

ORIGINAL ARTICLE

Socioeconomic Factors and Obesity

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SUMMARY

Background: It is already known from multiple studies that obesity is distributed along a socioeconomic gradient. In the present study, we attempt to determine the relative importance of three different status indicators: income, education, and occupational position.

Method: Data were drawn from the 2003 Telephone Health Survey in Germany ($n = 8318$), which yielded representative information on the resident population in Germany aged 18 and older. The socioeconomic variables studied were the net equivalent household income, the highest level of general education completed, and the autonomy of occupational activity as measured on the Hoffmeyer-Zlotnik scale. Age- and sex-specific prevalences of obesity were determined, and odds ratios with 95% confidence intervals were calculated by binary logistic regression.

Results: In Germany in the year 2003, 17% of men and 20% of women aged 18 and older were obese. For men, both the highest level of general education completed and the individual's occupational position were found to have a significant effect on the prevalence of obesity, after statistical controls for the influence of age and the other two status indicators. In women, a statistically significant social gradient was found for all three status indicators. For example, women in the lowest income group were three times as likely to be obese as women in the highest income group.

Conclusion: The fight against obesity is a main goal of health-care policy because of its increasing prevalence and its contribution to the causation of many secondary diseases. The results reported here demonstrate that socioeconomic factors play an important role. These factors should be taken into account in the design of target-group-specific measures for the prevention and treatment of obesity.

In the Western industrialized nations, the proportion of people who are overweight has increased continuously during the past few decades (1). One particularly clear sign of this development is the prevalence of severe overweight, which is why the World Health Organization (WHO) has long been warning of an impending obesity epidemic in the 21st century (2). In the case of Germany, it can be shown that between 1985 and 2002, the rates of obesity in men and women aged from 25 to 69 years rose from 16.2% to 22.5% and from 16.2% to 23.3%, respectively (3).

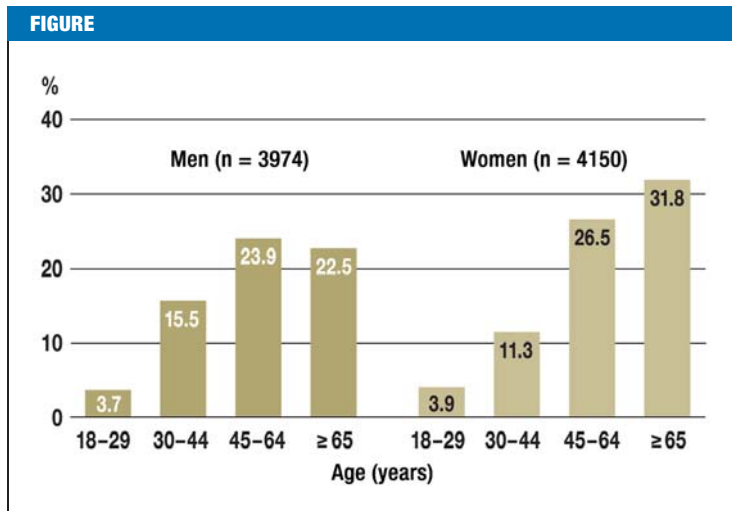
The health consequences of this development are serious: obesity increases a person's risk of cardiovascular disease, metabolic disorders, diabetes mellitus, arthrosis and other orthopedic complications, and certain cancers, e.g. colon, breast, and prostate cancer. In addition to this, obese people more often report impaired psychosocial wellbeing and health-related quality of life, and are at greater risk of premature death (4–6). All this results in considerable costs to the national economy. According to estimates, between 3.1% and 5.5% of the annual costs in the German health care system are spent on treating obesity and related diseases (5).

Against this background, it is important to develop specific preventive measures and treatment options. In doing so, it must be borne in mind that there are social inequalities in how overweight and obesity are distributed among the population. Studies show that in countries with a Western-type lifestyle, socially disadvantaged groups are more often affected by obesity than are comparatively better-off groups (7–10). Germany is no exception. As the results of the health surveys by the Robert Koch Institute and the National Nutrition Survey II (Nationale Verzehrsstudie II) show, obesity is more common in children and adults of low social status (11–13, e1, e2).

To measure social status, many studies rely on a multidimensional index based on information about school and vocational education, occupational status, and net household income (14, 15). An index of this kind will help to show up social differences in the occurrence of obesity, but when it comes to explaining these differences, identifying target groups, and elaborating recommendations for action, it does not provide much in the way of concrete starting points. For this reason, in the present study the indicators used to determine social status will be examined individually and

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Obesity prevalences in Germany by age and sex

their relative importance for the occurrence of obesity will be determined (16, 17).

Methods

The statistical analyses are based on data from the 2003 Telephone Health Survey (GSTel03), which are representative of the resident population over the age of 18 years in Germany. This survey, which was carried out by the Robert Koch Institute using computer-assisted telephone interviews, was conceived as an innovative instrument of federal health care reporting and was carried out from September 2002 to March 2003 (18).

A total of 8318 men and women from all over Germany were asked questions on a broad spectrum of health-related topics. The response rate was 59.2% (19, 20). The basis of the study was a sample of 45 000 private telephone numbers selected using the Gabler-Häder method and provided by the Center for Surveys, Methods and Analyses (Zentrum für Umfragen, Methoden und Analysen, ZUMA) in Mannheim, Germany. The Gabler-Häder method allows the inclusion of telephone numbers that are not listed in the published telephone directories. To ensure the representivity at the personal level, the so-called next birthday method was used, according to which, in households containing more than one person, the one questioned is always the one who at first contact with the household is the one whose birthday is next (21).

To be able to make statements about the prevalence of obesity, body mass index (BMI) was calculated on the basis of respondents' reported body weight and height. The calculation is done by dividing the body weight (in kilograms) by the square of the body height (in meters). According to the frequently used WHO classification, obesity is taken to be present when the BMI is 30 or higher (2).

Socioeconomic factors recorded were highest level of general school education, occupational position, and

net household income. School education level was divided into low (Volksschule or Hauptschule, no school-leaving certificate), intermediate (Realschule, polytechnic high school), and high (education to college and university entrance qualification). To determine occupational status, four groups were distinguished based on the Hoffmeyer-Zlotnik autonomy scale of occupational activity: low occupational status (unskilled and semi-skilled workers), simple occupational status (civil servants, employees, and skilled workers with simple areas of activity), intermediate occupational status (middle-level civil servants, foremen/gang leaders, employees with wider areas of activity), or high occupational status (self-employed, management personnel, persons with powers of high-level decision-making) (e3).

To measure income, information was sought about household net equivalent incomes weighted according to the needs of the members of the household, in accordance with the new OECD scale. This allows the financial advantage of shared costs in multi-person households to be taken into account.

In 2003, the median net equivalent monthly income was 1564 euros (e4). Taking this as a relative point of reference, the following income groups were defined: less than 60%, 60% to less than 100%, 100% to less than 150%, and 150% or more of the median income (15). According to poverty and wealth reporting guidelines, households with a net equivalent income of less than 60% of the median are at risk of poverty. The 150% threshold defines where relative prosperity begins.

Statistical analyses were carried out using the SPSS 17 for Windows package. Age- and sex-specific prevalences and the odds ratios derived from binary logistic regressions are given. To ensure statements were representative, the data were adjusted for the age, sex, and regional distribution of the general population, using weighting factors (18).

Results

In 2003, according to the findings of the Telephone Health Survey, around 17% of men over the age of 18 and 20% of women of the same age in Germany were obese. A marked increase in obesity with age can be seen in both sexes (Figure). Although the proportion of obese men and women is well under 5% in the youngest age group, by the time the 45- to 64-year-old age group is reached, every fourth man and every fourth woman have a BMI over 30. In the group aged 65 years and over, the prevalence of obesity drops slightly in men, but continues to rise in women (Figure).

How closely the occurrence of obesity is linked to social position is apparent from Table 1. Men and women in the lower educational, occupational, and income groups are much more frequently obese than those in the socially better-off groups. The only exception is among 18- to 29-year-old men, in whom there is no clear correlation between obesity and occupational status or income. The fact that the middle status groups

TABLE 1

Obesity prevalences by age, sex, and socioeconomic factors (data given as percentages)*¹

	Age	Education (n = 7801)			Occupational status (n = 6986)				Net equivalent income (n = 5903)			
		Low	Inter-mediate	High	Low	Simple	Inter-mediate	High	<60%	60 to <100%	100 to <150%	≥150%
Men	18–29 years	5.1	4.8	3.2	9.1	4.5	9.6	4.7	3.3	4.0	4.4	3.2
	30–44 years	22.0	15.2	11.2	23.9	20.9	13.3	11.5	20.5	17.4	12.1	9.1
	45–64 years	29.5	25.7	16.3	33.3	30.5	22.1	20.2	31.9	24.4	23.3	18.1
	≥ 65 years	26.3	19.4	16.0	28.6	33.3	25.5	15.5	30.9	24.8	18.8	19.4
	Overall	24.3	16.7	11.9	26.0	23.0	18.0	15.7	21.6	18.8	16.2	13.9
Women	18–29 years	7.9	6.0	1.9	10.0	9.1	4.7	5.0	4.8	4.4	2.8	2.6
	30–44 years	15.3	13.5	6.8	24.4	16.9	8.7	7.6	20.8	11.5	9.5	3.1
	45–64 years	36.3	21.1	17.6	43.0	35.9	22.8	19.9	38.8	32.5	23.2	13.2
	≥65 years	36.4	30.3	19.4	41.1	38.5	26.4	23.0	40.3	40.3	26.7	11.4
	Overall	31.4	17.3	10.1	36.4	28.3	16.7	15.2	25.6	23.3	17.4	8.7

*¹ The differences in n values are due to missing data

are usually less often affected by obesity than the low status groups, but more often than the high status groups, suggests the existence of a finely graduated social gradient. Obesity prevalence rates were also calculated for persons who gave no information about their occupational status and income. They lie in an intermediate zone, so selection of the valid values can be ruled out.

In order to consider the socioeconomic determinants together, binary logistic regressions were carried out with obesity as the dependent variable. The age-adjusted odds ratios shown in *Table 2* represent the odds of obesity occurring in the group under consideration compared with the reference group. In model 1 the influential variables are regarded separately, whereas in model 2 they are taken together. Thus, whereas in model 1 only the influence of age is considered, model 2 also controls for the other two status indicators, in order to quantify the effect of education, income, and occupational status alone. Regarded separately in model 1, all variables appear to be significant in both men and women. When the variables are regarded together and independently of each other, in men only education and occupational status are associated with increased risk of obesity. Thus, men with a low school education level have a risk of obesity that is increased by a factor of 1.5 compared with that of men with a school education to university entrance level. In respect of occupational status, the ratio of the odds between the low and the high groups is 1.6 (*Table 2*).

In women, in contrast to men, all three indicators of socioeconomic status are in inverse relation to the occurrence of obesity. Women with a low educational and occupational status are 1.7 times more often obese than women with a school education to university entrance level or with high occupational status. The effect of income is particularly noticeable. Thus, compared to

women in the high income group, the obesity risk of those on a low income is increased by a factor of 3. The findings also show increased occurrence of obesity among women in the middle income groups.

Discussion

In addition to genetic predisposition, the main contributors to overweight and obesity are low physical activity levels and faulty eating habits (5, 13, 22). The results presented here indicate in addition the importance of socioeconomic factors. The analysis according to the individual indicators of socioeconomic status (education, income, and occupational status) allows a more detailed picture to be given.

According to this analysis, women in Germany who have a lower level of school education, lower occupational status, and are in a lower income group appear to be excessively affected by obesity. In men there is a correlation between school education and occupational status on the one hand and obesity on the other. It is particularly striking that income has a strong effect for women, whereas for men income is unrelated to the presence of obesity.

In interpreting these results, it must be borne in mind that because of the cross-sectional design of the survey on which they are based, no conclusions can be drawn about causal relationships. In addition, it must be remembered that the prevalence of obesity based on self-reporting will be an underestimate compared to one based on measured values. Studies in which both self-reports and measurements were available have shown that people responding to surveys overestimate their height and underestimate their weight. In respect of deviation, age- and sex-specific differences have been determined. Social status evidently has no role in this respect, so it may be assumed that the results of the present study are not distorted (13).

TABLE 2

Correlation between socioeconomic factors and obesity (BMI \geq 30). Results of binary logistic regressions controlling for the influence of age (odds ratio [OR] with 95% confidence intervals, n = 7005)

	Men (n = 3322)				Women (n = 3683)			
	Model 1		Model 2		Model 1		Model 2	
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
School education								
Low	1.94	(1.56–2.41)	1.54	(1.19–1.98)	2.51	(1.97–3.21)	1.67	(1.26–2.20)
Intermediate	1.39	(1.10–1.76)	1.22	(0.95–1.56)	1.66	(1.29–2.13)	1.37	(1.05–1.79)
High	1	–	1	–	1	–	1	–
Occupational status								
Low	2.09	(1.53–2.87)	1.55	(1.09–2.20)	2.70	(2.01–3.64)	1.72	(1.24–2.40)
Simple	1.77	(1.29–2.17)	1.36	(1.05–1.76)	2.07	(1.58–2.72)	1.37	(1.02–1.85)
Intermediate	1.30	(1.04–1.63)	1.13	(0.89–1.43)	1.12	(0.87–1.43)	0.92	(0.71–1.18)
High	1	–	1	–	1	–	1	–
Net equivalent income								
<60%	1.99	(1.40–2.82)	1.38	(0.95–2.01)	4.70	(3.05–7.25)	2.97	(1.89–4.67)
60 to <100%	1.56	(1.17–2.07)	1.20	(0.88–1.62)	3.51	(2.35–5.24)	2.57	(1.70–3.87)
100 to <150%	1.26	(0.93–1.70)	1.08	(0.80–1.47)	2.38	(1.57–3.62)	1.99	(1.30–3.04)
\geq 150%	1	–	1	–	1	–	1	–

The predictors school education, equivalent income, and occupational status are regarded separately in model 1 and together in model 2

The results presented here are supported by the findings of international studies. In an early review, Sobal and Stunkard pointed up a strong inverse correlation among women in wealthy societies between social status and the occurrence of obesity (7). In a recent review, in 63% of the studies included (333 English-language studies, restricted to the developed countries), a negative correlation was determined between socioeconomic status and obesity for women (23); the same was true for men in only 37% of these studies. The fact that the effect of income is stronger for women but weaker or not significant for men agrees with the findings of comparable studies (23, 24).

Because of its increasing prevalence, and its relevance in respect of numerous related diseases, the fight against overweight and obesity is one of the top-priority goals of public health policy. Obesity is a chronic disease that can be largely avoided by preventive and health-promoting measures; once present, however, it requires long-term therapy (5). All the more important, therefore, to acquire knowledge about the determinants of obesity and develop target-group-specific preventive measures. Programs that aim one-sidedly at changing the behavior of obese persons sometimes do not go far enough. In comparison with individual prevention approaches, setting-oriented programs are better suited to influence a variety of social problem situations, environments that promote overweight, and socioculturally handed-down nutritional and exercise behaviors. Health scientists point out that in the context of the current sociopolitical engagement with the consequences of faulty nutrition and lack of exercise, “the social dimension of the overweight problem” is not given enough attention (25).

Although practical experience has shown how difficult it generally is to work towards behavioral changes that will lead to weight reduction, discoveries about the correlation between social status and obesity are also important for physicians. The present findings indicate that socially disadvantaged people who present with obesity should be made aware in a targeted manner about ways of losing weight and about a health-

promoting lifestyle. In doing so, it is particularly important to adapt the recommendations to the persons' everyday life in the light of their particular life circumstances.

Conflict of interest statement

The authors declare that no conflict of interest exists according to the guidelines of the International Committee of Medical Journal Editors.

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KEY MESSAGES

- The fight against obesity, especially by preventive means, is a high-priority goal of public health policy.
- In addition to unfavorable nutritional and exercise behaviors, socioeconomic factors are also closely correlated to the prevalence of obesity.
- Education, income, and occupational status are associated with the occurrence of obesity not only in a linked manner, but also independently of each other (with the exception of income in the case of men).
- Women on a low income especially have an above-average likelihood of being obese.
- The social dimension of the problem of overweight should be accorded greater significance in future.

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