Does weight-related stigmatisation and discrimination depend on educational attainment and level of income? A systematic review

Marie Bernard 1,2, Thomas Fankhænel, 2 Steffi G Riedel-Heller, 3 Claudia Luck-Sikorski 1,2

ABSTRACT

Objectives Obesity is considered a global health issue, because of its health-related consequences and also because of its impact on social status as a result of stigma. This study aims to review the quantitative state of research regarding socioeconomic characteristics’ influence on weight-related stigmatisation and discrimination. Based on Bourdieu’s Theory of Class and his concept of ‘habitus’, it is assumed that people with a higher level of education and income show stronger negative attitudes towards people with obesity.

Method A narrative systematic literature review was conducted in 2017 using PubMed, PsychINFO, Web of Science and the Cochrane Library. Seventeen studies that measured weight bias and either educational attainment or level of income were included in the analysis.

Results The results of the studies included were inconsistent: six of these studies were found to support the hypothesis, whereas two of the studies contradicted it. The remaining seven studies did not show any significant correlation between weight bias and either education or income.

Conclusion In light of the inconsistent and heterogeneous results of the studies that report a significant association between weight bias and socioeconomic variables, the findings must be discussed concerning their cultural context, that is, cultural and governmental differences. Furthermore, educational attainment seems to be more likely to predict weight bias than income. The review revealed a lack of research when it came to examining the impact of socioeconomic capital on weight bias.

INTRODUCTION

According to the WHO, the worldwide prevalence of obesity, defined by a body mass index (BMI) of over 30 kg/m², nearly tripled between 1975 and 2016. To give just two examples, current data reveal an obesity rate of over 21% in Germany and 37.7% in the USA. With its escalating rate, obesity can be classified as a global health issue, primarily because it is associated with numerous comorbid diseases, such as diabetes mellitus, cardiovascular diseases and certain forms of cancer.

Health-related consequences are connected to obesity and psychological implications that affect those concerned on a social level. In particular, obesity is classified as a stigmatised condition. Therefore, being obese is a characteristic that sets those affected apart from people with normal weight. Since obesity is mislabelled as a self-inflicted situation, numerous negative stereotypes, such as laziness, lack of willpower, unhealthy lifestyle and being unintelligent are associated with the condition. Stigmatisation leads to discriminating behaviour towards people with obesity in the form of mistreatment in several areas of life, such as labour market, healthcare and educational system.

The systematic review of Spahlholz revealed increased perceived discrimination towards people with obesity in comparison to people with normal weight, especially towards people with more extreme obesity (BMI >35 kg/m²) as well as towards women. Moreover, the prevalence of weight-related discrimination accelerated over time. In the USA, the prevalence of weight-related discrimination was nine times higher (66%) in 2005 than in 1995.
on the labour market, especially for women. Understanding the origin of stigma, which can be seen as the catalyst for structural discrimination, is necessary to prevent discriminating behaviour. Although weight-related stigmatisation and discrimination are closely linked, they need to be considered as two divergent concepts. However, in the following, we will refer to weight-related stigmatisation and discrimination as ‘weight bias’, but will differentiate between both concepts whenever needed.

Some people are more prone to display weight bias than other: There is some evidence that older age is associated with stigmatising attitudes
closer, the impact of educational attainment and level of income on weight bias remain ambiguous. Several studies have shown the negative impact of being overweight on the labour market, especially for women as well as in the education system. In addition, a lower level of education and income is associated with obesogenic behaviour such as a poor diet and a lack of exercise caused by factors such as stress. Moreover, Bourdieu sees the most decisive determinant of a healthy lifestyle in socioeconomic class. While people that belong to the working class preferred tasty and nutritious food, people from the upper-middle class preferred food that can be described as light, healthy and low in calories, according to his study. Subsequently, people with a higher level of education and income might choose a healthier lifestyle to distance themselves from people with obesity.

As a superior framework to generate missing hypotheses, Bourdieu’s Theory of Class can be applied. Following his concept of ‘habitus’, a person’s general attitude, lifestyle and even body shape can be seen as a metaphor for social status. Furthermore, Bourdieu considers stigma as a form of symbolic power and a tool to serve the interests of the powerful. Phelan and colleagues continue with his line of thought and presented three motives of stigma, namely keeping people in, away or down. Particularly, keeping people down applies to the review’s theoretical framework. Link and Phelan discuss stigma as an instrument of a dominant group to keep another group down to attain or maintain high social status, wealth and power. However, a person’s educational attainment and level of income are mainly invisible characteristics; thus, there are other attributes that more readily show social status. Assuming that obesity is perceived as a metaphor for lower social status, groups with higher social status might be aware of this link and keep people with obesity down to empower themselves. In this review, it is therefore assumed that people with a higher level of education and income display negative attitudes towards people with obesity in comparison to people with lower educational attainment and income. The impact of educational attainment and level of income on weight bias will be examined and compared.

Based on a sociological perspective, this systematic literature review attempts to outline the current state of research and reveal the relationship between weight bias and people with a higher level of education and income. Tyler and Slater criticised inter alia that one of the major limitations of existing understandings of stigma is the ways in which they have ‘bracketed off’ key questions, such as where stigmatising attitudes come from, how and by whom is stigma crafted, mediated, produced and why [...].’ The general aim of this review is thus to identify social and economic groups that stigmatise and discriminate against those who are obese. In the future, this information could help researchers to develop and implement interventions in a more targeted manner.

METHODS
Search strategy
A systematic review of published studies reporting weight-related attitudes held by differing socioeconomic status groups was conducted by using the relevant scientific electronic databases: PubMed, PsychINFO, Web of Science and the Cochrane Library. The review followed the Prisma Guidelines.

The systematic review of literature was performed independently by two reviewers using the following keywords: stigma*, discrimination, “weight bias”, or prejudice; education*, income, salary, wage, status, socioeconomic, socioeconomic*, SES, sociodemographic, or sociodemographics; and obes*, overweight, or fat. Giving a very high number of results, the literature search was limited to the publications’ titles and abstracts. Only published studies written in English or German were included. There was no restriction regarding the year of publication. The stages of the systematic literature search are provided in figure 1. The literature review was conducted for all studies that have been published until June 2019.

Data extraction
The systematic search of the literature revealed 2331 studies, whereby 1708 studies remained after removing duplicates. Furthermore, 1510 studies were excluded because screening their titles and abstracts related stigmatisation
Figure 1 Phases of the systematic review.

for eligibility showed no association with the research question. Disagreement and uncertainty between the two reviewers over the eligibility were resolved by re-inspecting the papers in detail and discussing disparate perspectives. For the remaining 198 studies, full articles were screened in detail to assess their eligibility. For data extraction we used an adjusted PICO scheme. Studies that collected data of an adult sample (P) which assessed stigmatising and discriminating attitudes (I) depending on socioeconomic variables (C) to investigate if weight bias is associated with socioeconomic status (O). The detailed inclusion and exclusion criteria are presented in the following.

**Inclusion criteria**

Studies that report associations between weight bias and either educational attainment or level of income were included. Weight bias was operationalised to reflect stigmatising and discriminating attitudes. Therefore, studies that measured stigmatising attitudes by applying explicit and implicit instruments will be included, but also studies that assessed causal beliefs about obesity, which can be considered as proxy variable as previously done before. Studies that assessed discriminating attitudes, for example, by measuring the support for weight-related antidiscrimination policies and law or considering obesity as a financial burden are considered for inclusion. According to Woolford et al., who found less support to cover obesity-related costs by public health insurers, the public's opinion can be seen as a potential guideline for insurance funds. In other words, based on the public’s view, discrimination might occur in the field of health insurance policies. This assumption might be of particular importance when considering the increased obesity-related healthcare cost.

**Exclusion criteria**

The following exclusion criteria were used to eliminate studies that were not applicable: (1) studies with a sample of healthcare professionals, dietitians, psychologists and physical educators; (2) studies that investigated stigmatising attitudes of children and/or adolescents; (3) studies that investigated stigma towards childhood obesity; (4) studies with an overweight and/or obese sample that investigated perceived stigmatisation; (5) studies with a homogenous sample in regard to educational attainment (eg, students) or level of income; (6) studies that investigated weight bias towards extended stigma groups (eg, obese and binge eating) and (7) reviews or qualitative studies. The flowchart (figure 1) displays how many studies were excluded in accordance with the exclusion criteria. In summary, 50 studies were excluded because they did not report the participants’ educational attainment or income. In addition, 29 studies did assess data of a sample with no variance concerning socioeconomic characteristics and 23 studies were excluded because of the samples' characteristics (overweight/obese or children/adolescents sample). Five studies were excluded because they followed a qualitative approach and 34 studies were excluded because they could be categorised as reviews. Thirty-nine studies were found that did not meet the criteria for the aimed outcome of weight bias. Two studies were neither published in English nor German.
Moreover, one paper had to be excluded because of its lack of academic background. After excluding the studies that did not meet our criteria, 17 studies were identified as relevant for in-depth investigation (figure 1). Therefore, sampling characteristics, study design, assessment of weight bias and measurement of educational attainment and income were systematically examined.

**Risk of bias**

We assessed the risk of bias of all studies included using the Appraisal tool for Cross-Sectional Studies (AXIS) developed by Downes and colleagues. The studies were therefore examined regarding potential causes that might induce a specific risk of bias.

**Patient and public involvement**

Within this study, no patient data were collected. We conducted a systematic review and analysed data that had already been collected. Thus, patients were not involved in this study.

**RESULTS**

The 17 studies included were tabulated according to the following characteristics: the origin of the sample, sample size (N), sample characteristics, study design, instruments to assess weight bias, educational attainment or income and a summary of results. Studies reviewed in detail are tabulated by either educational attainment (table 1) or by the level of income (table 2).

**Study characteristics**

All relevant study characteristics are summarised in tables 1 and 2, respectively. Seven out of 17 studies are based entirely on an American sample. Two other studies are based on a Paraguayan and an Icelandic sample. These two studies also provided data based on a Canadian sample of healthcare professionals and American, Australian and Icelandic student samples that did not meet the inclusion criteria and therefore all four samples had to be excluded. Three studies were based on a German sample and five studies based on one sample, from Paraguay, Mexico, Sweden, Denmark and Great Britain, respectively. The study by Brewis and Wutich, based on a Paraguayan sample also provided data of a comparison group of US-undergraduate students that were not considered in the analysis because of the homogenous study sample in terms of educational attainment. The 17 studies included showed a wide variety of sample sizes ranging from 198 to 3502 participants.

Since the aim of the study was to outline the impact that socioeconomic status in the form of educational attainment and level of income have on weight bias, attention was paid to a variation in these variables within the samples. The studies included therefore focused either on a population-based sample or an convenience sample. Although Jiménez-Cruz and colleagues investigated stigmatising attitudes of an entirely low-income sample, they divided the socioeconomic factors (level of education and income) into five and four categories, respectively; thus, variation within the sample could be ensured. Moreover, an investigation of weight bias in different gradations of lower status groups could provide further insight into the topic. In one study, the general population was included, whereby the overweight participants received an alternative questionnaire assessing the perceived stigmatisation and not their stigmatising attitudes towards obesity. Therefore, only the normal weight sample could be included.

The distribution of women and men was equally considered in the majority of studies, even though more women than men were included. However, two studies posed an exception. The study of Brewis et al and the study of Jiménez-Cruz investigated only the stigmatising attitudes of female participants.

We also assessed the risk of bias among all studies that fulfilled the inclusion criteria. None of these studies justified the sample size; however, despite a risk of bias regarding the non-responders (ie, no categorisation, description and ratio between the response and non-response rate), the majority of the studies included showed a low risk of bias. Only a few studies were detected to be at moderate risk of bias based on the sampling procedure. The summarised risk of bias assessment of all studies included is provided as an online supplementary table (online supplementary material 1).

**Instruments**

The studies included were found to be heterogeneous with regard to the instruments used (tables 3 and 4). Therefore, the study team has decided against a meta-analysis and for a systematic narrative literature review.

**Educational attainment and level of income**

Seventeen studies were found that assessed attitudes towards obesity in association with participants’ educational attainment and/or level of income. All of these 17 studies reported the participants’ educational attainment. Depending on the origin of the sample and the analogous countries’ educational system, categories were formed or years of educational attainment were gathered. From 17 studies, 13 assessed participants’ level of income. Therefore, income was either assessed by the annual, weekly, household or individual income.

**Weight bias in form of stigmatising attitudes**

Studies that examined either participants’ stigmatising attitudes or participants’ beliefs about the causes of obesity were included. Stigmatising attitudes were thereby measured with instruments such as the Fat Phobia Scale, the Universal Measure of Bias, the Weight Control/Blame of the Antifat Attitude Test, the Attitudes to Obese People (ATOP), the Implicit...
Table 1  Summary of selected studies: weight bias depending on educational attainment

| Study                  | N     | Sample description                        | Instruments weight bias          | Educational attainment | Association’s direction* | Magnitude of association                                                                                                                                 |
|-----------------------|-------|-------------------------------------------|----------------------------------|------------------------|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| **Form of weight bias: stigmatising attitudes**                                                                                                                                          |
| Sikorski et al<sup>1,</sup> GER 3003 | Population-based (ø age: 51.7 years; 52.8% female) | Short-FPS<sup>1</sup> | Four subgroups:   | No degree                                          | Negative                | Multivariate Regression:                                                                                                                                     |
|                       |       |                                           |                                  | 9th grade degree                             | β=−0.278, p<0.01, (SE 0.0852) |
|                       |       |                                           |                                  | 10th grade degree                             | β=−0.251, p<0.01 (SE 0.0838) |
|                       |       |                                           |                                  | 12th grade degree                             | Upper secondary school: β=−0.214, p<0.05, (SE 0.0835) |
| Hilbert et al<sup>1</sup>, GER 960 | US adults (ø age: 43.8 years; 50.2% female) | WCB<sup>2</sup> | Two subgroups:   | Low; <13 years of education)                      | Negative                | Multiple linear regression:                                                                                                                                     |
|                       |       |                                           |                                  | High; ≥13 years of education)                 | β=−0.16, p<0.001       |
|                       |       |                                           |                                  | Zero-order association                        | −r=−0.18, p<0.0001     |
| Jiménez-Cruz et al<sup>1</sup>; MEX 1100 | Women aged 18–40 of low SES (ø age: 37.5 years) | Beliefs about the causes of obesity | Five subgroups: | None                                           | Positive                | Logistic regression:                                                                                                                                           |
|                       |       |                                           |                                  | Some elementary                              | Having an unhealthy lifestyle*: unadjusted OR=2.56, p<0.001, CI 1.88–3.49 |
|                       |       |                                           |                                  | Elementary                                   |                          |
|                       |       |                                           |                                  | Middle                                       |                          |
|                       |       |                                           |                                  | High school                                   |                          |
| Puhl et al<sup>1;</sup> USA and ISL 899 | US adults (ø age: 40.9 years; 46.1% female) | Short-FPS<sup>1</sup> | Three subgroups: | High school or less                             | FPS: Mixed                                  | Linear regression:                                                                                                                                            |
|                       |       |                                           |                                  | Some college/technical or vocation degree     | UMB-FAT<sup>3</sup>      | High school or less=reference category                                                                                                                     |
|                       |       |                                           |                                  | College graduate or higher                   |                            |
|                       |       |                                           |                                  | Vocational training/some college (β=0.202, p<0.05) | Postgraduate (β=−0.017, p<0.1) |
|                       |       |                                           |                                  | College (β=0.141, p<0.1)                      |                            |
|                       | 659   | ISL adults (ø age: 45.9 years; 55.1% female) | Two subgroups: | High school or less                             | FPS: Positive                           | Linear regression:                                                                                                                                            |
|                       |       |                                           |                                  | College                                      | UMB-Fat: Positive          | High school or less=reference category                                                                                                                     |
|                       |       |                                           |                                  | College (β=0.189, p<0.05)                     | Postgraduate (β=−0.024, p<0.1) |
|                       |       |                                           |                                  | Postgraduate (β=−0.034, p<0.1)                |                            |
| Hansson et al<sup>1</sup>; SWE 2436 | Representative Swedish population aged 25–64 (ø age: 47.8 years; 63% female) | ATOP<sup>4</sup> | Three subgroups:                                                                 | Negative                | Spearman zero-order correlations:                                                                                                                               |
|                       |       |                                           |                                  | Low                                            | −r=−0.023, p<0.260       |
|                       |       |                                           |                                  | Medium                                         |                            |
|                       |       |                                           |                                  | High                                           |                            |
| Puhl and Liu;<sup>1</sup> USA 1118 | US adults (ø age: 43.8 years; 50.2% female) | Opinions about obesity as a disease<sup>5</sup> | Three subgroups: | High school or less                             | Mixed                      | Linear regression:                                                                                                                                            |
|                       |       |                                           |                                  | Some college/ Technical or vocation degree     | Agreement with statements in support of classification                                                                                                       |
|                       |       |                                           |                                  | College graduate or higher                   | Agreement with statements in support of classification                                                                                                     |
|                       |       |                                           |                                  | Mixed                                          | Agreement with statements in support of classification                                                                                                     |

Continued
| Study                                      | N   | Sample description                              | Instruments weight bias | Educational attainment | Association’s direction | Magnitude of association          |
|--------------------------------------------|-----|-------------------------------------------------|-------------------------|------------------------|------------------------|----------------------------------|
| Swami and Monk, GB                        | 198 | Community-based (♂ age: 32.58 year; 50.5% female) | PFRS<sup>5</sup>        | Five subgroups         | /                      | Univariate ANOVA;               |
|                                            |     |                                                  |                         |                        |                        | F(1, 197)=0.47, p<0.705, η²<0.01 |
|                                            |     |                                                  |                         |                        |                        |                                  |
| Lippa and Sanderson, USA                  | 396 | General, not overweight population (♂ age: 42.7 years; 43.7% female) | Short-FPS<sup>1</sup>  | Three subgroups:      | /                      | Adjusted model of correlates;   |
|                                            |     |                                                  |                         |                        |                        | F(2)=0.026, p<0.974              |
|                                            |     |                                                  |                         |                        |                        |                                  |
| Bewis and Wutch, PRY                       | 200 | Women (♂ age: 38.9 years)                       | ATOP<sup>4</sup>, IAT<sup>7</sup> | Metric measurement; years of formal education | /                      | /                                |
|                                            |     |                                                  |                         |                        |                        |                                  |
| Form of weight bias: both, stigmatising and discriminating attitudes |     |                                                  |                         |                        |                        |                                  |
| Sea and Torabi, USA                       | 981 | US representative sample (62% female)           | Beliefs about obesity as a financial burden for society | Four subgroups:       | Positive              | Logistic regression;             |
|                                            |     |                                                  |                         |                        |                        | ≤ some HS: adjusted OR=0.25, p<0.05 |
|                                            |     |                                                  |                         |                        |                        | Some College: adjusted OR=1.61, p<0.05 |
|                                            |     |                                                  |                         |                        |                        | ≥ College: adjusted OR=1.97, p<0.01 |
|                                            |     |                                                  |                         |                        |                        |                                  |
| Form of weight bias: discriminating attitudes |     |                                                  | Beliefs about the controllability of obesity | Three subgroups:      | Mixed                  | Logistic regression;             |
|                                            |     |                                                  |                         |                        |                        | ≤ some HS: adjusted OR=0.99, p<0.05 |
|                                            |     |                                                  |                         |                        |                        | Some College: adjusted OR=0.90, p<0.05 |
|                                            |     |                                                  |                         |                        |                        | ≥ College: adjusted OR=1.68, p<0.05 |
| Puhl et al, USA                           | 1114| Adults (♂ age: 44.87 years; 48% female)         | Six statements assessing support of general and employment-specific antidiscrimination laws or policies | Three subgroups:      | Positive              | Ordinal logistic regression, for all six statements;|
|                                            |     |                                                  |                         |                        |                        | High school/GED=reference category |
|                                            |     |                                                  |                         |                        |                        | College: OR 0.28–0.49, p<0.05   |
|                                            |     |                                                  |                         |                        |                        |                                  |
| Suh et al, USA                            | 3502| Adults (♂ age 21–65; 61.9% female)              | Three statements assessing support of legal protection and employment-specific antidiscrimination laws or policies | Three subgroups:      | Positive              | Multiple logistic regression;    |
|                                            |     |                                                  |                         |                        |                        | High school or less=reference category |
|                                            |     |                                                  |                         |                        |                        | Law 1: adjusted OR=0.7, p=0.01   |
|                                            |     |                                                  |                         |                        |                        | Law 2: adjusted OR=0.8, p<0.05   |
|                                            |     |                                                  |                         |                        |                        | Law 3: adjusted OR=1.2, p=0.05   |
|                                            |     |                                                  |                         |                        |                        | ≥ College graduate or higher     |
|                                            |     |                                                  |                         |                        |                        | Law 1: adjusted OR=0.7, p=0.01   |
|                                            |     |                                                  |                         |                        |                        | Law 2: adjusted OR=0.8, p<0.05   |
|                                            |     |                                                  |                         |                        |                        | Law 3: adjusted OR=0.3, p<0.05   |

Continued
### Table 1 Continued

| Study | N  | Sample description | Instruments weight bias | Educational attainment | Association's direction* | Magnitude of association |
|-------|----|--------------------|-------------------------|------------------------|--------------------------|--------------------------|
| Puhl et al.;44 USA and ISL | 893 | US adults (ο age:40.9 years; 46.1% female) | 13 statements assessing support for employment-specific and broader antidiscrimination laws or policies | Three subgroups: ▶ High school or less ▶ Some college/technical or vocation degree ▶ College graduate or higher | Positive | Tobit regression: ▶ Broad laws and policies: Coeff=-0.135, p>0.05 ▶ College: Coeff=-0.223, p>0.05 ▶ Postgraduate: Coeff=-0.040, p>0.05 |
|       | 658 | ISL adults (ο age:45.9 years; 46.1% female) | Two subgroups: ▶ High school or less ▶ College | Positive | Tobit Regression: ▶ Broad Policies ▶ College: OR=−0.221, p<0.01 |
| Puhl and Heuer;38 USA | 1001 | Population-based sample (ο age:43.8 years; 51% female) | Six statements assessing support for general, employment-specific and broader policies/antidiscrimination laws or policies | Three subgroups: ▶ High school ▶ College degree ▶ Postgraduate degree | Positive | Logistic regression, five of six statements: ▶ Higher degree: OR=0.56–0.72, p<0.05 |
| Oliver and Lee;42 USA | 909 | US adults | Two statements assessing support for antidiscrimination policies | Only two subgroups: ▶ Less than High school ▶ College degree | Positive | Probit model: ▶ Less than High school=reference category ▶ ‘Government should do more to protect obese’ ▶ College degree: β=−0.100, p<0.05 ▶ ‘Overweight should get same protections as disabled’ ▶ College degree: β=−0.136, p<0.01 |
| Hilbert et al.;45 GER | 2531 | Population-based sample (ο age:48.79 years; 55.5% female) | Six statements assessing support of general and employment-specific antidiscrimination laws or policies | Two subgroups: ▶ Low (<12 years of education) ▶ High (≥12 years of education) | General laws: Positive ▶ Employment-specific laws: Negative | Logistic regression: ▶ Education=12 years: OR=0.60, p=0.005 ▶ Logistic regression: ▶ Education=12 years: OR=1.25, p=0.016 |
| Lund et al.;50 DNK | 1003 | Citizens aged 18–65 | Attitudes towards weight-loss surgery and medical treatment of obesity | No details reported | / | / |

*Bold characters display significant association. Positive: demonstrates greater anti-fat attitudes with increasing educational attainment; Negative: demonstrates greater anti-fat attitudes with decreasing educational attainment; n=sample size.

ANOVA, analysis of variance; ATOP, Attitudes to Obese People; FPS, Fat Phobia Scale; IAT, Implicit Association Test; FFIRS, Photographic Figure Rating Scale; SES, socioeconomic status; UMB, Universal Measure of Bias; WCB, Weight Control/blame of the Anti-Fat Attitudes Test.
Table 2  Summary of selected studies: weight bias depending on level of income

| Study                  | N  | Sample description                  | Instruments weight bias | Level of income | Direction of correlation* | Magnitude of association |
|------------------------|----|-------------------------------------|-------------------------|-----------------|---------------------------|--------------------------|
| **Form of weight bias: stigmatising attitudes**                        |    |                                     |                         |                 |                           |                          |
| Jiménez-Cruz;48 MEX    | 1100 | Women aged 18–40 of low SES (ø age: 37.5 years) | Beliefs about the causes of obesity | Weekly income, four subgroups:  
  ► US$ <1200  
  ► US$ 1200–2000  
  ► US$ 2000–4000  
  ► US$ ≥4000 | Logistic regression  
  ► 'Having an unhealthy lifestyle: unadjusted OR=1.13, p>0.05, CI 0.78 to 1.62  
  ► 'Having an unhealthy lifestyle: adjusted OR=1.18, p<0.01, CI 1.04 to 1.34 | Negative             |
| Hilbert;10 GER         | 960  | Population-based sample (ø age: 45.9 years; 56.9% female) | WCB7                    | Monthly income, two subgroups:  
  ► EUR<2000  
  ► EUR≥2000 | Logistic regression  
  ► 'Obesity: unadjusted OR=1.15, p<0.001, CI 1.07 to 1.24  
  ► 'Obesity: adjusted OR=1.32, p<0.001, CI 1.21 to 1.44 | Negative             |
| Hansson and Rasmussen;49 SWE | 2436 | Representative Swedish population aged 25–64 (ø age: 47.8 years; 63% female) | ATOP4                   | Annual household income; no subgroups reported | Logistic regression  
  ► 'Obesity: unadjusted OR=1.15, p<0.001, CI 1.07 to 1.24  
  ► 'Obesity: adjusted OR=1.32, p<0.001, CI 1.21 to 1.44 | Positive             |
| Puhl and Liu;40 USA    | 1118 | US adults (ø age:43.8 years; 50.2% female) | Opinions about obesity as a disease | Annual household income, five subgroups:  
  ► US$ <25 000  
  ► US$ 25 000–49 999  
  ► US$ 50 000–74 999  
  ► US$ 75 000–99 999  
  ► US$ >100 000 | Linear regression  
  ► 'Obesity: unadjusted OR=1.09, p<0.001, CI 1.06 to 1.12  
  ► 'Obesity: adjusted OR=1.12, p<0.001, CI 1.09 to 1.15 | Negative             |
| Sikorski;46 GER        | 3003 | Population-based (ø age: 51.7 years; 52.8% female) | Short-FPS1              | Monthly household income, four subgroups:  
  ► EUR<999  
  ► EUR 1000–1999  
  ► EUR 2000–2999  
  ► EUR>3000 | Logistic regression  
  ► 'Obesity: unadjusted OR=1.15, p<0.001, CI 1.07 to 1.24  
  ► 'Obesity: adjusted OR=1.32, p<0.001, CI 1.21 to 1.44 | Negative             |
| Lippa and Sanderson;36 USA | 396  | General, not overweight population (ø age: 42.7 years; 43.7% female) | Short-FPS1              | Annual household income, five subgroups:  
  ► US$ <20 000  
  ► US$ 20 000–39 000  
  ► US$ 40 000–59 000  
  ► US$ 60 000–79 000  
  ► US$ >80 000 | Linear regression  
  ► 'Obesity: unadjusted OR=1.09, p<0.001, CI 1.06 to 1.12  
  ► 'Obesity: adjusted OR=1.12, p<0.001, CI 1.09 to 1.15 | Negative             |
| **Form of weight bias: both stigmatising and discriminating attitudes** |    |                                     |                         |                 |                           |                          |
| Seo and Torabi;39 USA  | 981  | US representative sample (62% female) | Beliefs about obesity as a financial burden for society | Annual household income, four subgroups:  
  ► US$ <25 000  
  ► US$ 25 000–50 000  
  ► US$ 50 000–75 000  
  ► US$ >75 000 | Logistic regression  
  ► 'Obesity: unadjusted OR=1.15, p<0.001, CI 1.07 to 1.24  
  ► 'Obesity: adjusted OR=1.32, p<0.001, CI 1.21 to 1.44 | Positive             |
| **Form of weight bias: discriminating attitudes**                       |    |                                     |                         |                 |                           |                          |
| Continued                                           |    |                                     |                         |                 |                           |                          |
Association Test (IAT) or the Photographic Figure Rating Scale. As described before, beliefs about the causes of obesity in the form of evaluating obesity as a controllable condition—which is supposedly preventable by a greater extent of self-discipline—can consequently be seen as one decisive factor in determining stigmatising attitudes and was therefore included. The instruments used are presented in Table 3.
Weight bias in the form of discriminating attitudes

We found eight studies that investigated participants’ discriminating attitudes towards people with obesity. All instruments used to measure discriminating attitudes are listed in Table 4. Discrimination was measured for example, by examining policy and law support, but also the ratings on the statement ‘Obesity is a major burden to society in terms of health-care costs’ as well as attitudes towards weight-loss surgery and medical treatment. We found some studies that investigated support for the same or almost identical laws or policies (Law/policy a-i). However, these items were analysed in such heterogeneous way, for example, by merging different items into one, that a meta-analysis could not be conducted.

Findings
The studies included showed a very heterogeneous picture regarding their results. Eleven out of the 17 studies significantly associated educational attainment (Table 5) and/or level of income (Table 6) with stigmatising and/or discriminatory attitudes towards people with obesity.

Associations between educational attainment and weight-related stigmatisation
We found 10 studies that reported an association between educational attainment and stigmatising attitudes, whereas only 2 of them showed a positive association between higher educational attainment and weight-related stigmatisation. In addition, the study of Puhl and colleagues found a significant association in the Icelandic ($\beta$=0.160, p<0.05), but not in the American sample. However, two German studies showed an inverse correlation. Both of these studies found evidence that higher education is associated with lower stigma and less belief in individual responsibility for an obese condition. The remaining studies did not report significant associations.

Associations between educational attainment and weight-related discrimination
Six studies reported increased discriminating attitudes with higher education. The study of Puhl and colleagues found no significant association between weight bias and educational attainment in the US sample, but did find an association in the Icelandic sample ($\beta$=−0.221, p<0.01). The study of Hilbert and colleagues revealed inconsistent findings: Higher education is associated with less support for general but more support for employment specific weight-related antidiscrimination laws or policies.

Associations between the level of income and weight-related stigmatisation
We found no study that reported a significant association between the level of income and weight-related stigmatisation.

Associations between the level of income and weight-related discrimination
Four American studies revealed stronger weight-related discrimination with increasing income. One German study found less support for general, but not for employment specific policies and laws among more affluent people. Although the study of Suh et al. found a significant positive association between level of income and support for two laws and policies (law a: $\chi^2=6.06$, p=0.01; law d: $\chi^2=3.81$, p=0.05), these results could not be validated by logistic regression analysis. Moreover, the assumption that discrimination, in the form of views on the funding for medical or weight-loss surgery, is somehow associated with income was not found.

DISCUSSION
This systematic literature review aimed to summarise the current state of research on socioeconomic status and its impact on weight-related stigmatisation and discrimination. As it was outlined earlier, the association between socioeconomic factors and weight bias has not been investigated sufficiently. This review aimed therefore to address this gap. Although many studies were found that investigated various forms of weight bias and assessed socioeconomic data, an association was only reported in 17 studies. The underlying reason why an association was not reported might be a different research focus and also insignificant findings. Overall, 11 out of the 17 studies showed that weight bias is significantly associated with either educational attainment or level of income. In the following the results are discussed separated by education...
Table 4 Overview of the instruments used to measure discriminating attitudes

| Instrument measuring discriminating attitudes | Studies that apply the instrument |
|-----------------------------------------------|----------------------------------|
| Attitudes towards weight-loss surgery and medical treatment | 50 |
| Beliefs about obesity as a financial burden for society | 39 |
| Statements measuring support/rejection of weight-related laws or policies |
| a. My country/state should include body weight in our civil rights law in order to protect people from discrimination based on their body weight. | 37 38 41 44 45 |
| b. It should be illegal for an employer to refuse to hire a qualified person because of his or her body weight. | 37 38 41 44 45 |
| c. It should be illegal for an employer to terminate or fire a qualified employee because of his or her body weight. | 37 38 41 44 45 |
| d. Fat/overweight persons should be subject to the same legal protections and benefits offered to people with physical disabilities. | 37 38 41 42 44 45 |
| e. It should be illegal for an employer to deny a promotion or appropriate compensation to a qualified employee because of his or her body weight. | 37 38 41 44 |
| f. Obesity should be considered a disability (under the ADA) so that people will be protected from weight discrimination in the workplace. | 38 41 44 45 |
| g. Congress/Government should pass the WDEA to protect overweight Americans from discrimination in the workplace/employees from discrimination in the workplace based on their body-weight. | 38 41 44 |
| h. The government should play a more active role in protecting overweight people from discrimination. | 38 41 42 |
| i. It should be illegal for an employer to assign lower wages to a qualified employee because of his or her body weight. | 44 45 |
| j. The government should have specific laws in place to protect people from weight discrimination. | 44 |
| k. The government should penalise (or fine) those who discriminate against persons because of their weight. | 44 |
| l. Individual companies should have the right to determine whom to hire based on an employee’s personal body weight. | 44 |
| m. Employers should be allowed to assign different salaries to employees based on their body weight. | 44 |
| n. My country should pass a Healthy Workplace Law to address workplace bullying | 44 |

WDEA, Weight Discrimination in Employment Act.

Educational attainment, level of income and stigmatising attitudes

Overall, 10 studies reported an association between educational attainment and stigmatising attitudes. However, we found no systematic pattern in which way educational attainment and stigmatising attitudes are associated: Two studies supported the hypothesis that stigmatising attitudes are more likely in people with higher educational attainment, whereas two German studies contradict this. Moreover, six studies did not show any significant association or a clear direction of the assumed association. In light of divergent results of studies that report a significant association between socioeconomic variables and stigmatising attitudes, the findings must be discussed with regard to their cultural context: American, Mexican and Icelandic studies were found to support the working hypothesis, whereas two German studies revealed findings to the contrary.

These differences might be explained when considering cultural distinctions. In cultures, in which individual responsibility is considered as one of the leading causes of self-fulfilment, health and wealth, obesity might be perceived as a self-inflicted condition. Highly educated people might attempt to keep people down to maintain their high(er) social status. In contrast, in cultures in which individuals’ situations are principally considered as a result of various circumstances, obesity might consequently not only be seen as self-inflicted. In these cultures, especially highly educated people might be aware of social barriers as determinants for self-fulfilment, wealth and health, that is, body weight. In conclusion, the direction of the relationship between weight bias and socioeconomic status might depend on divergent sociocultural perspectives. Hence, future research should consider expansion and reorientation of stigma’s theoretical framework by focusing on the meso and macro sociocultural structures, as Bonnington and Rose suggest.

Overall, we found eight studies that investigated (or rather reported) the association between level of income and income, as well as weight-related stigmatisation and discrimination.
Table 5  Studies that show significant associations between education attainment and weight-related stigmatisation and discrimination

| Study                  | Direction of correlation | Form of weight bias | Instrument weight bias | Result                                                                                                                                                                                                 | Adjusted for                                                                                   |
|------------------------|--------------------------|---------------------|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| Sikorski et al.        | Negative                 | Stigmatisation      | Short-FPS              | Higher educational attainment is associated with lower stigmatising attitudes                                                                                                                        | Gender, age, income, residence, emigrational background                                        |
| Hilbert et al.         | Negative                 | Stigmatisation      | WCB                    | Higher educational attainment is associated with less stigmatising attitudes (p<0.001)                                                                                                                  | Causal attributions to behaviour, labelling obesity as an illness, age, causal attributions to heredity |
| Puhl et al.            | Positive                 | Stigmatisation      | UMB-Fat                | Higher educational attainment is associated with higher stigmatising attitudes (ISL sample; p<0.05)                                                                                                | Gender, race/ethnicity, BMI, perceived causes of obesity, weight-related attributions           |
| Jiménez-Cruz et al.    | Positive                 | Stigmatisation      | Beliefs about the causes of obesity | Higher educational attainment is associated with greater belief in individual responsibility (p<0.001)                                                                                     | Unadjusted                                                                                     |
| Seo and Torabi         | Positive                 | Discrimination      | Belief in obesity as a financial burden for society | Higher educational attainment is associated with greater belief in the statement 'Obesity is a major burden to society in terms of healthcare costs' (p<0.01) | Race/ethnicity, sex, income, employment, age group, marital status, BMI, smoking status         |
| Suh et al.             | Positive                 | Discrimination      | Support for weight-related laws or policies | Higher educational attainment is associated with lower support for weight-related laws or policies (p<0.01)                                                                                  | Other sociodemographic variables                                                             |
| Puhl et al.            | Positive                 | Discrimination      | Support for weight-related laws or policies | Higher educational attainment is associated with lower support for weight-related laws or policies (p<0.01)                                                                                  | Sex, age, race/ethnicity, BMI                                                                |
| Puhl and Heuer         | Positive                 | Discrimination      | Support for weight-related laws or policies | Higher educational attainment is associated with lower support for weight-related laws or policies                                                                                           | Sex, body weight, age, income, race, political affiliation, history of weight-based victimisation |
| Oliver and Lee         | Positive                 | Discrimination      | Support for civil protections for the obese | Higher educational attainment is associated with lower support for civil protection of the obese                                                                                       | Sex, age, BMI, race/ethnicity, income, political orientation, perceived causes for obesity         |
| Puhl et al.            | Positive                 | Discrimination      | Support for general and employment specific antidiscrimination laws or policies | Higher educational attainment is associated with less support for weight-related laws or policies                                                                                               | Body weight, age, race, political affiliation, income, history of weight-based discrimination, divergent vignettes describing obesity and obesity-related (workplace) discriminations |
| Hilbert et al.         | Positive                 | Discrimination      | Support for general antidiscrimination laws or policies | Higher educational attainment is associated with less support for general antidiscrimination laws or policies                                                                                  | Sex, age, weights status, income, residence, church membership, readiness to vote in following week, weight-based victimisation, weight bias internalisation |
|                        | Negative                 | Discrimination      | Support for employment-specific antidiscrimination laws or policies | Higher educational attainment is associated with stronger support for employment specific antidiscrimination laws or policies                                |                                                                                               |

Positive: demonstrates greater weight bias with increasing educational attainment; Negative: shows greater weight bias with decreasing educational attainment.

BMI, body mass index; FPS, Fat Phobia Scale; UMB, Universal Measure of Bias; WCB, Weight Control/Blame of the Anti-Fat Attitudes Test.
Table 6  Studies that show significant associations between level of income and weight-related stigmatisation and discrimination

| Study                  | Direction of correlation | Form of weight bias | Instrument weight bias                                                                 | Result                                                                 | Adjusted for                                                                 |
|-----------------------|--------------------------|---------------------|----------------------------------------------------------------------------------------|------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| Seo and Torabi<sup>39</sup> | Positive                | Discrimination      | Belief in obesity as a burden for society                                               | Yes; A higher income level is associated with greater belief in statement ‘Obesity is a major burden to society in terms of healthcare costs’ (p<0.05) | Race/ethnicity, sex, education, employment, age group, marital status, BMI, smoking status |
| Puhl and Heuer<sup>38</sup> | Positive                | Discrimination      | Support for weight-related laws or policies                                             | Higher income is associated with lower support for weight-related laws or policies | Sex, body weight, age, education, income, race, political affiliation, history of weight-based victimisation |
| Oliver and Lee<sup>42</sup> | Positive                | Discrimination      | Support for civil protections for the obese                                            | Higher income is associated with lower support for civil protection of the obese | Sex, age, BMI, race/ethnicity, education, political orientation, perceived causes for obesity |
| Puhl et al<sup>41</sup> | Positive                | Discrimination      | Support for general and employment specific antidiscrimination laws or policies        | Higher income is associated with less support for weight-related laws or policies | Body weight, age, race, political affiliation, education, history of weight-based discrimination, divergent vignettes describing obesity and obesity-related (workplace) discriminations |
| Hilbert et al<sup>45</sup> | Positive                | Discrimination      | Support for general antidiscrimination laws or policies                                 | Higher income is associated with less support for general antidiscrimination laws or policies | Sex, age, weights status, education, residence, church membership, readiness to vote in following week, weight-based victimisation, weight bias internalisation |

Positive: demonstrates greater weight bias with increasing level of income; Negative: shows greater weight bias with decreasing level of income.
BMI, body mass index.
and stigmatising attitudes. None of these studies showed a significant relationship. However, the direction of the (insignificant) associations did not show any pattern. We found three studies reporting an (insignificant) positive association, and one study each reporting an (insignificant) positive or mixed associations.

**Educational attainment, level of income and discriminating attitudes**

Of the 17 studies included, 8 studies were found that reported an association between educational attainment and discriminating attitudes. Five of these studies reported a positive relationship, that is, stronger discriminating attitudes (in the form of law and policy support) with increasing education. Another study that applied the same instruments for an American and an Icelandic sample found only indications for our assumption (ie, higher education is associated with stronger discriminating attitudes) in the Icelandic, but not in the American sample. This study was also replicated by Hilbert et al, who report heterogeneous findings as they found less support for general antidiscrimination laws with increasing level of education, but stronger support for employment specific laws and policies among the higher educated German sample. It should, therefore, be discussed whether general and employment-specific antidiscrimination policies and laws can be viewed as similar outcomes or if they display different dimensions of discrimination. Moreover, views on who should pay for medical treatment or weight-loss surgery did not reveal significant associations. Only one study did not find a significant association between educational attainment and discriminating attitudes, nor did it report the direction of the insignificant association.

With regard to the association between level of income and discriminating attitudes, we found overall seven studies in which an association was reported. Five studies reported positive relationships, that is, stronger discriminating attitudes with an increasing level of income. Suh et al, who asked Danish citizen by whom medical treatment or weight-loss surgery should be funded, found no significant association, nor did they report a direction of the association.

These findings support our assumption that higher socioeconomic status is associated with stronger discriminating attitudes. However, one German study reported contradicting results that might be ascribed at a macrolevel to Bourdieu’s theory about how cultural frameworks determine how specific values and characteristics are perceived. Governmental structures might enforce stigmatising and discriminating attitudes as an instrument to nudge people into desired patterns of behaviour. It can be assumed that cultural frameworks shape governmental systems and are strengthened at the same time through them, especially through the national health and welfare systems. Tyler and Slater, for example, outline the political and social function of stigma as a form of power. They discuss macrolevel structures, particularly those used actively and passively by governments, as determinants shaping stigmatising and discriminating attitudes, a level of understanding often left out in social psychology. As explained above, it might be possible that in countries in which obesity is merely perceived as self-inflicted, discriminating attitudes might be stronger—Hence, stigma is an instrument used by individuals to enforce personal interests and one put in place (intended or not) by governments.

The different and to some extent inconclusive results might be caused by diverging study designs, sample sizes and instruments assessing weight-related stigmatisation and discrimination, educational attainment and level of income: Studies that did not show a significant association between weight bias and either educational attainment or level of income excluded the overweight portion of the sample or were characterised by a small sample (ranging from n=198 to n=396) size. Furthermore, the association between weight bias with either educational attainment or level of income was not seen in instruments such as the ATOP scale, the IAT agreement ratings as to whether obesity can be classified as a disease and measurement of attitudes towards weight-loss surgery and medical treatment.

However, there are findings diminishing this line of argument: The study of Hilbert et al found less support for general, but stronger support for employment specific laws with increasing socioeconomic status. In addition, the German population was found to be less supportive of laws and policies that would impede to refuse to hire, assign lower wages and to fire qualified persons because of their body weight, compared with an American and Icelandic sample. Moreover, the German population was less supportive of including body weight in the civil rights of law compared with the American, but not the Icelandic sample.

A final point of discussion might be whether the prevalence of obesity has an impact on the magnitude of weight bias. When comparing the prevalence and the stigmatisation of obesity between the USA and Germany, for example, the following can be stated: In both countries, the prevalence of obesity increased over time (1995, USA 21.9%; GER 14.5%; 2005 USA 29%; GER 18%). However, the prevalence of obesity itself increased, along with the (perceived) stigmatisation towards people with obesity in the USA and in Germany.
Limitations
Just as any overview must contend with heterogeneous samples and instruments, this systematic review has likewise attempted to cope with varying data. The studies reviewed differed with respect to the instruments used to assess education and income. In particular, the measurement of educational attainment was strongly influenced by the different organisation and structure of the varied local educational systems. In addition, the instruments to assess weight bias were also heterogeneous, particularly those used to measure stigmatising attitudes. Some studies used validated scales, whereas other studies used single items only. Thus, the manner of gathering data and classifying categories can be described as heterogeneous itself—and therefore caused the study team to decide against a meta-analysis. However, studies that did use the same instrument, such as items weighing support for specific laws and policies differed with regard to how they were analysed (as single items or as an item battery). Therefore, the authors had to decide again against a meta-analysis and applied a vote-counting approach despite its shortcomings.

Moreover, the study aimed to investigate socioeconomic determinants of weight bias in the general population, as discussed in the inclusion and exclusion section. Therefore, we excluded, among other things, studies that focused on overweight and/or obese samples only. We assumed that people try to differentiate themselves from lower status groups, which might be characterised by varying body sizes, that is, excess weight or obesity. However, overweight and obese samples were included as part of the general population in some studies. Also, these studies did not differentiate their results by participants’ body sizes. We also excluded studies based on homogenous samples, such as healthcare professionals and students. We considered these studies as inadequate since there would have been no possibility to compare and thus interpret these results with regard to the research question. Moreover, stigmatising attitudes among some professions, such as dietitians and nutritionists, were already investigated systematically.

In the general population, we assume that people try to differentiate themselves by socioeconomic status and by other status markers as well, such as excess weight. Although we attempted to explain the heterogeneous and inconclusive results by appealing to governmental and cultural differences, there was insufficient (and also inconclusive) evidence to conclude the role of cultural and governmental structures on weight bias.

Since the study team has only sufficient language skills in English and German, the current research includes only papers written in English or German. We assumed that a higher level of education or income is associated with greater stigmatisation and discrimination. Therefore, the current study situation was analysed systematically. Although data of education and income are always collected as mandatory sociodemographic information, research is lacking when it comes to examining their impact on weight bias. Since this question has not yet been answered sufficiently, this review was supposed to address this gap in research and aimed to contribute to closing this gap.

Our working hypothesis that weight bias increases with higher educational attainment or level of income could not be verified. Particularly, we found eight studies that supported our hypothesis, two German studies indicating the reverse conclusion, one German study reported heterogenous findings and seven studies that did not show a significant association at all.

The key to identifying effective interventions to battle stigmatisation, discrimination and consequences for those affected might lie in exposing the characteristics of stigmatising groups and their motivations. Therefore, future research should pay more attention to the link between weight bias and socioeconomic factors and cultural or rather governmental structures. Moreover, meta-analysis should be considered as an important direction for future research.

CONCLUSION
The literature review aimed to investigate to what extent weight bias can be traced back to socioeconomic variables, such as educational attainment and level of income.

ACKNOWLEDGEMENTS
We acknowledge support from the German Research Foundation (DFG) and University Leipzig within the program of Open Access Publishing.

CONTRIBUTORS
MB, CL-S and SGR-H outlined and specified the research question. MB and CL-S conducted the systematic search of the literature. Furthermore, MB, CL-S and TF discussed papers in detail in case of disagreement and uncertainty over the eligibility of abstracts. MB wrote the first draft of the manuscript. TF, SGR-H and CL-S revised it critically for valuable intellectual content. All authors contributed to and have approved the final manuscript.

FUNDING
This study was supported by the Federal Ministry of Education and Research (BMBF), Germany, FKZ: D1E01501.

DISCLAIMER
The funding source had no involvement in study design, collection, analysis and interpretation of data.

COMPETING INTERESTS
None declared.

PATIENT CONSENT FOR PUBLICATION
Not required.

PROVENANCE AND PEER REVIEW
Not commissioned; externally peer reviewed.

DATA AVAILABILITY STATEMENT
No data are available.

OPEN ACCESS
This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: http://creativecommons.org/licenses/by-nc/4.0/.

ORCID ID
Marie Bernard http://orcid.org/0000-0003-4208-4057

REFERENCES
1 World Health Organization. Obesity and overweight, 2018. Available: http://www.who.int/en/news-room/fact-sheets/detail/obesity-and-overweight [Accessed 27 Aug 2018].
2 Mensink GSB, Schienkiewitz A, Hartenberger M, Scheidt-Nave C, et al. [Overweight and obesity in Germany: results of the German Health Interview and Examination Survey for Adults (DEGS1)].
Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz 2013;56:786–94.
3 Flegal KM, Kruszon-Moran D, Carroll MD, et al. Trends in obesity among adults in the United States, 2005 to 2014. *JAMA* 2016;315:2296–91.
4 Pi-Sunyer X. The medical risks of obesity. *Postgrad Med* 2009;121:21–33.
5 Jung FUCE, Luck-Sikorski C, Wiemers N, et al. Dietitians and Nutritionists: stigma in the context of obesity. A systematic review. *PloS One* 2015;10:e0140276.
6 Puhl RM, Heuer CA. The stigma of obesity: a review and update. *Obesity (Silver Spring)* 2009;17:941–64.
7 Andreyyeva T, Puhl RM, Brownell KD. Changes in perceived weight discrimination among Americans, 1995–1996 through 2004–2006. *Obesity (Silver Spring)* 2008;16:1129–34.
8 Spahiljolz J, Baer N, König H-H, et al. Obesity and discrimination - a systematic review and meta-analysis of observational studies. *Obes Rev* 2016;17:43–55.
9 Puhl RM, Andreyyeva T, Brownell KD. Perceptions of weight discrimination: prevalence and comparison to race and gender discrimination in America. *Int J Obes (Lond)* 2008;32:952–1000.
10 Hilbert A, Rief W, Braehler E. Stigmatizing attitudes toward obesity in a representative population-based sample. *Obesity (Silver Spring)* 2008;16:1529–34.
11 Rand CS, Wright BA. Continuity and change in the evaluation of ideal and acceptable body sizes across a wide age span. *Int J Eat Disord* 2000;28:90–100.
12 Schwartz MB, Chambless HO, Brownell KD, et al. Weight bias among health professionals specializing in obesity. *Obes Res* 2003;11:1039–9.
13 Crandall CS. Prejudice against fat people: ideology and self-interest. *J Pers Soc Psychol* 1994;66:882–94.
14 Puhl RM, Schwartz MB, Brownell KD. Impact of perceived consensus on stereotypes about obese people: a new approach for reducing bias. *Health Psychol* 2005;24:157–25.
15 Latner JD, Stunkard AJ, Wilson GT. Stigmatized students: age, sex, and ethnicity effects in the stigmatization of obesity. *Obes Res* 2005;13:1226–31.
16 Perez-Lopez MS, Lewis RJ, Cash TF. The relationship of Antifat attitudes to other Prejudicial and gender-related Attitudes1. *J Appl Soc Psychol* 2001;31:685–97.
17 Link BG, Phelan J, power S. Stigma power. *Soc Sci Med* 2013;104:23–34.
18 McLaren L. Socioeconomic status and obesity. *Epidemiol Rev* 2007;29:29–48.
19 Brewis AA, McGarvey ST, Jones J, et al. Perceptions of body size in Pacific Islanders. *Int J Obes Relat Metab Disord* 1998;22:185–9.
20 Brewis AA, Wutich A, Falletta CF, et al. Body norms and fat stigma in global perspective. *Curr Anthropol* 2011;52:269–76.
21 Flint SW, Cadek M, Codreanu SC, et al. Obesity Discrimination in the Recruitment Process: ‘You’re Not Hired!’. *Front Psychol* 2016;7:647.
22 Agerström J, Rooth D-O. The role of automatic obesity stereotypes in real hiring discrimination. *J Appl Psychol* 2011;96:790–805.
23 Puhl R, Brownell KD. Bias BKD. Bias, discrimination, and obesity. *Obes Rev* 2013;14:788–805.
24 Flaskenr JH, deLilly CR, Flaskenr JH. Social determinants of health status. *Issues Ment Health Nurs* 2012;33:494–7.
25 Bourdieu P. Distinction: a social critique of the judgement of taste. 1984th edn. Cambridge, Mass: Harvard University Press, 2000.
26 Cockerham WC. Health lifestyle theory and the convergence of agency and structure. *J Health Soc Behav* 2005;46:51–67.
27 Bourdieu P. What makes a social class? on the theoretical and practical existence of groups. *Berkeley J Sociol* 1987;32:1–17.
28 Phelan JC, Link BG, Dovidio JF. Stigma and prejudice: one animal or two? *Soc Sci Med* 2008;67:358–67.
29 Tyler T, Slater T. Rethinking the sociology of stigma. *Social Rev* 2018;66:721–43.
30 Moher D, Liberati A, Tetzlaff J, et al. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *BMJ* 2009;339:b2535.
31 Howard C. Subject & course guides: evidence based medicine: PICO. Available: https://researchguides.uic.edu/che.php?guides=3954402 [Accessed 14 Aug 2019].
32 Puhl RM, Latner JD, Stigma LJJD, Stigma, obesity, and the health of the nation’s children. *Psychol Bull* 2007;133:557–80.
33 Woolford SJ, Clarke SJ, Butchart A, et al. To pay or not to pay: public perception regarding insurance coverage of obesity treatment. *Obesity (Silver Spring)* 2013:21:6790–94.
34 Biener A, Cawley J, Meyerhoefer C. The high and rising costs of obesity to the US health care system. *J Gen Intern Med* 2013:32:6–8.
35 Downes MJ, Brennan ML, Williams HC, et al. Development of a critical appraisal tool to assess the quality of cross-sectional studies (axis). *BMD Open* 2016:8:e011458.
36 Lippa NC, Sanderson SC. Impact of information about obesity genomics on the stigmatization of overweight individuals: an experimental study. *Obesity (Silver Spring)* 2012:20:2367–76.
37 Suh Y, Puhl R, Liu S, et al. Support for laws to prohibit weight discrimination in the United States: public attitudes from 2011 to 2013. *Obesity (Silver Spring)* 2013;21:1792–9.
38 Puhl RM, Heuer CA. Public opinion about laws to prohibit weight discrimination in the United States. *Obesity (Silver Spring)* 2011:19:74–82.
39 See D-C, Torabi MR. Racial/ethnic differences in body mass index, morbidity and attitudes toward obesity among U.S. adults. *J Natl Med Assoc* 2006:98:1300–8.
40 Puhl RM, Liu S. A national survey of public views about the classification of obesity as a disease. *Obesity (Silver Spring)* 2015:23:1288–95.
41 Puhl RM, Heuer C, Sarda V. Framing messages about weight discrimination: impact on public support for legislation. *Int J Obes (Lond)* 2011;35:863–72.
42 Oliver JE, Lee T. Public opinion and the politics of obesity in America. *J Health Polit Policy Law* 2005;30:923–54.
43 Puhl RM, Latner JD, O’Brien KS, et al. A multinational examination of weight bias: predictors of anti-fat attitudes across four countries. *Int J Obes(Lond)* 2015;39:1166–73.
44 Puhl RM, Latner JD, O’Brien KS, et al. Potential policies and laws to Prohibit weight discrimination: public views from 4 countries. *Milbank Q* 2015:93:991–731.
45 Hilbert A, Hübner C, Schmutzer G, et al. Public support for weight-related Antidiscrimination laws and policies. *Obes Facts* 2017:10:101–11.
46 Sikorski C, Lippa M, Brähler E, et al. Obese children, adults and senior citizens in the eyes of the general public: results of a representative study on stigma and causation of obesity. *PLoS One* 2012:7:e46924.
47 Brewis AA, Wutich A. Explicit versus implicit fat-stigma. *Am J Hum Biol* 2012;24:32–5.
48 Jiménez-Cruz A, de Escobar-Aznar YM, Castillo-Ruiz O, et al. Beliefs about causes and consequences of obesity among women in two Mexican cities. *J Health Popul Nutr* 2012;30:311–6.
49 Hansson LM, Rassmusen F. Attitudes towards obesity in the Swedish general population: the role of one’s own body size, weight satisfaction, and controllability beliefs about obesity. *Body Image* 2014;11:43–50.
50 Lund TB, Nielsen MEJ, Sandoe P. In a class of their own: the Danish public considers obesity less deserving of treatment compared with smoking-related diseases. *Eur J Clin Nutr* 2015;69:514–8.
51 Swami V, Monk R. Weight bias against women in a university acceptance scenario. *J Gen Psychol* 2013:140:45–56.
52 Gorman MJ, Butsch WS, Reilly-Harrington NA. Stigma In Persons with Obesity. In: Parenk R, Childs EW, eds. *Stigma and prejudice: Touchstones in understanding diversity in healthcare*. Cham: Springer International Publishing, 2016: 23–40.
53 Bonnington O, Rose D. Exploring stigmatisation among people diagnosed with either bipolar disorder or borderline personality disorder: a critical realist analysis. *Soc Sci Med* 2014;124:37–71.
54 World Health Organization. Overweight and obesity. Available: https://www.who.int/gho/ncd/risk_factors/overweight_obesity/obesity_adults/en/ [Accessed 14 Aug 2019].
55 Herpert S, Zwaan M, Zipfel S. *Handbuch Essstörungen und Adipositas*. Berlin, Heidelberg: Springer Berlin Heidelberg, 2015.