Trends in body mass index and prevalence of obesity in Swedish men 1980–89

Alicja Kuskowska-Wolk, Reinhold Bergström

Abstract

Study objective—To assess changes in the body mass index (BMI, weight (kg)/height² (m²) and in the prevalence of obesity in Swedish men during the 1980s.

Design—Data from two successive cross sectional surveys were used.

Setting—The whole of Sweden.

Participants—Subjects included in the analyses were 7055 men from a 1980–81 survey (response rate 83.4%) and 6081 men from a 1988–89 survey (response rate 79%). Men were aged 16–84 years and were a representative sample of Swedish males.

Measurements and main results—The results were based on self reported weight and height obtained during interview. After adjustment for sociodemographic variables, a significant increase in the mean BMI of the entire population of men was found between 1980–81 and 1988–89 (0.23 kg/m²; $p < 0.001$), with a particularly large increase in the 25–34 year age group (0.45 kg/m²; $p < 0.0001$) which corresponds to 1.4 kg for a man 180 cm tall). In manual workers this value was 0.25 kg/m² ($p < 0.0005$). This increase was also reflected by a significant relative increase in the prevalence of the combination of overweight and obesity (BMI > 25 kg/m²) of about 19% (odds ratio=1.19, 95% confidence intervals: 1.09, 1.29).

Conclusions—During the 1980s the mean BMI and the prevalence of overweight and obesity among adult Swedish men increased.

however, have been weaker, more variable, and less consistent.^{6 18–22 24–29 31–35}

Data from two successive cross sectional surveys were used to study changes in the BMI and prevalence of obesity in Swedish men between 1980–81 and 1988–89. Adjustments were made for possible differences in age, education, socio-economic class, geographical region, and nationality, between these two study periods. The relations between sociodemographic variables and BMI and the prevalence of obesity are also presented.

Methods

Data from two national surveys on living conditions—Undersökning av Levnadsförhållande (ULF) 1980–81 and ULF 1988–89—were used for the analyses. These surveys were designed and conducted by Statistics Sweden (the official statistical organisation). Questions about weight and height were included among about 200 other questions covering many aspects of living conditions. Nationally representative samples of Swedish men aged 16–84 years who resided permanently in Sweden were chosen for each survey.

The procedure for data collection was the same in 1980–81 and 1988–89, and most of the data were collected during a personal visit by an interviewer. Some interviews were performed by telephone when there was no reply or when the interviewee requested it.

Weight and height were self reported by subjects, without an objective check by the interviewer, although the latter would have reacted in the event of an obvious discrepancy between the observed stature and the reported values.

The validity and reproducibility of these self reports on weight and height have been studied and previously reported.^{36–37} The response rate in 1980–81 was 83.4% and in 1988–89 it was 79%. The number of study subjects, broken down by sociodemographic group and year of the survey, is presented in table I. Details of the surveys are given elsewhere.³⁷

We computed the body mass index (BMI) using the widely accepted method of weight (kg) divided by the square of height (m²).³⁸ The criteria recommended by the FAO/WHO/UNU expert consultation in 1985 were used to assess the prevalence of obesity in Swedish men.³⁹ The cut off points for BMI were as follows:

BMI=25–30 kg/m²—overweight (obesity grade I⁴⁰);

BMI > 30 kg/m²—obesity (obesity grade II and upwards⁴⁰).

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Information programmes and treatment of obesity are common in many countries. The effectiveness of these preventive methods in an entire population—that is, in different sociodemographic groups—is of great interest since obesity is associated with a number of medical and psychosocial complications.^{1 2} Higher rates of mortality among obese subjects have also been reported.^{3–5} It is therefore important to investigate trends over time in the body mass index (BMI) and in the prevalence of obesity in different countries. Changes in the BMI and the prevalence of obesity over time in men have recently been investigated in the USA,^{6–10} Italy,¹¹ Finland,¹² Denmark,^{13 14} The Netherlands,¹⁵ and Czechoslovakia.¹⁶ In Sweden, there is no information on these trends. Earlier studies have reported an inverse relation between sociodemographic status and obesity in women.^{17–30} The associations found between sociodemographic factors and obesity in men,

Cancer Epidemiology Unit, University Hospital, S751 85 Uppsala, Sweden
A Kuskowska-Wolk
R Bergström
Health Behaviour Research, Karolinska Institute, Stockholm, Sweden
A Kuskowska-Wolk
Department of Statistics, Uppsala University, Uppsala, Sweden
R Bergström

Correspondence to:
Dr A Wolk

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STATISTICAL METHODS
In the analyses with BMI in a continuous form, the standard regression model was used. This model made it possible to estimate the effects of each

Table I Body mass index in nationally representative samples of Swedish men by age group, education, socioeconomic group, region, and nationality for two study periods, 1980–81 and 1988–89 (mean (SD)).

Characteristics	Body mass index (kg/m ²)					
	1980–81			1988–89		
	No	Mean	(SD)	No	Mean	(SD)
Age group (y):						
16–24	1117	22.20	(2.54)	998	22.27	(2.76)
25–34	1291	23.48	(2.78)	1032	23.89	(2.85)
35–44	1195	24.45	(2.92)	1122	24.59	(3.02)
45–54	847	25.12	(3.04)	976	25.23	(3.19)
55–64	936	25.39	(3.18)	683	25.69	(3.33)
65–74	785	25.20	(3.19)	782	25.30	(3.20)
75–84	884	24.70	(3.18)	488	24.64	(3.28)
Total 16–84	7055	24.24	(3.15)	6081	24.41	(3.25)
Education:						
Elementary school, ≤9 y	2719	24.49	(3.41)	2254	24.62	(3.50)
High school, 10–11 y	1580	24.09	(3.00)	1754	24.48	(3.28)
After high school 12–14 y	1417	23.87	(2.77)	1506	24.25	(2.95)
University, >14 y	449	23.48	(2.73)	556	23.74	(2.73)
Unspecified*	884	24.70	(3.18)	—	—	—
Socioeconomic group:						
Manual workers	3306	24.51	(3.18)	2698	24.72	(3.38)
Junior salaried employees	541	24.31	(3.13)	573	24.45	(2.94)
Intermediate salaried employees	904	24.11	(2.78)	874	24.22	(2.98)
Senior salaried employees and self employed professionals	699	24.01	(2.79)	730	24.30	(2.91)
Farmers	593	24.87	(3.23)	505	25.16	(3.18)
Entrepreneurs	427	25.00	(3.12)	213	25.21	(3.15)
Students	464	21.55	(2.38)	425	21.75	(2.63)
Region:						
H ₁ Stockholm	1192	23.75	(3.10)	986	24.00	(3.34)
H ₂ Gothenburg and Malmö	933	24.34	(3.28)	850	24.34	(3.36)
H ₃ Large municipalities	2201	24.30	(3.19)	2012	24.32	(3.06)
H ₄ Southern/central Sweden, excluding 1–3	1676	24.41	(3.14)	1374	24.68	(3.28)
H ₅ Northern densely populated area	547	24.18	(2.98)	443	24.43	(3.26)
H ₆ Northern sparsely populated area	506	24.39	(2.91)	416	25.05	(3.44)
Nationality:						
Native born Swedish	6288	24.25	(3.12)	5345	24.40	(3.22)
Second generation immigrants	242	23.32	(3.25)	276	23.86	(3.35)
Naturalized immigrants	226	24.67	(3.23)	244	25.02	(3.32)
Foreign nationals	295	24.27	(3.46)	206	24.63	(3.63)

*In the 1980–81 study, men older than 74 years were not asked about their education

Table II Influence of different variables on the body mass index of Swedish men (regression parameter estimates with standard errors).

Variables	Estimate	Standard error	p value
Intercept	22.36	0.11	
Study 1980–91 (ref)			
Study 1988–89	0.23	0.06	0.001
Age group (y):			
16–24 (ref)			
25–34	1.21	0.10	0.0001
35–44	2.07	0.10	0.0001
45–54	2.65	0.11	0.0001
55–64	2.97	0.11	0.0001
65–74	2.59	0.11	0.0001
75–84	1.88	0.16	0.0001
Education:			
Elementary school, ≤9 y (ref)			
High school, 10–11 y	−0.10	0.07	0.1767
After high school, 12–14 y	−0.27	0.08	0.0007
University, >14 y	−0.96	0.13	0.0001
Socioeconomic group:			
Manual workers (ref)			
Junior salaried employees	−0.31	0.10	0.0017
Intermediate salaried employees	−0.43	0.09	0.0001
Senior salaried employees and self employed professionals	−0.29	0.11	0.0103
Farmers	0.09	0.10	0.3859
Entrepreneurs	−0.06	0.13	0.6101
Students	−1.37	0.13	0.0001
Regions:			
H ₁ Stockholm (ref)			
H ₂ Gothenburg and Malmö	0.43	0.10	0.0001
H ₃ Large municipalities	0.35	0.08	0.0001
H ₄ Southern/central Sweden, excluding 1–3	0.43	0.09	0.0001
H ₅ Northern densely populated areas	0.38	0.12	0.0011
H ₆ Northern sparsely populated areas	0.62	0.12	0.0001
Nationality:			
Native born Swedish (ref)			
Second generation immigrants	0.27	0.14	0.0481
Naturalised immigrants	0.30	0.14	0.0355
Foreign nationals	0.51	0.14	0.0002

(ref)=reference group

explanatory variable—study period, age, education, socioeconomic group, region, and ethnic origins—after adjustment for the effects of the other variables. The explanatory variables were used in categorical or categorised form. In the regression models, each variable was represented by suitably chosen dummy variables in such a way that one of the categories of each variable served as the reference category (period 1980–81, age group 16–24 years, etc as shown in table II). The estimated parameters show the differences with regard to this reference group. Thus, the parameter 0.23 in table II suggests that after adjustment for the effects of other variables the BMI was 0.23 units higher in the time period 1988–89 than in 1980–81.

In the analyses of the proportion of overweight and obesity, the logistic regression model, estimated by the maximum likelihood method, was used. If the proportion of overweight and obesity (or obesity only) is represented by P, this model assumes that the logarithm of the odds (P/(1-P)) of being, for example, obese is a linear function of the explanatory variables. From the estimated parameters of this model, odds ratios (ORs) were computed.

The OR of, for example, obesity in 1988–89 compared with 1980–81 is defined as (P₁/(1-P₁))/(P₀/(1-P₀)) where P₀ and P₁ represent the risks of being obese in 1980–81 and 1988–89, respectively. The OR is a measure of the relative risk (RR) of being obese and is close to the RR when the absolute risks are reasonably small. When the RR is larger than 1, the OR is always larger than the RR, and for large absolute risks the difference can be considerable (with P₁=0.5 and P₀=0.4 the RR=1.25 and the OR=1.50) This should be kept in mind when the OR values are interpreted. In very general terms the OR of 1.15

Table III Effect of the time period on the body mass index (BMI) of Swedish men in different age groups after adjustment for the effect of education level, socioeconomic group, region, and nationality. The intercept shows the mean BMI (kg/m²) for an individual in the reference group in 1980–81. The slope parameter shows the difference in BMI between 1980–81 and 1988–89.

Age group (y)	Intercept	(SE)	Slope	(SE)
16–24	22.27	(0.20)	−0.03	(0.12)
25–34	23.62	(0.21)	0.45	(0.12)*
35–44	25.02	(0.20)	0.23	(0.12)
45–54	25.00	(0.24)	0.21	(0.15)
55–64	24.87	(0.24)	0.27	(0.16)
65–74	24.89	(0.26)	0.14	(0.16)
75–84	24.34	(0.27)	0.16	(0.21)
Total 16–84	24.37	(0.09)	0.26	(0.06)*

*p<0.0001

Table IV Effect of the time period on the body mass index (BMI) of Swedish men in different socioeconomic groups after adjustment for the effect of age, education, region, and nationality. The intercept shows the mean BMI for an individual in the reference group in 1980–81. The slope parameter shows the difference in BMI between 1980–81 and 1988–89.

Socioeconomic groups	Intercept	(SE)	Slope	(SE)
Manual workers	22.42	(0.17)	0.25	(0.09)*
Junior salaried employees	22.46	(0.38)	0.08	(0.18)
Intermediate salaried employees	21.75	(0.35)	0.21	(0.14)
Senior salaried employees and self employed professionals	23.72	(0.67)	0.29	(0.15)
Farmers	22.60	(0.61)	0.28	(0.21)
Entrepreneurs	24.31	(1.45)	0.20	(0.33)
All socioeconomic groups	21.76	(0.10)	0.22	(0.06)†

*p<0.005; †p<0.0001

for the period 1988–89 (table VI) means that the RR of becoming obese was 15% higher in 1988–89 than in 1980–81. When comparing 1980–81 with 1988–89 we shall sometimes use the expression 'trend' in BMI. It should be kept in mind, however, that only two observation points are available and we cannot say whether this is a trend in the true sense of the word.

In all of the regression analyses, the actual sample values were used without any weighting of the observations.

Results

EIGHT YEAR TRENDS IN MEAN BMI

The crude mean BMI increased by 0.17 kg/m² between 1980–81 and 1988–89 (table I). After adjustment for such sociodemographic variables as age, education, socioeconomic group, region, and ethnic origin, the difference increased to 0.23 kg/m² ($p < 0.001$) (table II). This is a 1% increase over the eight year period. For a man with an average height of 180 cm, the increase corresponds to over 0.7 kg. Table III shows the eight year trends in mean BMI for each age group separately. The greatest increase, seen in the 25–34 year age group, was 0.45 kg/m² ($p < 0.0001$), which corresponds to 1.4 kg for a man of average height. In the various socioeconomic groups, workers showed a significantly higher BMI in 1988–89 than in 1980–81 (0.25 kg/m²; $p < 0.005$). The point estimates for the increase in mean BMI among senior salaried employees and farmers were even higher, but they did not reach statistical significance because of the smaller number of observations (table IV).

Table V Prevalence of individuals with body mass index (BMI) > 25 kg/m² and with BMI > 30 kg/m² in nationally representative samples of Swedish men by age group, education, socioeconomic group, region, and nationality for two study periods 1980–81 and 1988–89.

Characteristics	BMI > 25 kg/m ²		BMI > 30 kg/m ²	
	1980–81 (%)	1988–89 (%)	1980–81 (%)	1988–89 (%)
Age group (y):				
16–24	11.4	13.1	1.5	1.1
25–34	23.9	28.7	2.9	2.8
35–44	35.7	38.5	4.5	6.1
45–54	45.6	47.7	6.1	7.2
55–64	50.2	54.0	7.7	8.8
65–74	49.3	50.3	7.8	7.2
75–84	41.5	41.0	5.6	6.5
Total 16–84	35.0	37.4	4.9	5.3
Education:				
Elementary school, ≤ 9 y	40.9	41.8	6.3	6.9
High school, 10–11 y	31.8	38.9	4.2	5.0
After high school 12–14 y	29.3	32.9	3.3	4.8
University, > 14 y	22.9	29.0	2.8	1.8
Unspecified	41.5	—	5.6	—
Socioeconomic group:				
Manual workers	38.9	41.1	5.4	6.4
Junior salaried employees	34.4	37.1	4.9	5.0
Intermediate salaried employees	31.0	33.3	3.7	3.8
Senior salaried employees and self employed professionals	28.6	35.3	3.3	4.0
Farmers	44.6	47.4	7.9	8.1
Entrepreneurs	48.7	52.1	5.9	6.3
Students	10.6	13.0	2.0	1.4
Region:				
H ₁ Stockholm	27.6	31.4	4.0	5.2
H ₂ Gothenburg	35.9	36.1	5.7	5.5
H ₃ Large municipalities	36.3	38.1	5.5	4.2
H ₄ Southern/central Sweden, excluding 1–3	37.1	40.2	4.7	6.2
H ₅ Northern densely populated area	36.1	36.3	3.6	5.6
H ₆ Northern sparsely populated area	37.4	46.5	4.6	8.2
Nationality:				
Native born Swedish	35.1	37.1	4.7	5.4
Second generation immigrants	25.2	34.4	4.6	3.1
Naturalised immigrants	42.0	43.7	7.7	6.6
Foreign nationals	34.6	40.5	6.8	4.2

EIGHT YEAR TRENDS IN THE PREVALENCE OF OVERWEIGHT AND OBESITY

Table V presents the crude percentages of men with BMI > 25 kg/m² (overweight and obese) and with BMI > 30 kg/m² (obese) in different socio-demographic groups according to the year of the survey. The above mentioned increase in the mean BMI was also observed in the analyses with BMI in categorised form. Table VI shows a 19% relative increase in the prevalence of men with BMI > 25 kg/m² in adult Swedish men over the eight year period. In absolute values, the prevalence of overweight and obesity increased by about 0.13%/year. The greatest relative increase in the prevalence of BMI > 25 kg/m² took place in the 25–34 year age group (OR=1.36, 95% confidence interval (CI): 1.12, 1.65) and among senior salaried employees and self employed professionals (1.41; 1.10, 1.80) (tables VII and VIII). The prevalence of obesity (BMI > 30 kg/m²) was not significantly different in 1988–89 and 1980–81 for any specific age or socioeconomic group.

SOCIODEMOGRAPHIC TRENDS IN BMI AND THE PREVALENCE OF OBESITY

Tables II and VI show quantitative estimates of these relations. The BMI in men is largely determined by age, the highest mean values occurring in the 55–64 year age group. In this group the prevalence of BMI > 25 kg/m² is up to sevenfold higher and the prevalence of obesity up to sixfold higher than in young men 16–24 years of age.

A clear trend is present—that is, Swedish men with a higher education tend to have a significantly lower BMI. The difference between men with a university degree and those with only an elementary school education amounts to about 1 kg/m², which corresponds to 3.2 kg for a man 180 cm tall. In the highest education group, the prevalence of BMI > 25 kg/m² is about 50% lower and the prevalence of obesity about 60% lower than in the elementary education group.

Junior, intermediate, and senior salaried employees and self employed professional men all have a significantly lower BMI than manual workers. The mean BMIs of farmers and entrepreneurs do not differ from those of workers. The prevalence of BMI > 25 kg/m² is also significantly lower among junior, intermediate, and senior salaried employees than among manual workers. Obesity occurs significantly less often in intermediate salaried employees. Changes in the BMI with increasing age vary substantially between socioeconomic groups. The mean BMI of senior salaried employees and self employed professional men remains relatively stable throughout life, with the greatest difference, 1.2 kg/m² ($p = 0.05$), in the 55–64 year age group compared with the men aged 16–24 years. In contrast, farmers in the same age group increased their mean BMI by 3.3 kg/m² (data not shown in tables).

Compared with men from Stockholm, all other geographical regions in Sweden have significantly higher BMIs. The most striking difference, seen in the northern sparsely populated areas (0.62 kg/m²), corresponds to 2 kg for a man 180 cm tall. The prevalence of BMI > 25 kg/m² is about 30–40% higher in all regions other than Stockholm.

Table VI Prevalence of overweight and obesity (body mass index (BMI) >25 kg/m² and obesity (BMI >30 kg/m²) in nationally representative samples of Swedish men by year of study, age, education, socioeconomic group, region, and nationality after adjustment for the effects of the other variables (odds ratios (OR) with 95 % confidence intervals (CI)).

Variables	BMI >25 kg/m ²		BMI >30 kg/m ²	
	OR	95% CI	OR	95% CI
Study 1980-81 (ref)				
Study 1988-89	1.19	1.09, 1.29	1.15	0.97, 1.37
Age group (y):				
16-24 (ref)				
25-34	2.30	1.92, 2.74	2.28	1.37, 3.79
35-44	3.88	3.24, 4.63	4.11	2.51, 6.72
45-54	5.52	4.59, 6.64	4.99	3.04, 8.18
55-64	6.62	5.49, 7.99	6.28	3.84, 10.3
65-74	5.60	4.64, 6.77	5.19	3.15, 8.54
75-84	3.57	2.77, 4.59	4.03	2.20, 7.37
Education:				
Elementary school, ≤9 y (ref)				
High school, 10-11 y	0.90	0.81, 0.99	0.78	0.63, 0.97
After high school, 12-14 y	0.76	0.67, 0.85	0.71	0.55, 0.91
University, >14 y	0.53	0.44, 0.65	0.36	0.21, 0.60
Socioeconomic group:				
Manual workers (ref)				
Junior salaried employees	0.81	0.70, 0.94	0.86	0.64, 1.16
Intermediate salaried employees	0.75	0.66, 0.85	0.67	0.50, 0.90
Senior salaried employees and self employed professionals	0.80	0.68, 0.95	0.81	0.56, 1.17
Farmers	1.07	0.93, 1.23	1.22	0.94, 1.57
Entrepreneurs	1.05	0.89, 1.26	0.79	0.55, 1.15
Students	0.38	0.29, 0.50	0.48	0.23, 1.01
Region:				
H ₁ Stockholm (ref)				
H ₂ Gothenburg	1.30	1.13, 1.50	1.26	0.94, 1.70
H ₃ Large municipalities	1.29	1.14, 1.45	0.99	0.76, 1.29
H ₄ Southern/central Sweden, excluding 1-3	1.30	1.14, 1.48	1.05	0.80, 1.38
H ₅ Northern densely populated areas	1.29	1.08, 1.54	0.98	0.67, 1.44
H ₆ Northern sparsely populated areas	1.46	1.23, 1.75	1.15	0.80, 1.66
Nationality:				
Native born Swedish (ref)				
Second generation immigrants	1.39	1.12, 1.73	1.22	0.74, 2.01
Naturalised immigrants	1.17	0.95, 1.43	1.34	0.92, 1.96
Foreign nationals	1.33	1.08, 1.64	1.48	0.99, 2.21

Native born Swedish men have a significantly lower mean BMI (after adjustment for age, education, socioeconomic group, and region) than those of all other ethnic groups living in Sweden. The prevalence of BMI >25 kg/m² among native Swedes is significantly lower than that among second generation immigrants and other ethnic groups.

Finally, it should be pointed out that although we have noted very significant effects in many cases, the regression model presented in table II (including variables such as the study period, age, education, socioeconomic group, region and ethnic origin) explains only 14% of the variance in BMI among Swedish men ($R^2=0.14$).

Discussion

Our study has two important features: firstly, a large number of representative subjects, and secondly, available data on many sociodemographic variables that make it possible to adjust for them in the analyses.

TIME TRENDS IN BMI DEVELOPMENT

According to the data from the two ULF cross sectional surveys, there is a statistically significant increase in the mean BMI among Swedish adult men during the 1980s when adjusted for age, education, socioeconomic group, region, and ethnic origin. In every age group from 25 years up to 84 years, and among most socioeconomic groups, the mean BMI has increased. Our findings, in general, confirm and extend similar observations made in surveys carried out in the USA and Europe.^{6 15}

A report using American data on men aged 35-74 years who participated in four nationwide surveys in 1960-80 (NHES I and III; NHANES I and II) indicated an increase in the mean BMI for all age groups.⁶ No consistent trend was found in men aged 18-34 years from the same surveys.^{7 8} In the Minnesota Heart Survey the age adjusted mean BMI of men aged 25-59 years increased significantly by 1 kg/m² from 1973 to 1987.⁹ A significant increase in BMI, adjusted for age and education, was found between 1980 and 1987 in a sample of men aged 25-74 years (0.8 kg/m²/year over seven years) from the Minnesota Heart Health Programme. A further analysis of these data indicated that the weight increase was noticeable only in the 30-39 and 50-59 year age groups.¹⁰

The results from European countries are more heterogeneous. In Italy, the mean BMI of men aged 20-59 years in 1983-84 did not change in relation to the mean BMI of people examined in 1978-79 in the nine communities study.¹¹ Three population surveys in eastern Finland, carried out in 1972, 1977, and 1982, each included about 1600 men aged 30-59 years. In men aged 30-39 years, the mean BMI remained stable between 1972 and 1982; in those aged 40-49 years the mean BMI increased by 1.1 kg/m²; and in those 50-59 years of age it increased less noticeably.¹² It should be noted that the mean BMIs of Italian and Finnish men were not adjusted for age or other sociodemographic characteristics of the subjects. The 25th, 50th, and 75th centiles for BMI of 18 year old Danish men remained essentially unchanged over 20 years between 1957 and 1976.¹³ Data from two screening projects concerning cardiovascular risk factors were used to investigate trends in BMI in The Netherlands in 1974 and 1986. The mean BMI of 14 000 men aged 37-43 years examined in the period 1974-80, showed an increase of 0.5 kg/m² (adjusted for age and town). In the period 1981-86 there was no change in the mean BMI of 80 000 men aged 33-37 years in The Netherlands; however, some regional differences were noted.¹⁵

TIME TRENDS IN PREVALENCE OF OBESITY

Our findings show that the prevalence of overweight and obesity (defined as BMI >25 kg/m²) and obesity (BMI >30 kg/m²) increased consistently in all age and socioeconomic groups of Swedish men during the 1980s. During a similar period (1980-87) in the upper midwestern region of the USA, the prevalence of obesity, defined as BMI >30.16 kg/m² (85th centile at year 1980), increased by 0.6%/year in men aged 25-74

Table VII Effect of time period on the prevalence of overweight and obesity (body mass index (BMI) >25 kg/m²) and of obesity (BMI >30 kg/m²) in different age groups after adjustment for the effect of education, socioeconomic group, region, and nationality (odds ratios (OR) with 95% confidence intervals (CI)).

Age group (y)	BMI >25 kg/m ²		BMI >30 kg/m ²	
	OR	95% CI	OR	95% CI
16-24	1.13	0.85, 1.49	0.81	0.35, 1.88
25-34	1.36	1.12, 1.65	1.04	0.62, 1.75
35-44	1.19	0.99, 1.43	1.47	0.99, 2.18
45-54	1.16	0.96, 1.41	1.19	0.80, 1.76
55-64	1.18	0.96, 1.45	1.22	0.84, 1.77
65-74	1.06	0.86, 1.31	0.96	0.64, 1.42
75-84	1.11	0.85, 1.45	1.35	0.81, 2.26
Total 16-84	1.20	1.11, 1.30	1.17	0.99, 1.39

Table VIII Effect of the time period on the prevalence of overweight and obesity (body mass index (BMI) >25 kg/m²) and of obesity (BMI 30 kg/m²) in different socioeconomic groups after adjustment for the effect of age, education, region and nationality (odds ratios (OR) with 95% confidence intervals (CI)).

Socioeconomic groups	BMI >25 kg/m ²		BMI >30 kg/m ²	
	OR	95% CI	OR	95% CI
Manual workers	1.15	1.02, 1.29	1.23	0.97, 1.57
Junior salaried employees	1.08	0.82, 1.43	0.93	0.54, 1.61
Intermediate salaried employees	1.21	0.97, 1.51	1.08	0.63, 1.85
Senior salaried employees and self employed professionals	1.41	1.10, 1.80	1.16	0.65, 2.09
Farmers	1.16	0.88, 1.53	1.20	0.74, 1.95
Entrepreneurs	1.24	0.80, 1.93	1.29	0.54, 3.05
Students	1.26	0.76, 2.10	0.42	0.08, 2.24
All socioeconomic groups	1.18	1.09, 1.28	1.16	0.97, 1.38

years.¹⁰ A similar absolute increase (about 4% over seven years) in the prevalence of obesity, defined as BMI $=27$ – 30 kg/m²,¹⁵ was observed in The Netherlands in 1976–80 among men 37–43 years of age. In Finland, between 1972 and 1982, an increase in the prevalences of BMI >25 kg/m² and BMI >30 kg/m² in men were particularly pronounced in the 40–59 years aged group but not in the 30–39 year age group.¹² In Denmark, the prevalence of obesity (BMI >30 kg/m²) showed a steep increase in the birth cohorts, beginning in the early 1940s and levelling off thereafter.^{13 14} The most dramatic increase in the prevalence of obesity among men was reported from Czechoslovakia between 1985 and 1988. The proportion of obese men in the 25–64 year age group rose from 18.5% to 23.9%, $p < 0.001$.¹⁶

These data indicate that the mean BMI and the prevalence of obesity generally increased in adult men in both Europe and the United States, with some exceptions. It should be pointed out that in most of the studies information about the BMI was available for only two or three points in time. Moreover, in not all studies were the mean BMI and prevalence of obesity adjusted for differences in age and in the distribution of other socio-demographic parameters in successive surveys. An advantage of the present study was the availability of sociodemographic characteristics which made it possible to adjust for potential effects of confounding variables.

SOCIODEMOGRAPHIC TRENDS

Our study includes a broader range of age, education, socioeconomic status, geographical region, and ethnic origin than do more limited samples, which tend to be more homogeneous and very often limited to one region only. The results concerning adult Swedish men in nationally representative samples confirm that there is a strong positive association between BMI and the prevalence of obesity in relation to age. This association varies, however, among socioeconomic groups: it is strongest among farmers and very weak among senior salaried employees and self employed professionals. The significant inverse relation between education and socioeconomic group and the BMI in men agrees with a trend among American men.^{7 29 35}

Native born Swedes living in Stockholm have a lower BMI than those who live in other large municipalities and geographical regions and who are not native Swedes. Our results agree with studies showing differences in the prevalence of obesity between those living in rural and urban environments²⁶ and among various ethnic groups.³³

In summary, there are clear sociodemographic patterns of obesity in various populations. These patterns should be taken into account in planning effective means of preventing and controlling obesity.

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