

# Health correlates of overweight and obesity in adults aged 50 years and over: results from the Survey of Health, Ageing and Retirement in Europe (SHARE)

## Obesity and health in Europeans aged $\geq 50$ years

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## Summary

**Questions under study:** To examine the association between overweight/obesity and several self-reported chronic diseases, symptoms and disability measures.

**Methods:** Data from eleven European countries participating in the Survey of Health, Ageing and Retirement in Europe were used. 18 584 non-institutionalised individuals aged 50 years and over with BMI  $\geq 18.5$  (kg/m<sup>2</sup>) were included. BMI was categorized into normal weight (BMI 18.5–24.9), overweight (BMI 25.0–29.9) and obesity (BMI  $\geq 30$ ). Dependent variables were 13 diagnosed chronic conditions, 11 health complaints, subjective health and physical disability measures. For both genders, multiple logistic regressions were performed adjusting for age, socioeconomic status and behaviour risks.

**Results:** The odds ratios for high blood pressure, high cholesterol, diabetes, arthritis, joint pain and swollen legs were significantly increased for overweight and obese adults. Compared to normal-weight individuals, the odds ratio (OR) for reporting  $\geq 2$  chronic diseases was 2.4 (95% CI 1.9–2.9) for obese men and 2.7 (95% CI 2.2–3.1)

for obese women. Overweight and obese women were more likely to report health symptoms. Obesity in men (OR 0.5, 95% CI 0.4–0.6), and overweight (OR 0.5, 95% CI 0.4–0.6) and obesity (OR 0.4, 95% CI 0.3–0.5) in women, were associated with poorer subjective health (i.e. a decreased risk of reporting excellent, very good or good subjective health). Disability outcomes were those showing the greatest differences in strength of association across BMI categories, and between genders. For example, the OR for any difficulty in walking 100 metres was non-significant at 0.8 for overweight men, at 1.9 (95% CI 1.3–2.7) for obese men, at 1.4 (95% CI 1.1–1.8) for overweight women, and at 3.5 (95% CI 2.6–4.7) for obese women.

**Conclusions:** These results highlight the impact of increased BMI on morbidity and disability. Healthcare stakeholders of the participating countries should be aware of the substantial burden that obesity places on the general health and autonomy of adults aged over 50.

**Key words:** health outcomes; obesity; overweight; survey

## Background

In recent decades the prevalence of obesity (body mass index (BMI)  $\geq 30$  kg/m<sup>2</sup>) has dramatically increased in Western societies. While the adult prevalence of obesity varied from 13% in 1960–1962 [1] to 32% in 2003–2004 [2] in the United States (US), figures from European countries also showed an increase in prevalence during the eighties and nineties [3]. The Surveillance of Chronic Disease Risk Factors (SuRF) Report 2

estimates that in Europe in 2010 the highest prevalence of obesity among adults aged  $>15$  years will be found in Greece for men (30%), and in Greece and the United Kingdom (26%) for women. Figures for the US are projected to be 44% for men and 48% for women [4].

In industrialised countries, the continuing rise over time of life expectancy and the trend in the prevalence of overweight and obesity [1–2, 5–7]

are of concern since increased healthcare utilisation and costs are associated with both, and, more importantly, because it has been estimated that the rising obesity prevalence may reduce or even reverse the decline in disability rates expected among the elderly [8]. In addition, diseases associated with obesity [9, 10] usually appear during the second half of life [11], a period during which the prevalence of overweight and obesity is at its greatest [12, 13].

Several studies investigating the epidemiology of obesity and overweight have used data from the United States and assessed associations between body weight and diseases. Field [9] and Must [14] found that the associations between BMI and several chronic diseases increased with the severity of overweight both in men and

women, and Patterson has shown that BMI was also associated with a broad range of self-reported health complaints [15]. The use of data from various European countries [16] or those also including health complaints and physical disabilities is less frequent [15, 17–19].

This study expands on prior research by examining the association between BMI and diagnosed chronic conditions, health complaints, overall subjective health and physical disability using pooled data from nationally representative samples of community-dwelling individuals aged  $\geq 50$  years in eleven European countries. Because the associations between BMI and health outcomes may differ with gender, analyses will be performed separately for men and women.

## Methods

### Setting and participants

This study employed data from the survey of health, ageing and retirement in Europe (SHARE) [20]. Between 2004 and 2005, SHARE collected data on non-institutionalised individuals aged  $\geq 50$  years. The eleven participant countries (Austria, Belgium, Denmark, France, Germany, Greece, Italy, the Netherlands, Spain, Sweden, Switzerland) were responsible for drawing representative samples from their non-institutionalised population, following a complex probabilistic multistage design [21]. An overall response rate of 61.6% was obtained, varying across countries from 46.9 to 81.0%, except in Switzerland and Belgium where it was as low as 38.8% and 39.2%, respectively (table 1) [21]. Using computer-assisted interviewing methods, trained interviewers collected self-reported information through standardised face-to-face interviews (entire questionnaires and complete SHARE documentation are available online: <http://www.share-project.org/>). For this study we excluded 332 persons whose values for height, weight or BMI were missing or unlikely, and 242 underweight individuals (BMI  $< 18.5$  kg/m<sup>2</sup>). The final analytic sample consisted of 18,584 subjects.

### Body mass index (BMI)

Height and weight were self-reported. Subjects were classified as being of normal weight (BMI 18.5–24.9 kg/m<sup>2</sup>), overweight (BMI 25.0–29.9 kg/m<sup>2</sup>) or obese (BMI  $\geq 30$  kg/m<sup>2</sup>).

### Outcome variables

The main binary (0/1) outcome measures were various diagnosed chronic conditions (“Has a doctor ever told you that you had any of the conditions on this card?”), followed by any heart disease including myocardial infarction and congestive heart failure, high blood pressure, high cholesterol, stroke or cerebrovascular disease, diabetes or high blood sugar, chronic lung disease, asthma, arthritis, osteoporosis, cancer – excluding minor skin cancers, gastrointestinal ulcers, cataract) and health complaints (“For the past six months, have you been bothered by any of the health conditions on this card?” followed by heart trouble, angina or chest pain, difficulty breathing, persistent cough, pain in any joint, swollen legs, sleep problems, falls, fear of falling down, dizziness or black-outs, gastric or intestinal problems, incontinence or involuntary loss of urine). Depression was measured using the EURO-D scale, an instrument validated in Europe which includes twelve items. The presence of clinically significant depressive symptoms is defined by a score  $> 3$  [22].

**Table 1**

Overweight (BMI 25.0–29.9 kg/m<sup>2</sup>) and obesity (BMI  $\geq 30.0$  kg/m<sup>2</sup>) populations’ estimated prevalence, by gender and country, in non-institutionalised individuals aged  $\geq 50$  years (weighted results):

	Response rate	Working sample size	Men		Women	
			Overweight	Obese	Overweight	Obese
Austria	55.6%	1775	52.0%	17.9%	35.7%	19.8%
Belgium	39.2%	848	46.5%	19.6%	33.9%	17.5%
Denmark	63.2%	1525	45.4%	14.4%	32.5%	13.8%
France	81.0%	1595	49.0%	15.2%	30.6%	15.7%
Germany	63.4%	2252	51.2%	17.1%	36.9%	17.5%
Greece	63.1%	1930	54.2%	17.0%	42.1%	22.5%
Italy	54.5%	1928	52.9%	16.2%	37.1%	18.1%
Netherlands	61.6%	2208	48.4%	14.1%	36.5%	16.7%
Spain	53.0%	1627	49.4%	20.2%	41.1%	26.9%
Sweden	46.9%	1992	46.9%	13.4%	36.8%	15.8%
Switzerland	38.8%	904	46.7%	13.1%	30.3%	12.7%
Total	61.6%	18584	50.5%	16.5%	36.2%	18.5%

Overall subjective health and physical disability measures were also considered. The latter included difficulties in any of the following five activities of daily living (ADL) [23]: bathing, dressing, eating, walking across a room and getting in or out of bed, as well as difficulty in walking 100 metres, difficulty in climbing one flight of stairs, difficulty in climbing more than one flight of stairs and activity limited by a health problem.

All the outcome variables were self-reported and based on a single question, with the exception of depression, which was measured by a score dichotomised for analysis.

### Statistical analysis

Separate multiple logistic regressions were used to assess the association between BMI and each outcome variable, using the normal weight category as the refer-

ence. Adjustment was made for age, marital status, years of education, purchasing power parity-household income (euros) [21] adjusted for size of household, smoking, physical activity and country. For subjective health and disability outcomes we run supplementary logistic regressions adding the following adjustment variables: heart diseases, chronic lung diseases, stroke, cancer, diabetes and arthritis. Analysis took account of the complex sampling design (data weighted for age, gender, non-response and sampling scheme) to make samples representative of each country's population. The joint Wald test was used to evaluate the interaction between BMI and gender, and all analyses presented were performed separately for men and women. None of the variables considered had missing data  $\geq 2\%$ .

We used Stata 8.0, and considered *P* values  $< 0.05$  as significant.

## Results

The estimated prevalence of excess body weight and obesity by gender, overall and across countries, is shown in table 1. According to the SHARE data, 36.2% and 18.5% respectively of European women, and 50.5% and 16.7%, respectively, of European men, were overweight or obese. These data also highlight that Austria, Greece, and Spain had the highest prevalence of obesity among both men and women. Characteristics of the male and female populations are given in table 2.

Table 3 shows the adjusted odds ratios for self-reported diseases, health complaints, and subjective health and physical disability measures. In men and women, overweight and obesity were associated with significantly increased odds of reporting two or more chronic diseases. For overweight and obesity, the odds for high blood pressure, high cholesterol, diabetes and arthritis were significantly and similarly increased for men and

women. In addition, obese men and women were at elevated risk of any heart diseases and depression.

The adjusted odds for presenting two or more health complaints were augmented for overweight and obese individuals, irrespective of gender. Overweight and obese women were more likely to report symptoms; they were actually at increased risk of reporting gastrointestinal problems, incontinence, falls, fear of falling down, having joint pain or swollen legs. The latter two symptoms were also significantly associated with obesity and overweight in men. Obese men and women were also at increased risk of reporting heart trouble or angina, and sleep problems.

Obese men and women and overweight women were significantly less likely to report excellent, very good or good subjective health, and more likely to report difficulties in all five physical disability outcomes. However, the associations

**Table 2**  
Characteristics of the pooled SHARE study population, by gender (weighted results, n = 18 584):

	Men (n = 8607)	Women (n = 9977)
Age, mean (SD)	64.1 (0.2)	66.2 (0.2)
$\geq 12$ years of education, %	49.6	37.5
PPP-household income (Euros)		
25 <sup>th</sup> percentile	13 064	10 674
50 <sup>th</sup> percentile	22 750	18 924
75 <sup>th</sup> percentile	38 674	33 411
Married or registered partnership, %	76.7	55.7
Currently smoking, %	24.3	12.8
Neither moderate nor vigorous physical activity, %	9.1	14.7
Number of chronic diseases, %		
0-1	60.8	53.4
2 or more	39.1	46.5
Number of health complaints, %		
0-1	69.3	52.8
2 or more	30.6	47.2
Excellent / very good / good subjective health, %	67.9	60.6
Difficulties in any of 5 activities of daily living, %	9.0	12.1

were stronger for women than for men. After additional adjustment for chronic diseases, the significant odds ratios for disability and subjective health decreased only slightly (results not shown).

Overall, overweight had a greater impact on health outcomes in women than in men. Also, for

most outcomes, particularly those with statistically significant results for overweight and obesity, a "dose-response" relationship was noted with increasing body weight. Cancer, gastrointestinal ulcers and persistent cough were not associated with body weight.

**Table 3**

Adjusted odds ratios† (95% CI) for self-reported diseases, health complaints, subjective health and physical disability, according to BMI (reference = normal weight category):

	Men				Women			
	Overweight		Obesity		Overweight		Obesity	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
<b>Self-reported diseases<sup>1</sup></b>								
Diabetes or high blood sugar	1.6*	1.3–2.1	3.1*	2.4–4.3	1.7*	1.3–2.2	3.8*	2.8–5.0
High blood pressure	1.8*	1.6–2.2	2.9*	2.3–3.5	1.7*	1.5–2.0	3.3*	2.8–4.0
High cholesterol	1.5*	1.3–1.8	1.4*	1.1–1.8	1.2*	1.1–1.4	1.4*	1.2–1.7
Arthritis	1.2	1.0–1.5	1.5*	1.2–1.9	1.3*	1.1–1.5	1.7*	1.4–2.1
Any heart disease	1.1	0.9–1.4	1.6*	1.2–2.1	1.1	0.8–1.4	1.7*	1.3–2.2
Cataract	1.2	0.9–1.6	1.7*	1.2–2.5	1.0	0.8–1.3	1.5*	1.1–2.1
Asthma	1.0	0.7–1.5	1.4	0.9–2.3	1.6*	1.2–2.2	1.9*	1.4–2.7
Stroke or cerebral vascular disease	1.2	0.8–1.7	1.3	0.8–2.1	1.6*	1.1–2.4	1.1	0.7–1.8
Chronic lung disease	0.8	0.6–1.0	1.3	0.9–1.9	1.2	0.9–1.7	1.5*	1.1–2.1
Osteoporosis	0.9	0.5–1.3	1.9*	1.0–3.0	1.0	0.8–1.2	0.9	0.7–1.1
Depression	1.1	0.9–1.3	1.3*	1.1–1.8	1.0	0.9–1.2	1.2*	1.0–1.5
Cancer (excluding minor skin cancers)	0.9	0.6–1.2	1.0	0.6–1.6	1.2	0.9–1.7	1.	0.8–1.7
Gastrointestinal ulcers	0.9	0.7–1.1	1.2	0.9–1.7	1.2	0.9–1.6	1.1	0.8–1.6
2 or more chronic diseases	1.4*	1.2–1.6	2.4*	1.9–2.9	1.5*	1.3–1.7	2.7*	2.2–3.1
<b>Health complaints<sup>2</sup></b>								
Swollen legs	1.8*	1.3–2.5	5.0*	3.5–7.1	1.9*	1.5–2.3	4.4*	3.6–5.4
Pain in any joint	1.2*	1.0–1.3	1.8*	1.5–2.1	1.4*	1.2–1.6	2.1*	1.7–2.5
Difficulty breathing	1.2	0.9–1.6	2.3*	1.7–3.1	1.6*	1.3–1.9	2.5*	2.0–3.1
Dizziness, faints or blackouts	1.1	0.9–1.5	1.6*	1.1–2.2	1.1	0.9–1.4	1.2	0.9–1.5
Heart trouble or angina or chest pain	1.1	0.9–1.4	1.5*	1.1–2.1	1.1	0.8–1.5	1.6*	1.2–2.1
Incontinence or involuntary loss of urine	1.2	0.8–1.6	1.2	0.7–2.0	1.4*	1.0–1.8	2.6*	1.9–3.5
Falls	1.1	0.7–1.8	1.3	0.7–2.3	1.3*	1.0–1.8	1.9*	1.4–2.7
Fear of falling down	1.3	0.9–1.8	1.5	0.0–2.3	1.2	0.9–1.5	2.0*	1.6–2.6
Stomach or intestine problems	0.8*	0.6–0.9	0.9	0.7–1.2	1.2	1.0–1.4	1.2	1.0–1.5
Sleeping problems	1.2	1.0–1.5	1.6*	1.2–2.1	1.1	1.0–1.3	1.3*	1.1–1.5
Persistent cough	0.9	0.7–1.2	0.9	0.6–1.4	1.2	0.9–1.5	1.2	0.8–1.7
2 or more symptoms	1.1*	1.0–1.3	2.0*	1.6–2.5	1.4*	1.2–1.6	2.3*	1.9–2.7
<b>Subjective health</b>								
Excellent, very good, good (versus fair or poor)	0.9	0.7–1.0	0.5*	0.4–0.6	0.7*	0.6–0.8	0.4*	0.3–0.5
<b>Physical disability</b>								
Difficulty in climbing >1 flight of stairs	1.3*	1.0–1.6	2.4*	1.9–3.1	1.6*	1.4–1.9	3.4*	2.9–4.1
Difficulty in any of 5 ADL	1.2	1.0–1.6	2.2*	1.6–3.1	1.3*	1.0–1.6	2.4*	1.8–3.1
Difficulty in walking 100 m	0.8	0.6–1.1	1.9*	1.3–2.7	1.4*	1.1–1.8	3.5*	2.6–4.7
Difficulty in climbing 1 flight of stairs	1.0	0.8–1.4	1.6*	1.1–2.2	1.4*	1.1–1.7	2.9*	2.3–3.8
Activity limitations due to health problems	1.0	0.9–1.2	1.7*	1.4–2.0	1.3*	1.1–1.5	2.1*	1.8–2.4

† Adjustment was made for age, years of education, ppp-household income (power parity-household income), marital status, smoking status, physical activity and country.

\*  $P < .05$

ADL: activity of daily living

<sup>1</sup> Physicians' diagnosed chronic conditions ("Has a doctor ever told you that you had any of the conditions on this card?"):

high blood pressure or hypertension; high blood cholesterol; stroke or cerebrovascular disease; diabetes or high blood sugar; chronic lung disease such as bronchitis or emphysema; asthma; arthritis, including osteoarthritis or rheumatism; osteoporosis; cancer or malignant tumour, including leukaemia or lymphoma, but excluding minor skin cancers; stomach or duodenal ulcer, peptic ulcer; cataract.

<sup>2</sup> Health complaints ("For the past six months, have you been bothered by any of the health conditions on this card?"): pain in your back, knees, hips or any other joint; heart trouble or angina, chest pain during exercise; breathlessness, difficulty breathing; persistent cough; swollen legs; sleeping problems; falls; fear of falling down; dizziness, faints or blackouts; stomach or intestine problems; including constipation, air, diarrhoea; incontinence or involuntary loss of urine; other symptom, not yet mentioned.

## Discussion

In this study we have observed that the odds ratios for high blood pressure, high cholesterol, diabetes, arthritis, joint pain and swollen legs were significantly increased for overweight and obese adults. While overweight and obese women were more likely to report several health symptoms, obesity in men, and overweight and obesity in women, were associated with poorer subjective health. Disability outcomes were those showing the greatest differences in strength of association between gender and across BMI categories. Obesity, but not overweight, was consistently significantly related to physical disability measures, subjective health and most diseases and health complaints. However, although results suggested a “dose-response” relationship with increasing body weight in both genders, it was mainly in women that overweight was associated with a significant risk of reporting all physical disability measures and almost all health complaints.

These findings are generally in agreement with those of other studies, despite different study designs, samples, settings, ways of evaluating height and weight, BMI cut-offs and variables considered for adjustment. Indeed, population-based cross-sectional studies and prospective cohorts pointed to a dose-response relationship between BMI and health outcomes, with increasing risk of developing numerous conditions in both genders [9, 14]. In addition, similar trends towards augmented risk, for men and women, were found for the vast majority of the 41 self-reported physician-diagnosed conditions and health complaints considered by Patterson [15].

Results from other population-based studies have shown significant associations between BMI and physical disability, with stronger effects for obese women than for obese men, and often with an increased risk of disability for overweight in women only [13, 24–27]. Of these studies, however, only a few have assessed diseases and/or health complaints in addition to disability outcomes [13, 25, 27]. In fact, based on measured BMI, Lean [25] observed that, compared to normal weight individuals, obese/overweight women were significantly more likely to report symptoms and difficulties in physical functioning than overweight/obese men.

Despite gender discrepancies in the association between BMI and disability, and other reasons for analysing men and women separately [17, 25], some authors included only one gender [18, 19] or omitted gender stratification [28–30] and were thus prevented from identifying the higher risk of physical disability found for women. This lesser negative impact of overweight found in men compared to women deserves comment. It may be explained by the survivor effect [12] or by differences in disability-free life expectancy between genders, with elderly men representing a

healthier group than elderly women. Another explanation may be the greater contribution of muscle mass to BMI in men [25]. Indeed, individuals with excessive adiposity and low muscle mass have more difficulty with daily activities than those with appropriate muscle mass, muscle strength here being inadequate for body weight. It may also be that women in general are more likely to report health problems to their physicians.

A large database combining nationally representative samples from eleven European countries, the use of a standardised questionnaire and the availability of a data set allowing comprehensive adjustments were the main strengths of this study. However, some limitations must be considered. The first was the fact that height and weight were self-reported. Because men and women generally overestimate their height and underestimate their weight, particularly if they are obese, BMI tends to be underestimated [31] and associations between BMI and outcomes may tend to be overestimated [32]. The true percentage of overweight and obesity may therefore be higher than our estimates. As the degree of height and weight misreporting across countries is unknown, caution must be exercised in comparing overweight and obesity prevalence. Secondly, selection bias cannot be ruled out because the overall response rate was moderate (62%), in particular due to poor participation in Switzerland (39%). In spite of this, the age, gender, subjective health and BMI characteristics of the Swiss sample were similar to those of the 2002 Swiss Health Care Survey (unpublished results), and the trends in prevalence of overweight and obesity of the eleven European countries considered in this study were close to those presented in the Surveillance of Risk Factor report 2 published by the WHO [4]. Finally, due to the cross-sectional nature of the analysis, causality cannot be inferred. Whether overweight and/or obesity appeared before or after the onset of the health outcomes cannot be determined. However, longitudinal studies have already shown that obese individuals were at increased risk of developing diseases and disability [9, 13].

This study investigated the association between body weight and health. The results from the eleven European countries included in SHARE highlight the burden that increased BMI places on health complaints and disability, particularly for women. Because of the considerable long term care costs generated by functional losses, the impact on disability, from an economic perspective, may be higher than the impact of other specific diseases [33–34]. Healthcare professionals and politicians of the participant countries should be aware of the substantial burden that increased body weight places on the general health of adults aged over 50 years and their healthcare systems.

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