

# The social patterning of relative body weight and obesity in Denmark and Finland

Sirpa Sarlio-Lähteenkorva<sup>1</sup>, Inge Lissau<sup>2</sup>, Eero Lahelma<sup>1</sup>

**Background:** Relative body weight is typically inversely associated with social status in affluent societies but studies comparing the social patterning of relative body weight and obesity in different countries have only seldom been conducted. The aim of this study was to analyse and compare the social patterning of relative weight and obesity by occupational status, educational attainment and marital status between Danish and Finnish women and men. **Methods:** Data from the Finnish Survey on Living Conditions and the Danish Health and Morbidity Survey, both collected in 1994, were compared. Relative weight was studied by using body mass index (BMI), and those with BMI  $\geq 30$  kg/m<sup>2</sup> were regarded as obese. Logistic regression analysis was used to examine the social patterning of obesity in the pooled dataset. Two-variable interaction effects were tested separately. **Results:** Compared with their Danish counterparts, Finnish women and men had higher average relative weight and they were more often obese. There were no country differences in the socio-economic patterning of obesity by educational attainment, but a stronger patterning of obesity by occupational status was found among Danish women. Moreover, non-married women in Denmark were more likely to be obese than their married counterparts. **Conclusions:** Finns have higher relative weight and they are more often obese than Danes. The social patterning of obesity was similar in both studied countries but stronger in Denmark.

**Keywords:** education, marital status, obesity, occupational status, relative body weight

The prevalence of obesity is increasing worldwide. An earlier review on obesity and socio-economic status by Sobal and Stunkard<sup>1</sup> found a strong inverse relationship between socio-economic status and obesity in women in affluent societies, with a higher proportion of obese women in lower socio-economic groups. Moreover, differences in body mass index between educational groups seemed to have been widening over the past decades in most populations.<sup>2</sup> However, contrasting results have been reported recently from US, where disparities across educational groups have narrowed while the prevalence of obesity has dramatically increased.<sup>3</sup>

Similar trends showing increasing relative body weight and socio-economic differences in obesity<sup>2</sup> can equally be seen in the Nordic countries, including Denmark and Finland. Danish prospective studies of draftees showed that obese men not only suffer from a higher risk of somatic diseases, but also have to live with a social handicap that is independent of their parental social class, education and intelligence. Thus, at each level of education, the obese occupy a significantly lower social class position than their normal weight counterparts.<sup>4</sup> It has been shown in Finland that deviant body weight is associated with social and economic disadvantage in a gender-specific and partly curvilinear way. In particular, obese women face multiple social and economic disadvantages. For instance, obese women have a high risk of long-term unemployment<sup>5</sup> and highly educated obese women have significantly lower income than their normal weight counterparts.<sup>6</sup>

It is possible that differences in the relative body weight and prevalence of obesity affect the socio-economic patterning. Finns are more overweight than Danes<sup>2</sup> and people in the other Nordic countries also in teenagers.<sup>7</sup> Previous studies comparing Finland and Sweden have confirmed that social class differences in obesity are greater in Sweden, where the prevalence of obesity, however, is lower.<sup>8</sup>

This study focuses on working-age women and men in two comparable Nordic countries, Denmark and Finland, in the mid-1990s. The aim of the study was to analyse and compare the social patterning of relative weight and obesity by occupational status, educational attainment and marital status between Danish and Finnish women and men.

## Materials and methods

Nationwide survey data were used. The Finnish data derive from the Survey on Living Conditions, collected in 1994 by Statistics Finland, and the Danish data from the Health and Morbidity Survey, collected in 1994 by the Danish Institute for Clinical Epidemiology (currently the National Institute of Public Health, Denmark). The data were collected using personal interviews and the samples represent satisfactorily the population over 15–16 years in both countries. The response rate in the Finnish survey was 73% and the data include 8650 respondents.<sup>9,10</sup> The corresponding figures for the Danish survey were 4668 respondents with a 78% response rate.<sup>11,12</sup> We focused our study on working aged (25–64 years) people only, and the analysed data include 6474 Finns and 3081 Danes.

Educational attainment was categorised into three groups by approximate number of years: (i) higher ( $\geq 13$  years of education); (ii) secondary (10–12 years of education); and (iii) basic ( $\leq 9$  years of education).

Current occupational status was classified into six categories: (i) upper white-collar employees; (ii) lower white-collar employees; (iii) manual workers; (iv) self-employed; (v) unemployed; and (vi) other non-employed. This classification is based on a Nordic socio-economic classification scheme (NORD-SEI 1990-S) combined with the Danish socio-economic status (SOC8A) classification scheme and current employment status. The classification combines information about occupational social class and employment status. Upper white-collar employees include both higher and intermediate level white-collars, manual workers include both skilled and unskilled workers, and the self-employed include entrepreneurs, self-employed and farmers. The other non-employed group consists of

1 Department of Public Health, University of Helsinki, Finland

2 National Institute of Public Health, Copenhagen, Denmark

**Correspondence:** Eero Lahelma, Department of Public Health, University of Helsinki, Finland, tel: +358 9 19127554, fax: +358 9 191 27540, e-mail: eero.lahelma@helsinki.fi

homemakers, full-time students, early retired and other people who are outside the labour market.

To make the marital status variable comparable between the countries it was dichotomized into legally married and non-married only. The non-married group also includes registered homosexual couples (in Denmark only) and cohabiting participants (any co-habiting couples in Finland) as well as widows/widowers and singles in both countries.

Body mass index (BMI) was used as a measure of relative body weight. It was calculated using self-reported information on body height and weight (weight in kilograms divided by height in meters squared). Based on their BMI, the respondents were classified into four groups: 'underweight' (BMI <18.5 kg/m<sup>2</sup>), 'normal weight' (BMI 18.5–24.9 kg/m<sup>2</sup>), 'pre-obese or moderate overweight' (BMI 25–29.9 kg/m<sup>2</sup>) and 'obese' (BMI ≥30 kg/m<sup>2</sup>) using the WHO classification of BMI.<sup>13</sup>

Information about the respondents' age was based on their self-reported birth year, and it was used as a continuous variable in the analyses.

The distribution of socio-economic variables and BMI groups (table 1) in both countries were tested with  $\chi^2$ -test. GLM univariate analysis using age as a covariate was used to calculate age-adjusted mean BMIs and their 95% confidence intervals (CI) within occupational status, educational attainment and

marital status groups among women and men in both countries (table 2).

In further logistic regression analysis data from Finland and Denmark were pooled together. Results for both countries are presented by fitting identical age-adjusted models with two-variable interactions between occupational status and country, educational attainment and country, and marital status and country. To facilitate comparisons between countries, in table 3, the upper white-collar, the higher educated and the married were selected as the reference category [odds ratio (OR) 1.00]. Separate age-adjusted models were run for occupational status, educational attainment and marital status. The results are presented as ORs and their 95% CIs. The statistical significance of the two-variable interaction effects, with all models including age and main effects of country and each socio-economic variable under study (occupational status, educational attainment or marital status), were tested separately.

All analyses were computed with SPSS 10.0 program, separately for women and men.

## Results

As shown in table 1, there were statistically significant differences in the occupational structure between Denmark and

**Table 1** Distribution of occupational status, educational attainment, marital status and BMI among women and men in Finland and Denmark (%)

	Women (%)		Men (%)	
	Finland (n = 3193)	Denmark (n = 1604)	Finland (n = 3313)	Denmark (n = 1497)
<b>Occupational status</b>				
Upper white-collar	19	28	24	30
Lower white-collar	13	26	3	13
Manual worker	21	10	20	24
Self-employed	14	6	24	14
Unemployed	12	10	14	7
Other	22	21	16	12
		<i>P</i> < 0.0001		<i>P</i> < 0.0001
<b>Education</b>				
Higher	20	29	24	28
Secondary	47	49	42	54
Basic	32	22	34	18
		<i>P</i> < 0.0001		<i>P</i> < 0.0001
<b>Marital status</b>				
Married	65	63	64	59
Non-married	36	37	36	41
		<i>P</i> = 0.213 (NS)		<i>P</i> < 0.0001
<b>BMI group</b>				
Underweight	1.9	4.5	0.3	0.5
Normal	57	68	43	50
Moderate overweight	29	21	45	40
Obese	12	7	12	10
		<i>P</i> < 0.0001		<i>P</i> < 0.0001

NS, not significant

**Table 2** Age adjusted mean BMIs and their 95% CI by occupational status, educational attainment and marital status among women and men in Finland and Denmark

	Women (BMI)		Men (BMI)	
	Finland	Denmark	Finland	Denmark
<b>Occupational status</b>				
Upper white-collar	23.9 (23.6–24.2)	22.7 (22.3–23.1)	25.5 (25.3–25.8)	24.7 (24.4–25.0)
Lower white-collar	24.4 (24.0–24.8)	23.8 (23.4–24.2)	25.9 (25.2–26.7)	26.0 (25.5–26.5)
Manual worker	25.0 (24.7–25.3)	24.3 (23.7–24.9)	26.1 (25.8–26.4)	25.9 (25.5–26.3)
Self-employed	25.3 (24.9–25.9)	23.3 (22.5–24.1)	26.4 (26.1–26.6)	25.7 (25.3–26.2)
Unemployed	25.4 (25.0–25.8)	24.0 (23.4–24.7)	26.0 (25.7–26.4)	25.5 (24.8–26.1)
Other	25.0 (24.7–25.3)	23.8 (23.4–24.3)	26.8 (25.5–26.1)	25.3 (24.8–25.8)
<b>Education</b>				
Higher	23.9 (23.5–24.2)	22.9 (22.6–23.3)	25.4 (25.1–25.6)	24.6 (24.2–24.9)
Secondary	24.9 (24.7–25.1)	23.6 (23.3–23.9)	26.1 (25.9–26.2)	25.6 (25.4–25.9)
Basic	25.3 (25.1–25.6)	24.2 (23.8–24.6)	26.3 (26.0–26.5)	26.1 (25.7–26.6)
<b>Marital status</b>				
Married	24.9 (24.7–25.0)	23.4 (23.1–23.6)	26.0 (25.9–26.2)	25.5 (25.2–25.7)
Non-married	24.7 (24.5–24.9)	23.8 (23.5–24.1)	25.9 (25.7–26.1)	25.4 (25.1–25.7)
All	24.8 (24.7–24.9)	23.5 (23.3–23.7)	26.0 (25.8–26.1)	25.4 (25.3–25.6)

**Table 3** Logistic regression analysis, age-adjusted ORs and their 95% CIs for obesity (BMI  $\geq 30$  kg/m<sup>2</sup>): separate models for occupational status, educational attainment and marital status among women and men in Finland and Denmark

	Women (OR)		Men (OR)	
	Finland	Denmark	Finland	Denmark
<b>Occupational status</b>				
Upper white-collar	1.00	1.00	1.00	1.00
Lower white-collar	0.84 (0.50–1.41)	3.58 (1.73–7.42)	1.74 (0.90–3.36)	2.45 (1.34–4.47)
Manual worker	1.82 (1.22–2.70)	4.47 (1.96–10.21)	1.29 (0.91–1.83)	1.91 (1.10–3.30)
Self-employed	2.17 (1.43–3.28)	1.42 (0.43–4.64)	1.45 (1.06–1.99)	1.93 (1.06–3.51)
Unemployed	1.66 (1.12–2.45)	3.52 (1.70–7.26)	1.35 (0.95–1.92)	2.70 (1.51–4.85)
Other	2.22 (1.44–3.43)	4.15 (1.80–9.58)	1.64 (1.14–2.36)	1.96 (0.90–4.24)
<i>P</i> -value for country*occupational status interaction		<i>P</i> = 0.007		<i>P</i> = 0.492 (NS)
<b>Education</b>				
Higher	1.0	1.0	1.0	1.0
Secondary	2.16 (1.48–3.15)	1.99 (1.1–3.60)	1.48 (1.10–2.00)	1.84 (1.14–2.95)
Basic	2.65 (1.82–3.88)	2.83 (1.53–5.23)	1.72 (1.28–2.31)	2.29 (1.33–3.94)
<i>P</i> -value for country*education interaction		<i>P</i> = 0.841 (NS)		<i>P</i> = 0.649 (NS)
<b>Marital status</b>				
Married	1.0	1.0	1.0	1.0
Non-married	0.92 (0.79–1.10)	1.48 (1.00–2.20)	1.00 (0.79–1.25)	1.36 (0.95–1.95)
<i>P</i> -value for country*marital status interaction		<i>P</i> = 0.038		<i>P</i> = 0.144 (NS)

NS, not significant

Finland among both women ( $P < 0.0001$ ) and men ( $P < 0.0001$ ). The proportion of participants in the upper and lower white-collar groups was higher in Denmark whereas Finnish participants were more often self-employed or unemployed.

Likewise, women ( $P < 0.0001$ ) and men ( $P < 0.0001$ ) in Denmark had higher average educational level than their counterparts in Finland. Men in Finland in this age group were more often married than men in Denmark ( $P < 0.0001$ ), but there

were no statistically significant marital status differences between the countries among women.

The distribution of BMI groups in table 1 differed between Denmark and Finland among both men ( $P < 0.0001$ ) and women ( $P < 0.0001$ ). The prevalence of moderate overweight and obesity was higher in Finland whereas the prevalence of normal weight was higher in Denmark.

Table 2 shows that the mean age-adjusted BMI for Finnish women was higher than that for Danish women in all occupational status, educational and marital status groups. As the 95% CIs indicate, these differences were clearly statistically significant, except for female manual workers and lower white-collar. A similar pattern was seen among men, although the BMI differences were statistically significant only for upper white collars, those with higher or secondary education and between the two marital status groups.

According to further logistic regression analyses those with lower occupational status and lower education were more likely to be obese in both countries (table 3). Moreover, among women there were statistically significant differences in the likelihood of being obese between the countries (country\*occupational status interaction,  $P = 0.007$ ). Among Danish women all occupational status groups, except self-employed, were clearly more likely to be obese than their Finnish counterparts as compared with upper white-collar women. Also, among men occupational class differences in obesity tended to be larger in Denmark than in Finland, but no statistically significant interaction effects could be found. In contrast, educational differences in obesity were very similar in both countries, with obesity being clearly most prevalent in the lower educational group among both women and men. In addition, there were statistically significant differences in obesity by marital status between Danish and Finnish women (country\*marital status interaction,  $P = 0.038$ ). This implied that non-married women in Denmark were more likely to be obese than their married counterparts, whereas similar differences could not be seen among Finnish women. A similar tendency, although statistically non-significant, could be found for men as well.

## Discussion

We found clear differences in the prevalence of obesity between Finland and Denmark. Previous studies have shown that Finns are more often overweight than Swedes,<sup>7,8</sup> and this study extends that finding to Danes as well: Finnish women and men were more often obese than their Danish counterparts. In addition, compared with Danish women, Finnish women had higher BMI values in all educational groups and most occupational status groups. A similar although less clear pattern was seen in men.

Although obesity was more common and average relative body weight was higher in Finland in all educational groups a similar patterning of obesity by education was seen in both countries. Thus we did not find less disparity across educational groups in a country with higher prevalence of obesity unlike in the US.<sup>3</sup> Nevertheless, among women a stronger social patterning of obesity by occupational status was found in Denmark as compared with Finland. Danish female lower white-collar and manual workers, as well as unemployed and other non-employed, showed a very high likelihood of being obese. The reasons for these differences in the occupational patterning of obesity remain open in our cross-sectional study. It is possible that there is more discrimination against the obese, or obese women may end up in lower status jobs through stronger selective processes in Denmark. Obesity may also be more acceptable among unemployed and lower educated persons. It is further possible that there are greater social class differences in sedentary lifestyles and food habits in Denmark as compared with Finland, making people in lower social classes more prone to weight gain. In the latest Danish national survey there is a clear trend that

lower socio-economic groups less frequently eat green salad and more often are physically inactive in leisure time.<sup>14,15</sup>

Additionally, Danish married women were less likely to be obese than their non-married counterparts, whereas for Finnish women there was a reverse tendency. The causal relationships remain open but it is possible that Finnish women are more likely to gain weight than their Danish counterparts, or that obese women have more difficulties in finding a partner in Denmark. Indeed, previous studies have shown that Finnish women are likely to gain weight after marriage,<sup>16</sup> and that married women are more likely to be overweight than single women, whereas divorced women are as often overweight as their married counterparts.<sup>17</sup> The latest national survey from Denmark is in accordance with our results and shows that obesity is much more frequently found among divorced, widowed and other non-partnered persons compared with persons who lived with a partner.<sup>18</sup>

Studies from several countries on marital status and weight show mixed results. In a recent US study BMI did not predict the likelihood of either being married or divorced.<sup>19</sup> Most studies, however, report that marriage is associated with higher relative weight or weight gain,<sup>19,20</sup> although this may not be true in all population groups. Unmarried people are also a very heterogeneous group and should be more closely examined in further studies. It is a limitation that in this study marital status could only be categorized into legally married and non-married. Nevertheless, marriage was the most common marital status in the study so this crude classification is likely to capture the main marital status differences in relative weight and obesity.

The main strength of this study was the possibility of using two comparable nationwide surveys to examine the social patterning of body weight and obesity. Much effort was devoted to harmonizing the data from the two different countries. A limitation is that BMI was calculated from self-reported height and weight, and it is well known that self-reports underestimate the prevalence of obesity.<sup>21,22</sup> In general, BMI is underestimated in all socio-economic groups, and the existing studies have failed to find any clear socio-economic pattern in this bias.<sup>21,23</sup> It is unlikely that the patterning of obesity by social status groups found in this study would be due to reporting bias. The response rates to the surveys were 73% in Finland and 78% in Denmark. These percentages can be regarded as satisfactory, but the potential biasing effect of non-response has to be taken into account while drawing conclusions from the analyses. However, the effect of non-response on the social patterning is likely to be conservative, since the higher educated were slightly more active respondents.<sup>10</sup>

In conclusion, compared with Denmark, the average relative weight was found higher and obesity more common in Finland. Body weight was patterned in a similar way in both countries and both genders by occupational status and education. The patterning was weaker among Finnish women. In particular, occupational class differences in obesity were larger among Danish than Finnish women. The reasons behind such a patterning remain open in this cross-sectional study but the prevalence of obesity may affect the strength of the socio-economic patterning.

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## Key points

- This study compared social patterning of body size by occupation, education and marital status between Danes and Finns.
- Finnish women and men had higher relative weights and more obesity than their Danish counterparts.
- Social patterning of obesity was similar in both countries but stronger in Denmark, especially among women.
- Since obesity is unevenly distributed in the population, more attention should be paid to weight-related inequalities.

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