

EVIDENCE BASED PUBLIC HEALTH POLICY AND PRACTICE

What determines public support of obesity prevention?

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Objective: To determine public support of obesity prevention.

Design: Representative population-based survey.

Setting: Random digit dialling telephone survey of non-institutionalised individuals aged ≥ 14 years in Germany.

Participants: Representative sample of 1000 individuals.

Main outcome measures: Interview-based assessment of prevention support, problem identification, causal attributions and responsibility beliefs regarding obesity.

Results: Support for obesity prevention with a focus on behavioural change in children (89.7%) and provision of information in adults (82.2%) was substantial, but regulations were less supported (42.2%). Predictors of prevention support were attributing causes of obesity to the food environment and lack of physical activity, greater problem identification, societal responsibility beliefs and sociodemographic characteristics including female gender and higher age. An information deficit concerning the definition, prevalence, and environmental and genetic risk factors was identified.

Conclusion: Results show a high public readiness for obesity prevention with a focus on individual behavioural change, but not for regulations. Addressing specific information deficits regarding the definition, prevalence and causes of obesity could further enhance the public's understanding of obesity and help to establish obesity prevention measures.

Currently, about 10–35% of the adult population in Western industrialised countries is obese, and prevalence rates are continually rising (<http://www.who.org>). Obesity is a major cause for medical morbidity and mortality, as well as for impaired quality of life.¹ Being a complex, multifactorial condition, probably resulting from an interaction between various environmental/behavioural and genetic factors, obesity is difficult to treat and is associated with substantial economic burden.^{2–4} Recently, the prevention of obesity has been considered a public health priority.^{5–6} Although previously it played only a minor role in building healthcare strategies in many countries, obesity prevention is now increasingly becoming a part of public health initiatives.⁷ At present, it is necessary to investigate public support of obesity prevention to inform current policy-making.

Previous survey investigations in the USA and Australia on public views about childhood obesity revealed varying degrees of support for prevention programmes.^{8–12} Interventions focusing on individual behavioural change, such as providing information about healthy eating and physical activity in schools, and some environmental interventions, mostly in the microenvironment (eg, increased marketing of healthy food in school cafeterias), were strongly supported. In contrast, macroenvironmental interventions, such as restriction of food advertisements during children's television programmes, generally garnered less support.^{9–10–12} The factors on which support of obesity prevention depends are largely unclear. Following the concept of community readiness, support may, beyond familiarity with potential preventive measures, depend on problem identification and knowledge about risk factors.¹³ Although associations between problem identification and prevention support have, to our knowledge, not yet been studied, initial results from one survey investigation on public views of child and adult obesity suggested that recognition of risk factors may indeed predict support of obesity prevention; however, operationalisation in this study was relatively nonspecific.¹⁴

As public support is key to sustained implementation of preventive measures, the overarching goal of the present study was to investigate public support for obesity prevention and its determinants, in order to identify potential starting points for enhancement of support. Public support was defined as individual agreement to obesity prevention measures in the population. The focus was on support for specific obesity prevention measures for both children and adults: as most prevention programmes have been developed for children, there are epidemiological, clinical, economical and ethical reasons to emphasise obesity prevention in adults.¹⁵ In this context, the main research questions of the present study: How is the public support of obesity prevention measures in children and adults? To what degree is obesity identified as a health problem? To which causal factors is obesity being attributed? Who is assumed to be responsible for the solution of the obesity problem? What are the determinants of prevention support?

METHODS

Sampling

The survey investigation was conducted in August 2005 by USUMA, an institute specialising in market, opinion and social research. Sampling was based on the random digital dialling methodology using the drawing base of the Association of German Market and Social Research Agencies that includes both registered and unregistered telephone numbers.¹⁶ Within a randomly selected household, a target person was chosen according to the last birthday method for permanent residents. A computer-assisted telephone interviewing procedure was used for data collection. Up to six calls were made for establishment of initial contact with a household and further contact with a target person to conduct the interview. This study met the ethical guidelines of the International Code of Marketing and Social Research Practice by the International

Abbreviations: BMI, body mass index; PCA, principal components analyses

Chamber of Commerce and the European Society for Opinion and Marketing Research (<http://www.eqomar.org>).

Sample

Following the above procedure, 1836 non-institutionalised civilian individuals were randomly selected from all states of Germany. Out of the 1836 individuals, 583 (31.8%) could not be reached by telephone, 157 (8.6%) refused to complete the interview, 96 (5.2%) were excluded because of incomplete interviews and 1000 individuals completed the interview corresponding to a response rate of 54.4%. After weighting, data were representative of the German population aged ≥ 14 years regarding age, sex and state of residence, according to the Federal Statistical Office population data.

Sample characteristics are presented in table 1. The study sample consisted of 431 men and 569 women (43.1% and 56.9%, respectively). Participants were on average 45.9 years old (SD 17.9) and had a mean body mass index (BMI, kg/m^2) of $24.5 \text{ kg}/\text{m}^2$ (SD 4.1). According to the guidelines of the National Institutes of Health, 29.2% of participants were classified as overweight and 9.1% as obese (BMI $25.0\text{--}29.9 \text{ kg}/\text{m}^2$ and $\geq 30.0 \text{ kg}/\text{m}^2$, respectively).¹⁷ These rates are lower than current prevalence rates of overweight and obesity in adults (40.7% and 18.1%, respectively); this is probably because of underestimation of body weight, which is inherent in self-report assessments.^{11 18}

Assessments

A structured interview was constructed on the basis of the current literature for the assessment of problem identification, causal attributions, support of obesity prevention and responsibility. Items are presented in table 2.

Problem identification

Problem identification was operationalised through six statement-format items on problem awareness, prevalence, comorbidity and chronicity (eg, "Obesity increases the risk for diseases such as diabetes or cancer"). Level of agreement with items was assessed using five-point rating scales ranging from 1 = disagree completely to 5 = agree completely. For all other items, percentage estimates were obtained (eg, "What proportion (%) of participants in behavioural weight loss programmes can maintain their weight lost over the course of 4 years?").

Causal attributions

Causal attributions were assessed through 11 items on behavioural, other environmental and genetic risk factors—for example, "Lack of facilities for outside physical activity" (five-point rating scales, 1 = disagree completely to 5 = agree completely).

Support of obesity prevention

For assessment of support of obesity prevention, 11 items were constructed covering a range of behavioural and environmental measures of prevention (eg, "Classes about healthy eating and physical activity by health insurance providers"; 1 = disagree completely to 5 = agree completely).

In addition, readiness for financial support was assessed through the item "For financing preventive measures, how much money would you be willing to spend more per year, eg, in the form of insurance fees or taxes?" (response categories, table 2). Further, responsibility was operationalised through the item "Is obesity a problem that needs to be solved by the individual or by the society?" (1 = completely by the individual to 5 = completely by the society).

The structured interview was pilot tested and performed by trained personnel. In addition to the response categories described above, a "no response" code was used if the interviewee felt unable to answer a question.

Data analytic plan

As a preparatory step, principal components analyses (PCA) with orthogonal VARIMAX rotation were separately performed on the problem identification, causal attribution and prevention support items for the purposes of data reduction (extraction criterion of $\lambda > 1$).

For further analysis, mean factor scores were computed. An overall prevention support composite was calculated as the average of the mean prevention factor scores. For descriptive purposes, percentage agreement to items, factors and prevention support composite was calculated (dichotomised agreement: 1, 2, 3 (or values < 3.50) were coded into 0 = no definite agreement/support, and 4, 5 (or values ≥ 3.50) into 1 = definite agreement/support). "No response" codes (see Assessments) were treated as missing values.

Stepwise multiple regression analysis was used for prediction of support of obesity prevention using the continuous prevention support composite as outcome variable. Regression analyses controlled for age, BMI (both continuous), gender, education, household income, region of residence and familial obesity (all categorical, table 1). Control variables were entered in step 1. Subsequently, mean factor scores of problem identification factors (step 2), causal attribution factors (step 3) and responsibility (step 4) were entered into the multiple linear regression equation. Effect size of prediction was evaluated according to Cohen's classification of R^2 (small effect: $R^2 > 2.0\%$, moderate: $R^2 > 13.0\%$, large: $R^2 > 26.0\%$).¹⁹ To determine whether predictors of obesity prevention support varied by specific sociodemographic characteristics, odds ratios (ORs) were computed and tested for significance using the

Table 1 Sociodemographic characteristics (n = 1000)

	n (%*)
Gender	
Female	569 (56.9)
Male	431 (43.1)
Age (years)	
14–29	214 (21.4)
30–44	270 (27.0)
45–59	231 (23.1)
≥ 60	285 (28.5)
Weight status [†]	
Obesity, BMI $\geq 30.0 \text{ kg}/\text{m}^2$	88 (9.1)
Overweight, BMI $25.0\text{--}29.9 \text{ kg}/\text{m}^2$	283 (29.2)
Familial obesity [‡]	307 (31.2)
Highest educational degree [§]	
Low	650 (65.5)
High	342 (34.5)
Household income [¶]	
$< \text{€}2000$ (US\$2634.44, £1346.07)	361 (41.1)
$\geq \text{€}2000$ (US\$2634.44, £1346.07)	518 (58.9)
Residence	
Eastern part of Germany	185 (18.5)
Western part of Germany	815 (81.5)

BMI, body mass index.

*Calculation of % from valid cases (n).

[†](n) = 969.

[‡]At least one obese first-degree relative; (n) = 992.

[§]Low: no school degree or < 13 years of education; high: 13 years of education or university degree; (n) = 992.

[¶]Net household income per month; (n) = 879.

Table 2 Agreement with problem identification, causal attributions and prevention support (n = 1000)

	Agreement*	
	n (% [†])	(n) [‡]
Problem identification		
Significance	808 (81.5)	(992)
Obesity is one of the major health problems in Germany	765 (76.6)	(999)
Obesity increases the risk for diseases such as diabetes or cancer	850 (86.3)	(986)
	% Estimates	(n) [‡]
	Mean (SD)	
Prevalence	37.9 (17.7)	(988)
What proportion (%) of the adult population in Germany is obese?	39.2 (17.8)	(987)
What proportion (%) of the children in Germany is obese?	36.5 (17.5)	(989)
Modifiability	18.6 (13.7)	(935)
On average, how much of their body weight (%) can participants in behavioural weight loss programmes reduce?	15.8 (9.5)	(911)
What proportion (%) of participants in behavioural weight loss programmes can maintain their weight lost over the course of 4 years?	21.3 (17.8)	(958)
Causal attributions		
	Agreement*	(n) [‡]
	n (% [†])	
Activity environment	235 (23.6)	(999)
Lack of sport programmes	161 (16.1)	(1000)
Lack of facilities for outside physical activity	309 (31.0)	(998)
Activity behaviour	820 (82.4)	(996)
Lack of physical activity	953 (95.7)	(996)
Too much TV-watching or playing computer games	757 (76.1)	(994)
Parents who do not care enough for their children's healthy eating and physical activity	751 (75.3)	(998)
Food environment	536 (53.8)	(997)
Advertisement for unhealthy food	539 (54.3)	(992)
Unhealthy food in fast food restaurants or cafeterias	800 (80.0)	(999)
Healthy food is too expensive	269 (27.0)	(999)
Eating behaviour	721 (72.8)	(986)
Binge eating	631 (64.2)	(982)
Eating too much	811 (81.4)	(995)
Heredity	342 (34.9)	(981)
Support of prevention		
Total support of prevention [§]	709 (71.4)	(993)
Information	817 (82.2)	(994)
Campaigns for healthy eating and physical activity	854 (85.7)	(996)
Information campaigns about health risks of obesity, eg, diabetes or cancer	898 (90.3)	(994)
Classes about healthy eating and physical activity by health insurance providers	843 (84.7)	(995)
Establishing nutritional labelling of foods	672 (68.0)	(989)
Regulation	421 (42.4)	(994)
Restricting advertisement for unhealthy food, eg, sweets or chips	474 (47.7)	(995)
Raising taxes on unhealthy food, eg, fast food	265 (26.7)	(992)
Banning unhealthy food in schools, eg, sweets, pastry or soda	525 (52.8)	(994)
Childhood prevention	888 (89.7)	(991)
More physical activity classes in schools	822 (83.1)	(990)
More voluntary sports programmes in schools	888 (90.4)	(983)
Educate parents to better care for their children's healthy eating and physical activity	911 (91.6)	(995)
School curriculum about healthy eating and physical activity	930 (93.5)	(995)
For funding preventive measures, how much money would you be willing to spend more per year, eg, in the form of insurance fees or taxes?		(981)
€0 (US\$0, £0)	388 (39.5)	
€1–20 (US\$1.31–26.34, £0.67–13.46)	254 (25.9)	
€21–50 (US\$27.65–65.85, £14.14–33.65)	223 (22.7)	
€51–100 (US\$67.16–131.72, £34.33–67.31)	77 (7.9)	
>€100 (US\$131.72, £67.313)	39 (3.9)	
Societal responsibility for the solution of the obesity problem	99 (10.0)	(996)

*Dichotomised scores (0 = no definite agreement/support; 1 = definite agreement/support).

[†]Calculation of % from valid cases.[‡](n) valid cases.[§]Prevention support composite.

Mantel–Haenszel test. For this analysis, dichotomised socio-demographic variables were used (reference categories listed first: age (≥ 45 years, < 45 years; median split), gender (women, men), education (high, low), obese weight status (≥ 30.0 kg/m², < 30.0 kg/m²), familial obesity (more than one obese first-degree relative, no obese first-degree relative), net household income per month ($\geq \text{€}2000$ (US\$2634.44, £1346.07) 2000; $< \text{€}2000$) and residence (western part,

eastern part)). A two-tailed α of 0.01 was applied for all statistical tests.

RESULTS

Problem identification, causal attributions and support of obesity prevention: preparatory analyses

PCA on the six problem identification items resulted in a three-factor solution accounting for 68.8% of the total item variance

Table 3 Multiple linear regression analysis: prediction of support for obesity prevention (n = 1000)

Prediction of prevention support	B	SE	β	t test	p Value	R ²
Age, years	0.01	0.00	0.15	5.02	<0.001	3.3
Gender, female	0.08	0.04	0.06	2.12	0.034	4.5
Residence, western part of Germany	-0.19	0.05	-0.12	-3.92	<0.001	5.4
Problem identification: significance of obesity	0.12	0.03	0.15	4.82	<0.001	9.4
Causal attributions: food environment	0.26	0.02	0.39	12.50	<0.001	26.8
Causal attributions: activity behaviour	0.08	0.03	0.08	2.57	0.010	27.4
Responsibility for the solution of the obesity problem: societal responsibility	0.09	0.02	0.14	4.49	<0.001	29.2
Constant	1.78	0.17				

β , standardised regression coefficient; B, unstandardised regression coefficient; R², adjusted multiple R² (cumulative); SE, standard error. Outcome variable: prevention support composite (1 = disagree completely to 5 = agree completely).

(primary loadings ≥ 0.74 ; cross-loadings ≤ 0.17). Factors were labelled prevalence, modifiability and significance (explained variance: 28.0%, 20.9% and 19.9%, respectively; table 2). For the 11 causal attribution items, PCA produced a five-factor solution (total variance explanation: 60.3%; primary loadings ≥ 0.49 , cross-loadings ≤ 0.26). Factors were labelled activity environment, activity behaviour, food environment, eating behaviour and heredity (explained variance: 13.0%, 12.9%, 12.7%, 11.8% and 9.9%, respectively; table 2). Concerning the 11 items on support of obesity prevention, PCA produced a three-factor solution accounting for 53.4% of the total item variance. Items had salient primary loadings of ≥ 0.60 and low cross-loadings ≤ 0.32 , with one exception: the item "School curriculum about healthy eating and physical activity" had almost equal loadings on two factors (factor I: 0.48 vs factor III: 0.43). To enhance interpretation, this item was added to the third factor. According to the pattern of loadings, factors were labelled information, regulation and childhood prevention (explained variance: 21.3%, 16.7% and 15.5%, respectively; table 2). Detailed PCA tables are available on request.

Problem identification

As presented in table 2, 76.6% of the population perceived obesity as one of the major health problems; 86.3% were aware that obesity increases the risk of certain chronic diseases such as diabetes or cancer. Participants assumed that obesity occurred in 39.2% of adults and 36.5% of youth and thereby overestimated current prevalence rates (adults: 18.1%, youth: 4–8%).^{17–20} Concerning the modifiability of body weight, participants slightly overestimated the average percentage of weight loss that participants in behavioural weight loss programmes can achieve (15.8% vs 7–10%), but adequately estimated the average proportion of participants able to maintain weight loss over the course of 4 years (21.3% vs 20%).^{21–22}

Causal attributions

The most prevailing causal attributions were lack of activity behaviour (82.4%) and eating behaviour characterised through overeating (72.8%; table 2). In contrast, the obesogenic food and activity environment and genetic factors were considered to be less important in their contribution to the development of obesity (23.6–53.8%).

Support of obesity prevention

As presented in table 2, obesity prevention was supported by 71.4% of participants. The strongest support was found for childhood prevention (89.7%) and for prevention based on information (82.2%). In contrast, regulation was supported by 42.4% of participants. Concerning financial support of obesity prevention, 25.9% of participants were willing to spend €1–20 (US\$1.31–26.34, £0.67–13.46) more per year for obesity

prevention; 34.5% were willing to spend more than €20 (US\$26.34, £13.46) more per year for preventive purposes. Regarding responsibility for a solution to the obesity problem, 38.3% assumed an individual responsibility, 10.0% assumed a societal responsibility and 51.8% assumed both.

Prediction of prevention support

As presented in table 3, the final regression equation for the prediction of prevention support retained seven variables, accounting for a total of 29.2% of the variance, which indicates a large prediction effect ($F(7, 773) = 46.83, p < 0.001$). Causal attribution of obesity to the food environment showed the greatest positive contribution to explanation of variance (17.4%, indicative of a moderate effect size); further significant predictors of greater prevention support were sociodemographic characteristics (ie, higher age, female gender, residence in the eastern part of Germany), a greater perceived significance of obesity, stronger societal responsibility for solution of the obesity problem and more causal attribution of obesity to lack of activity behaviour.

Sociodemographic determinants of predictors of prevention support

Analyses of the sociodemographic determinants of predictors showed less causal attribution to the food environment in men (OR 0.56, 95% CI 0.43 to 0.72, $p < 0.001$), less attribution to activity behaviour in those with lower income (OR 0.59, 95% CI 0.40 to 0.86, $p = 0.009$), greater attribution to activity behaviour in older participants (OR 1.70, 95% CI 1.18 to 2.45, $p = 0.004$) and greater societal responsibility for the solution of the obesity problem in those living in the eastern part of Germany (OR 0.54, 95% CI 0.38 to 0.77, $p = 0.001$) and in those with lower age (OR 1.64, 95% CI 1.27 to 2.12, $p < 0.001$). There was no further significant association between predictors and sociodemographic characteristics (all $p > 0.01$).

DISCUSSION

The present study sought to investigate public support for and determinants of obesity prevention in a representative population-based sample. Overall, obesity prevention was supported by the majority of the population. Consistent with previous research, there was a consensus in favour of prevention of childhood obesity^{8–12}; in addition, our study highlighted substantial support of information-based prevention targeting the adult population. Less support was found for regulative environmental interventions.^{9–10–12} In summary, the results show a high public readiness for obesity prevention with a focus on individual behaviour change, but not for prevention with a focus on regulation and restriction. Of note, readiness for financial support was considerable: 60.5% of the population was willing to spend at least some extra money per year for

obesity prevention; one-third of participants was willing to spend even more than €20 (US\$26.34, £13.46) per year.

New insights were gained into the determinants of prevention support. According to our expectations, causal attributions of obesity were particularly important predictors for prevention support. Most of the variance of prevention support was explained by causal attributions to the food environment. Women regarded such influences as more potent than men, possibly because they are traditionally more involved in feeding than men. A further predictor of prevention support was causal attribution to a lack of physical activity. It is important to note that, although obesity was mainly attributed to behavioural factors, environmental and genetic risk factors were considered only by a minority of participants. Apparently, recent research demonstrating major environmental and genetic influences on the development of obesity has hardly been received by the public.^{23–24} However, greater consideration of both environmental and genetic factors could impact prevention support—for example, in favour of environmental or regulative measures.¹⁴ Further significant predictors of prevention support were, as expected, perceived significance of obesity and societal responsibility for a solution to the obesity problem. Moreover, consistent with previous findings, the sociodemographic characteristics of higher age and female gender,^{10–11–14} and, plausibly, residence in the eastern, former socialist, part of the country emerged as significant predictors.

Overall, our results suggest a high level of problem identification. Extending previous research,^{9–10–12–14} it was detailed that most participants recognised obesity as a major health problem, were familiar with obesity-related sequelae and only slightly overestimated modifiability of body weight through behavioural weight loss. However, participants largely overestimated prevalence rates of obesity: they did not seem to distinguish overweight from obesity, and the definition of obesity as “very overweight” or “excess body fat” that was repeatedly given by assessors throughout the interview was apparently not sufficient to promote an accurate understanding of the obesity concept.

The results provide several clear implications for policy-making. Policy-makers can build on substantial support for childhood obesity prevention and information interventions, although acceptance of regulations is low. As support of obesity prevention largely depends on causal attributions and as the aetiological importance of environmental and genetic factors is not sufficiently recognised, it seems particularly relevant to promote communication of research findings on environmental and genetic factors to the public. Furthermore, education on the definition of obesity is clearly indicated. Specifically, education on the role of physical inactivity for the development of obesity should be directed to those with lower socioeconomic status and younger age. Prevention programmes may further need to be carefully introduced to men and younger people. Finally, societal responsibility, emerging as a major determinant of prevention, could be strengthened and utilised when prevention measures are implemented.

The results need to be interpreted with due consideration to the strengths and limitations of the present study. The strengths include addressing timely and important questions in the context of current public health initiatives on obesity prevention. Compared with previous survey investigations that concentrated on childhood prevention, our study comprehensively focused on obesity prevention in both children and adults, and placed emphasis on assessment of support for specific prevention measures to provide valuable information for policy-making. Use of PCAs allowed for structuring results across multiple specific items. It needs to

What this paper adds

- Previous survey investigations on public views of childhood obesity showed varying levels of support for obesity prevention. It was largely unclear which factors account for prevention support in obesity.
- The present study shows strong support for prevention measures focusing on individual behaviour change in both children and adults, but less support for regulations.
- Prevention support was largely determined through causal attributions and problem identification, for which an information deficit was identified.

Policy implications

- Policy-makers can build upon substantial support for childhood obesity prevention and information interventions in adults.
- Addressing specific education needs on problem identification and risk factors of obesity could enhance the public’s understanding of this complex condition and help to establish obesity prevention.

be noted, however, that, as with most surveys, the interview was not evaluated for test-statistic properties in an independent sample. Furthermore, this investigation was conducted in a sample representative of age, sex and state of residence. Although many precautions for avoiding sampling biases have been undertaken (eg, random digit dialling methodology, coverage of non-registered telephone numbers, structured computer-assisted telephone interviewing) and although our study yielded a response rate comparable to other representative health surveys,¹⁷ lower socioeconomic groups that usually have higher obesity risk were probably under-represented, as shown in a comparison with population data from the Federal Statistical Office regarding net household income and education. It would, however, be desirable to specifically assess knowledge about obesity and prevention support in these groups, as they are the main target groups of prevention.

Overall, our results indicate that the population is ready for obesity prevention. Addressing specific information needs regarding the definition, prevalence and causes of obesity could further enhance the public’s understanding of this prevalent and complex condition and help to establish sustainable preventive interventions.

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