factor, termed *negative emotional reactions*, was comprised of the six items 'I react angrily', 'I feel annoyed', 'This triggers incomprehension with me', 'I feel repelled', 'I feel disgust', and 'I think this is unaesthetic'. The items "I feel pity", "I feel sympathy", and "I want to help" loaded on the second factor of *positive emotional reactions*. Together, the two factors accounted for 50.9 % of variance. Two sum scores were computed, Cronbach's α was 0.78 for negative (6 items), and 0.47 for positive emotional reactions (3 items).

Desire for social distance was assessed by a scale developed by Link et al.,[41] a modified version of the Bogardus *Social Distance Scale*.[42] The instrument contains seven items that represent different social relationships (e.g. neighbor, colleague, or child-carer). On a 4-point Likert-scale, respondents were asked to indicate to what extent they would accept the person described in the vignette. A principal component analysis with varimax rotation was carried out; yielding a single factor that explained 55.1 % of variance. Cronbach's α was 0.86. Again, a sum score was computed, with higher scores indicating greater desire for social distance. The distribution of the stigma sum scales across the sample is shown in Table 1.

Statistical analyses

The analyses were performed using SPSS 22.[43] To test for significant mean differences between groups regarding single items and scales, Mann-Whitney-U tests were applied. This non-parametric test was conducted, since Kolmogorow-Smirnow-Tests revealed that responses to the stigma items did not follow a normal distribution. Determinants of stigmatizing attitudes were introduced into multiple linear regression models. We analyzed two main effects presented in the vignette: SES (janitor or cleaner/lawyer) and gender (female/male). To take into account possible interdependencies, the interaction effect of SES x gender was also introduced into the models. All models were controlled for respondents' characteristics. Age and BMI were entered as continuous variables. The respondents' occupational position was expressed in skill levels according to the International Standard Classification of Occupation (ISCO-08).[44] Other variables were the respondents' gender and personal contact to individuals who are obese.

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In all analyses, the response options 'prefer not to say' and 'don't know' were treated as missing values. Exact p values are reported. In view of the number of tests, values of $p < 0.01$ were regarded as statistically significant.

Patient involvement

No patients were involved in this study.

RESULTS

Sociodemographic characteristics of the analyzed sample are briefly presented in table 1. The male:female ratio is relatively even, which is similar to the general adult population in Germany according to the official statistics [45]. In terms of age, people aged 25 to 39 are underrepresented and people aged 60 to 64 are overrepresented in the sample compared to the distribution in the official statistics [46]. Almost half of the respondents work in occupational positions that are regarded skill level 2 when referring to ISCO.[44] Regarding weight status, more than 50% of the respondents reported overweight or obesity. The share of those with overweight/obesity corresponds to numbers obtained by other representative studies in Germany.[2] The vast majority (84.4%) has or had personal contact to someone who is overweight.

Table 1 Sample characteristics (n=627-692)

Gender (female)	48.9%
Mean age (standard deviation)	50.9 (18.0)
Age groups	
18 - ≤ 24 years	8.1%
25 - ≤ 39 years	20.0%
40 - ≤ 59 years	35.1%
60 - ≤ 64 years	12.6%
≥ 65 years	24.2%
Occupational position (ISCO-08)	
Skill level 1: *Simple/routine physical or manual tasks*	7.0%
Skill level 2: *Operating machinery and electronic equipment*	45.5%
Skill level 3: *Complex technical and practical tasks*	27.1%
Skill level 4: *Complex problem-solving, decision-making, creativity*	20.3%
Weight status according to BMI	
Underweight (≤ 18.49)	2.1%
Normal weight (18.50 – 24.99)	42.5%
Overweight (25.00 – 29.99)	34.2%
Obese (≥ 30.00)	21.2%
Contact to someone who is overweight (yes)	84.4%
Obesity stigma scales, mean (sd), median [interquartile range]	
Fat phobia scale[1]	3.34 (0.49), 3.29 [3-3.64]

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Negative emotional reactions scale[2]	10.29 (3.17), 10 [8-12]
Positive emotional reactions scale[3]	6.91 (1.86), 7 [6-8]
Desire for social distance scale[4]	12.72 (1.86), 13 [9-15]

[1]Fat phobia scale comprised of 14 items, ranging from 1 to 5, values > 2.50 indicate fat phobia; [2] Negative emotional reaction scale comprised of six items; sum scale ranging from 6 to 24; [3]Positive emotional reaction scale comprised of three items; sum scale ranging from 3 to 12; [4]Desire for social distance scale comprised of 7 items, sum scale ranging from 7 to 28.

In tables 2-4, differences in the mean stigma values depending on SES and gender presented in the vignette are reported. Regarding the fat phobia items, the adjective low self-esteem was ascribed to the female vignette significantly more often (respective means were 3.10 for the female vignette and 2.83 for the male vignette, table 2). In contrast, lazy, slow, and self-indulgent were significantly more often attributed to the male vignette. Comparing low and high SES, a homogenous picture emerged. A low SES was significantly associated with greater negative attitudes, expressing individual responsibility (no willpower, poor self-control, weak) as well as insecurity and low self-esteem when compared to high SES.

Table 2 Fat phobia (FPS, single items and scale); differences according to gender and socio-economic status (SES) in the vignette (mean values (standard deviation))

Pair of adjectives	**Gender**			**SES**		
	Female (n=337-348)	Male (n=306-316)	p*	Low Janitor/cleaner (n=317-327)	High Lawyer (n=326-337)	p*
Industrious ... lazy[1]	2.55 (0.92)	2.83 (0.81)	**<0.001**	2.68 (0.87)	2.69 (0.89)	0.667
Has willpower ... no willpower[1]	3.28 (0.97)	3.21 (1.04)	0.602	3.48 (0.98)	3.03 (0.97)	**<0.001**
Attractive ... unattractive[1]	3.33 (1.00)	3.42 (0.94)	0.160	3.43 (1.05)	3.32 (0.90)	0.149
Good self-control ... poor self-control[1]	3.10 (1.03)	3.17 (0.98)	0.440	3.30 (0.99)	2.97 (1.00)	**<0.001**
Fast ... slow[1]	3.25 (1.01)	3.47 (0.99)	**0.002**	3.32 (1.06)	3.39 (0.96)	0.592
Having endurance ... having no endurance[1]	3.41 (1.13)	3.37 (1.04)	0.297	3.39 (1.10)	3.40 (1.07)	0.688
Active ... inactive[1]	3.36 (0.98)	3.38 (1.06)	0.328	3.38 (1.06)	3.35 (0.97)	0.650
Strong ... weak[1]	3.15 (0.99)	3.18 (1.02)	0.914	3.33 (1.03)	3.01 (0.94)	**<0.001**
Self-sacrificing ... self-indulgent[1]	3.19 (0.91)	3.41 (0.86)	**<0.001**	3.32 (0.90)	3.28 (0.89)	0.375
Dislikes food ... likes food	4.05 (0.88)	4.15 (0.90)	0.093	4.08 (0.90)	4.12 (0.88)	0.584
Shapely ... shapeless[1]	3.41 (1.15)	3.21 (1.17)	0.098	3.40 (1.16)	3.31 (1.17)	0.753
Undereats ... overeats[1]	3.87 (0.91)	3.95 (0.90)	0.306	3.91 (0.93)	3.90 (0.89)	0.883
Secure ... insecure[1]	3.01 (1.06)	2.81 (1.03)	0.027	3.24 (1.02)	2.61 (0.98)	**<0.001**
High self-esteem ... low self-esteem[1]	3.10 (1.05)	2.83 (1.05)	**<0.001**	3.28 (1.00)	2.67 (1.02)	**<0.001**
FPS[1]	3.31 (0.48)	3.32 (0.50)	0.995	3.40 (0.51)	3.22 (0.46)	**<0.001**

[1]Semantic differential scales and mean FPS ranging from 1 to 5, values > 2.50 indicate fat phobia; *Mann-Whitney-U test

Regarding emotional reactions (table 3), the comparison of gender in the vignette showed that males with obesity evoked significantly more negative emotional reactions on four out of six

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items as well as on the subscale for negative emotions (respective means were 9.67 for the female vignette and 10.54 for the male vignette). In terms of SES, a cleaner/janitor with obesity evoked significantly more feelings of anger but also more positive emotional reactions, compared to a lawyer with obesity.

Table 3 Emotional reactions (single items and scales); differences according to gender and socio-economic status (SES) in the vignette (mean values (standard deviation))

	Gender			**SES**		
	Female (n=327-350)	Male (n=293-315)	p*	Low Janitor/cleaner (n=299-326)	High Lawyer (n=321-338)	p*
Annoyed[1]	1.56 (0.72)	1.59 (0.70)	0.290	1.65 (0.79)	1.50 (0.62)	0.056
Angry[1]	1.36 (0.64)	1.55 (0.71)	**<0.001**	1.52 (0.71)	1.38 (0.64)	**0.005**
Incomprehension[1]	1.88 (0.89)	2.04 (0.83)	**0.006**	2.05 (0.87)	1.87 (0.85)	0.012
Revolted[1]	1.46 (0.69)	1.67 (0.75)	**<0.001**	1.62 (0.78)	1.50 (0.67)	0.114
Disgust[1]	1.41 (0.66)	1.53 (0.66)	**0.002**	1.51 (0.69)	1.42 (0.94)	0.078
Unaesthetic[1]	2.01 (0.94)	2.15 (0.87)	0.022	2.08 (0.87)	2.07 (0.95)	0.919
Negative emotional reactions scale[2]	9.67 (3.06)	10.54 (3.24)	**0.001**	10.43 (3.23)	9.74 (3.05)	0.012
Sympathy[1]	2.58 (0.81)	2.53 (0.78)	0.769	2.54 (0.82)	2.57 (0.77)	0.884
Pity[1]	2.24 (0.94)	2.09 (0.90)	0.020	2.23 (0.92)	2.11 (0.92)	0.034
Want to help[1]	2.20 (0.93)	2.26 (0.86)	0.414	2.34 (0.93)	2.12 (0.85)	0.011
Positive emotional reactions scale[3]	6.97 (1.96)	6.86 (1.74)	0.692	7.08 (2.01)	6.97 (1.96)	**0.004**

[1]Single items ranging from 1 to 4; [2]Negative emotional reaction scales comprised of six items; sum scale ranging from 6 to 24; [3]Positive emotional reaction scale comprised of three items; sum scale ranging from 3 to 12; *Mann-Whitney-U test

A consistent picture emerged when comparing desire for social distance according to the person's gender in the vignette (table 4). Males with obesity were met with significantly greater levels of rejection in most aspects of social distance. Gender difference was also significant for the desire for social distance scale (13.15 for males and 11.66 for females). Similarly, a person with obesity and a low SES evoked greater desire for social distance concerning four of seven items. Also, the desire for social distance scale significantly differed between the SES vignettes (13.03 for low SES and 11.72 for high SES).

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Table 4 Desire for social distance (single items and scale); differences according to gender and socio-economic status (SES) in the vignette (mean values (standard deviation))

	Gender			SES		
	Female (n=332-350)	Male (n=292-312)	p*	Low Janitor/cleaner (n=307-324)	High Lawyer (317-338)	p*
Tenant[1]	1.71 (0.92)	1.96 (0.86)	**<0.001**	1.98 (0.98)	1.68 (0.78)	**0.001**
Colleague[1]	1.39 (0.57)	1.48 (0.61)	0.012	1.43 (0.54)	1.42 (0.63)	0.546
Neighbor[1]	1.52 (0.74)	1.56 (0.69)	0.155	1.54 (0.71)	1.54 (0.72)	0.649
Childcare[1]	1.70 (0.75)	1.95 (0.91)	**<0.001**	1.98 (0.90)	1.66 (0.74)	**<0.001**
In-law[1]	1.79 (0.90)	1.90 (0.79)	**0.003**	1.98 (0.89)	1.71 (0.78)	**<0.001**
Introduce friend[1]	1.74 (0.82)	2.25 (0.95)	**<0.001**	2.08 (0.92)	1.88 (0.90)	**0.008**
Recommend for job[1]	1.83 (0.84)	2.04 (0.81)	**<0.001**	2.03 (0.83)	1.83 (0.82)	0.011
Desire for social distance scale	11.66 (4.12)	13.15 (4.00)	**<0.001**	13.03 (4.14)	11.72 (4.03)	**<0.001**

[1]Single items ranging from 1 to 4; [2]Desire for social distance scale comprised of 7 items, sum scale ranging from 7 to 28; *Mann-Whitney-U test

The results of multiple linear regression analyses are reported in table 5. While controlling for respondents' characteristics, a significant main effect of SES emerged regarding fat phobia (β = 0.173). Being a janitor or cleaner with obesity was associated with significantly increased fat phobia compared to lawyers. Regarding positive emotional reactions, there were no significant associations with either gender or SES. However, male persons with obesity were confronted with more negative emotional reactions than females (β = -0.151). In terms of desire for social distance, both main effects were statistically significant. Being either a male or a janitor/cleaner with obesity was significantly associated with greater desire for social distance. In none of the models did the interaction effect of gender x SES attain statistical significance (table 5).

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Table 5 Linear regression analyses: associations between stigma components and socio-economic status (SES) and gender presented in the vignette

	Fat Phobia Scale (n=561)			Positive emotional reactions (n=607)			Negative emotional reactions (n=614)			Social Distance (n=608)		
	B	β	95% CI	B	ß	95% CI	B	ß	95% CI	B	ß	95% CI
Low SES vignette (ref. lawyer)	**0.171**	**0.173**	**0.052 - 0.287***	0.035	0.010	-0.393 - 0.464	0.304	0.047	-0.405 - 1.014	**1.122**	**0.135**	**0.217 - 2.026***
Female gender in vignette (ref. male)	-0.002	-0.002	-0.115 - 0.112	-0.146	-0.039	-0.556 - 0.264	**-0.977**	**-0.151**	**-1.655 - -0.299***	**-1.201**	**-0.145**	**-2.068 - -0.334***
Interaction gender * SES in vignette	-0.021	-0.019	-0.182 - 0.139	0.539	0.126	-0.048 - 1.125	0.238	0.032	-0.730 - 1.205	-0.215	-0.023	-1.451 - 1.021

*p<0.01; **p<0.001; the model is adjusted for respondents' gender, age, BMI, occupational position as well as contact to an individual with obesity

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DISCUSSION

The concept of multiple stigma suggests that a person can belong to different potentially stigmatized groups, experiencing an aggregation of disadvantages and discrimination.[23] Applying this approach to the present study, this would mean that because of their group affiliation (e.g. being female and of low SES) individuals suffer multiple stigma when confronted with the burden of obesity. Similarly, the framework of intersectionality describes the interdependent relationship between different social identities and structural inequities.[47] Multiple social categories interact and produce or protect against discrimination. In light of this, obesity stigma can reinforce pre-existing inequalities because of SES and / or gender.

The present study is the first to analyze the possible multiple stigma of gender, SES, and obesity. Following an intersectional approach, it was analyzed whether main effects or the interaction of social categories possibly reinforce obesity stigma, implying a double or multiple disadvantage for certain individuals. While there were no statistically significant interaction effects of categories, we found distinct differences in obesity stigma dependent on gender with regard different stigma components. Males with obesity were met with more negative emotional reactions and social distance. This contradicts some previous studies that found (young) women with overweight or obesity to be met with greater stigmatization than men.[15–19] The predominance of overly thin women in the media and the promotion of a slim beauty ideal for females can have different effects on the stigmatization of women and men with obesity.[20] Nevertheless, over the past decade, a trim and muscular male body image has come to the fore in most Western societies, shaping a new perspective on body image dissatisfaction and obesity stigma also among men.[48,49] Men have been found to be similarly stigmatized as women for being heavy,[20] and the concern about body image is associated with increased eating pathology in both men and women. [50]

Regarding SES and obesity, the study revealed significant differences in public attitudes in several stigma components under study. Those of low SES were rated less favorably with regard to fat phobia and desire for social distance when compared to persons with high SES. On the other hand, individuals with low SES were also met with significantly greater prosocial feelings. It is possible that, next to obesity, the status of a cleaner/janitor is linked to characteristics (e.g. economic hardship) that evoke pity among respondents. After the adjustment of respondents' characteristics in the multivariate analyses (gender, age, BMI, occupational position as well as contact to an individual with obesity), however, only the associations with fat phobia and social distance were found to be significant.

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Following the concept of intersectionality, and against the background of a disproportionate distribution of obesity (higher prevalence among females of low SES), one could have expected significant interaction effects in multivariate analyses. We were not able to verify this assumption. However, significant main effects of gender and SES indicate a double stigma to the disadvantage of males as well as individuals with a low SES who suffer from obesity.

Some limitations need to be mentioned and discussed when evaluating our findings. More than half of the individuals eligible for the study were not available or refused to participate. Although participation rates around 50% can be regarded satisfactory for telephone surveys,[32] we cannot rule out selection bias due to non-response. With respect to internal consistency, Cronbach's α for most scales was good or acceptable. Only the subscale of positive emotional reactions exhibited limited reliability, which could be due to the relatively small number of items. In this case, it is recommended to use the mean inter-item correlation as an indicator for acceptability, which was 0.22 in the present sample. A satisfactory range is said to be 0.2 to 0.4.[51] Furthermore, no conclusions on causal relationships can be drawn as our data are based on a cross-sectional design. Similar to other studies in stigma research, we used vignettes to explore possible multiple stigma of obesity. On the one hand, these should not be too long. On the other hand, only varying one sentence to express different social conditions might have been too short to convey a holistic picture of the individual, or to be kept in mind throughout the whole interview. Also, vignettes had to be understandable for the general population. Therefore, we decided not to report the BMI and not to use the term 'obese'. In this regard, it can be considered a limitation that the vignettes lack medical accuracy. Moreover, due to time constraints, every respondent only received one vignette. The lack of a neutral control condition impedes the interpretation of results. For example, it remains unclear whether respondents associate adjectives such as low self-esteem or insecurity with the fact that the individual in the vignette presented with obesity or pursues the profession of a janitor when compared to a lawyer. This is a limitation that has to be considered when interpreting our findings as an indication of multiple or double stigma. Finally, sample size may have been too small to detect significant interaction effects.

Differences in stigma based on gender and SES indicate that obesity can exacerbate pre-existing inequalities. The presence of obesity stigma could be shown in many domains of daily life, e.g. education, work, personal, and health care.[10,11] Stigmatization is a risk factor for physical and psychological health problems such as depression, body dissatisfaction, and low self-esteem. Instead of motivating individuals to lose weight, stigma is associated with additional

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weight gain [6] and underutilization of health care.[11] This implies a vicious circle of mutually reinforcing negative conditions. The manifold effects of obesity stigma require actions in all kinds of professional disciplines, e.g. among physicians, dieticians, and scientists in various fields. To counteract stigma, the topic should be the subject of discussion in obesity intervention measures, and anti-stigma messages have to be incorporated into obesity prevention campaigns. Our results underline the need to consider the social dimension of obesity stigma. In acknowledging the interrelation of social conditions and existing structures, future research should derive tailored measures to encounter obesity stigma and its related adverse physical and psychological health outcomes.

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DECLARATIONS

Ethical approval

Ethics Commission of the Medical Association Hamburg approved the data collection procedure (No. PV5421).

Consent to participate

Participants provided verbal informed consent.

Availability of data and material

Data are available by request from the corresponding author.

Competing interests

None declared.

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Contributors

ACM undertook the statistical analyses and wrote the first draft of the manuscript. OvdK conceived the study design and contributed to the manuscript. TJK and CLS contributed to the questionnaire and critically revised the manuscript.

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APPENDIX

Female vignettes

Diana D. is *a lawyer* and 46 years old. With a height of 5'5 and a weight of 200 pounds, she is severely overweight.

Diana D. is *a cleaner* and 46 years old. With a height of 5'5 and a weight of 200 pounds, she is severely overweight.

Male vignettes

John D. is *a lawyer* and 46 years old. With a height of 5'9 and a weight of 230 pounds, he is severely overweight.

John D. is *a janitor* and 46 years old. With a height of 5'9 and a weight of 230 pounds, he is severely overweight.

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STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

	Item No	Recommendation	Page
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	5
Objectives	3	State specific objectives, including any prespecified hypotheses	5
Methods			
Study design	4	Present key elements of study design early in the paper	6,7
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	7,8
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	*7,8*
Bias	9	Describe any efforts to address potential sources of bias	6,8
Study size	10	Explain how the study size was arrived at	6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	7,8
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	8
		(*b*) Describe any methods used to examine subgroups and interactions	8
		(*c*) Explain how missing data were addressed	8
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	-
		(*e*) Describe any sensitivity analyses	-
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	6,9
		(b) Give reasons for non-participation at each stage	6
		(c) Consider use of a flow diagram	-
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Table 1
		(b) Indicate number of participants with missing data for each variable of interest	Table 2 Table 3 Table 4 Table 5

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Outcome data	15*	Report numbers of outcome events or summary measures	Table 2 Table 3 Table 4 Table 5
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	Table 2 Table 3 Table 4 Table 5
		(*b*) Report category boundaries when continuous variables were categorized	-
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	-
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	15,16
Discussion			
Key results	18	Summarise key results with reference to study objectives	15,16
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	16,17
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	16,17
Generalisability	21	Discuss the generalisability (external validity) of the study results	17
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	18

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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