

ORIGINAL ARTICLE

Prevalence and trends of overweight and obesity in older adults from 10 European countries from 2005 to 2013

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Abstract

Aims: Overweight and obesity are clinical public-health concerns worldwide. Amongst older adults, the prevalence of overweight and obesity is considered high. The purpose of this study was to provide current data regarding the prevalence and trends of overweight and obesity of adults from 2005 to 2013 in 10 European countries. **Methods:** The data used in the present study were derived from the first, second, fourth and fifth waves of the Survey of Health, Ageing and Retirement in Europe. The present study includes individuals aged ≥ 50 years from 10 European countries. Body mass index (BMI) was calculated from self-reported height and weight (kg/m^2). **Results:** The general prevalence of overweight ($\text{BMI} \geq 25 \text{ kg}/\text{m}^2$) was slightly above 60% and remained stable between 2005 (60.1%, 95% confidence interval (CI): 59.3–60.9%) and 2013 (60.3%, 95% CI: 59.7–60.9%). On the other hand, the prevalence of obesity ($\text{BMI} \geq 30 \text{ kg}/\text{m}^2$) increased significantly (1.6 points, 95% CI: 0.7–2.6) from 17.5% in 2005 to 19.2% in 2013. Although the prevalence of obesity increased in most countries, the only significant increase was observed in Germany (5.8 points, 95% CI: 1.8–9.9). Spain was the only country where the prevalence of obesity decreased significantly (–4.7 points, 95% CI: –8.8 to –0.5). Sex and age differences are reported. **Conclusions:** Although the prevalence of overweight was stable, the prevalence of obesity rose. Based on the data currently available for Europe, the prevalence of obesity in European older adults has already reached epidemic proportions, which reinforces the need for the development of effective healthy lifestyle programs.

Keywords: *Epidemiologic research design, overweight, obesity, body mass index, older adult, ageing*

Introduction

Overweight and obesity are clinical public-health concerns worldwide [1–3]. Amongst older adults, the prevalence of overweight and obesity is considered high [4]. Furthermore, obesity is a major risk factor for diabetes [5], hypertension [6], coronary heart disease [7] and certain types of cancer [8]. Obesity is also associated with osteoarthritis, asthma and depression [9]. In Europe, by 2016, it was estimated that adults aged ≥ 50 years accounted for almost 40% of the population [10].

Over the last decades, the prevalence of overweight and obesity in most economically developed countries has remained stable [4]. However, it still has a huge health and economic impact. By 2009, obesity was estimated to account for between 0.7% and 2.8% of a country's total health-care expenditure [11]. Additionally, obese individuals were found to have medical costs that were approximately 30% higher than their normal weight peers [11].

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Previous studies, using data from the Survey of Health, Ageing and Retirement in Europe (SHARE), have reported the prevalence of overweight and obesity amongst middle-aged and older adults in several European countries [12–14]. Those studies found that in 2004, the prevalence of overweight (excluding obesity) in European countries was around 40%, whilst the prevalence of obesity was around 18%. However, only data from one wave were used and thus did not focus on the prevalence and trends of overweight and obesity. Some studies on the prevalence of obesity in middle-aged and older adults from non-European regions, such as the USA (2005–2014), Arabian Gulf States (1991–2006) and China (1992–2002), have reported increasing and stabilising trends over the years, as well as high prevalence values (>20%) [15–17].

Monitoring obesity and overweight prevalence and trends is important for assessing interventions aimed at preventing or reducing the burden of obesity. This is particularly important amongst older adults, because overweight and obesity in this population group is also associated with a greater risk of physical inactivity [18], mobility limitation [19], osteoarthritis [9] and poor functional performance [20]. Consequently, this impacts health and quality of life for older individuals.

Aims

Understanding and updating trends in the prevalence of obesity and overweight is central for evaluating and informing interventions aimed at preventing or reducing the burden of obesity. Therefore, the purpose of this study was to provide current data regarding the prevalence and trends of overweight and obesity in adults >50 years of age from 10 European countries from 2005 to 2013.

Methods

Participants and study design

The data used in the present study were derived from the first, second, fourth and fifth waves of SHARE. SHARE is an interdisciplinary survey on ageing that is run every two years and collects extensive information on health, socio-economic status and family interactions of individuals aged ≥ 50 years of age in several European countries from Scandinavia to the Mediterranean [21].

The present study included individuals aged ≥ 50 years from 10 countries (Austria, Belgium, Denmark, France, Germany, Italy, The Netherlands, Spain, Sweden and Switzerland). Data from 10 other

countries (Czech Republic, Estonia, Greece, Hungary, Ireland, Israel, Luxembourg, Poland, Portugal and Slovenia) that participated in the SHARE project were excluded because in those countries there were no data from all the waves that characterise the SHARE project. For the present study, there are no data from wave 3, in 2009, because in this wave, weight and height were not assessed. The final sample comprised 24,356 participants (11,115 men and 13,241 women) from wave 1 in 2005, 24,508 participants (11,128 men and 13,380 women) from wave 2 in 2007, 35,428 participants (15,877 men and 25,560 women) from wave 4 in 2011 and 46,903 participants (21,343 men and 25,560 women) from wave 5 in 2013.

In the SHARE project, data were collected face to face by trained interviewers using a computer-assisted personal interviewing program, supplemented by a self-completed paper-and-pencil questionnaire (available at www.share-project.org/methodological-research.html). Comparable questionnaires were applied in each country. Translation guidelines were applied, and pilots were performed to enhance comparability. The study meets the ethical standards of medical journals [22].

Body mass index

Body mass index (BMI) was calculated from self-reported height and weight (kg/m^2). BMI categories were calculated in accordance with World Health Organization guidelines [23]: normal weight (18.5–24.9 kg/m^2), overweight (25–29.9 kg/m^2) and obese (≥ 30 kg/m^2).

Statistical analysis

Descriptive statistics were performed to characterise the sample. For the prevalence of overweight and obesity, the percentage and 95% confidence interval (CI) were calculated. The differences between participants' characteristics in all waves were tested by analysis of variance and chi-square tests. Data analysis was performed using IBM SPSS Statistics for Windows v22 (IBM Corp., Armonk, NY). When statistical tests were applied, the level of significance was set at $p < 0.05$.

Results

Table I presents the participants' characteristics (age, weight, height, BMI and BMI category) in 2005, 2007, 2011 and 2013. Overall BMI slightly increased between 2005 and 2013 (2005: 26.5 kg/m^2 , 26.4–26.5 kg/m^2 ; 2013: 26.6 kg/m^2 , 26.6–26.7 kg/m^2 ;

Table I. Characteristics of participants.

	Mean or % (95% CI)				<i>p</i> ¹
	2005	2007	2011	2013	
<i>All</i>	<i>n</i> =24,356	<i>n</i> =24,508	<i>n</i> =35,428	<i>n</i> =46,903	
Age (years)	64.9 (64.8–65.0)	65.7 (65.6–65.9)	66.6 (66.5–66.7)	67.0 (66.9–67.1)	<0.001
Weight (kg)	74.8 (74.6–75.0)	75.0 (74.8–75.2)	75.3 (75.2–75.4)	75.7 (75.5–75.8)	<0.001
Height (m)	1.68 (1.68–1.68)	1.68 (1.68–1.68)	1.68 (1.68–1.68)	1.68 (1.68–1.68)	<0.001
BMI	26.5 (26.4–26.5)	26.5 (26.4–26.6)	26.6 (26.6–26.7)	26.6 (26.6–26.7)	<0.001
BMI category					<0.001
Underweight	0.5 (–0.8 to 1.7)	0.7 (–0.6 to 1.9)	0.7 (–0.3 to 1.7)	0.6 (–0.3 to 1.5)	
Normal weight	39.4 (38.5–40.4)	39.0 (38.1–40.0)	38.8 (38.0–39.6)	39.1 (38.4–39.8)	
Overweight	42.5 (41.6–43.5)	42.2 (41.2–43.1)	41.3 (40.5–42.1)	41.1 (40.4–41.8)	
Obesity I	13.6 (12.5–14.8)	13.9 (12.8–15.1)	14.6 (13.7–15.6)	14.5 (13.6–15.3)	
Obesity II	2.9 (1.7–4.1)	3.3 (2.1–4.5)	3.5 (2.5–4.5)	3.6 (2.7–4.4)	
Obesity III	1.0 (–0.3 to 2.2)	0.9 (–0.3 to 2.1)	1.1 (0.1–2.1)	1.1 (0.2–2.0)	
<i>Men</i>	<i>n</i> =11,115	<i>n</i> =11,128	<i>n</i> =15,877	<i>n</i> =21,343	
Age (years)	64.6 (64.4–64.8)	64.6 (64.4–64.8)	66.5 (66.4–66.7)	67.2 (67.1–67.3)	<0.001
Weight (kg)	80.9 (80.7–81.2)	81.5 (81.2–81.7)	82.1 (81.9–82.3)	82.5 (82.3–82.7)	<0.001
Height (cm)	1.74 (1.74–1.74)	1.74 (1.74–1.75)	1.75 (1.75–1.75)	1.75 (1.75–1.75)	<0.001
BMI	26.7 (26.6–26.7)	26.8 (26.7–26.8)	26.9 (26.9–27.0)	26.9 (26.9–27.0)	<0.001
BMI category					<0.001
Underweight	0.3 (–1.5 to 2.2)	0.4 (–1.4, 2.3)	0.4 (–1.1, 2.0)	0.4 (–0.9, 1.8)	
Normal weight	34.4 (32.9–36.0)	33.7 (32.2–35.2)	33.0 (31.7–34.2)	33.3 (32.2–34.4)	
Overweight	49.2 (47.9–50.5)	48.7 (47.3–50.0)	47.6 (46.5–48.8)	47.9 (46.9–48.9)	
Obesity I	13.2 (11.5–14.9)	14.1 (12.4–15.9)	15.4 (14.0–16.8)	14.7 (13.5–16.0)	
Obesity II	2.2 (0.4–4.1)	2.6 (0.8–4.5)	2.9 (1.3–4.4)	2.8 (1.5–4.1)	
Obesity III	0.6 (–1.3 to 2.4)	0.6 (–1.3 to 2.4)	0.7 (–0.9 to 2.2)	0.8 (–0.6 to 2.1)	
<i>Women</i>	<i>n</i> =13,241	<i>n</i> =13,380	<i>n</i> =19,551	<i>n</i> =25,560	
Age (years)	65.1 (65.0–65.3)	65.7 (65.5–65.9)	66.6 (66.4–66.7)	66.9 (66.8–67.0)	<0.001
Weight (kg)	69.6 (69.4–69.8)	69.6 (69.4–69.8)	69.8 (69.6–70.0)	70.0 (69.8–70.1)	0.018
Height (cm)	1.63 (1.63–1.63)	1.63 (1.63–1.63)	1.63 (1.63–1.63)	1.63 (1.63–1.63)	0.009
BMI	26.4 (26.3–26.4)	26.3 (26.2–26.4)	26.4 (26.3–26.4)	26.4 (26.4–26.5)	0.098
BMI category					0.003
Underweight	0.6 (–1.1 to 2.3)	0.9 (–0.8 to 2.6)	0.9 (–0.5, 2.3)	0.8 (–0.4 to 2.1)	
Normal weight	43.6 (42.4–44.9)	43.5 (42.2–44.8)	43.5 (42.5–44.6)	43.9 (42.9–44.8)	
Overweight	36.9 (35.6–38.3)	36.8 (35.5–38.2)	36.1 (35.0–37.2)	35.4 (34.5–36.4)	
Obesity I	14.0 (12.4–15.6)	13.7 (12.2–15.3)	14.0 (12.7–15.3)	14.3 (13.1–15.4)	
Obesity II	3.5 (1.8–5.1)	3.8 (2.2–5.5)	4.0 (2.7–5.4)	4.2 (3.0–5.4)	
Obesity III	1.4 (–0.3 to 3.0)	1.2 (–0.5 to 2.9)	1.4 (0.0–2.8)	1.4 (0.2–2.6)	

¹Comparison between the four waves. The differences were tested by analysis of variance and chi-square test. CI: confidence interval; BMI: body mass index.

$p < 0.001$). However, when considering sex, BMI only significantly increased for men ($p < 0.001$).

The prevalence of overweight and obesity by sex and age are shown in Table II. Overall, between 2005 and 2013, the general prevalence of overweight (BMI ≥ 25 kg/m²) was slightly above 60% and by and large remained stable. However, when looking at age, it was possible to observe that while the 60–69 years age group dropped 1.4 points (95% CI: –2.5 to –0.3), the ≥ 80 years age group increased by 4.9 points (95% CI: 3.0–6.8). Similar results were observed for women. Although the prevalence of overweight in men remained stable for all age groups, the prevalence for women significantly decreased by 0.4 points (95% CI: –1.6 to 0.7) overall and 3.4

points (95% CI: –5.4 to –1.5) for the 60–69 years age group, while increasing 5.5 points (95% CI: 2.2–8.8) in the older age group.

The general prevalence of obesity (BMI ≥ 30 kg/m²) significantly increased 1.6 points (95% CI: 0.7–2.6) from 17.5% in 2005 to 19.2% in 2013. The 60–69 and 70–79 years age groups were the only ones where significant differences were observed. The overall prevalence of obesity in men significantly increased by 2.3 points (95% CI: 0.6–4.0) between 2005 and 2013, while the prevalence in women did not present significant differences. The 60–69 years age group (3.4%, 95% CI: 0.4–6.3) for men was the only one where the prevalence of obesity significantly increased.

Table II. Prevalence of overweight (BMI ≥ 25 kg/m²) and obesity (BMI ≥ 30 kg/m²) in 2005, 2007, 2011 and 2013 amongst European adults aged ≥ 50 years by sex and age.

	% (95% CI)				Change 2005 to 2013, point (95% CI)
	2005	2007	2011	2013	
<i>Overweight (BMI ≥ 25 kg/m²)</i>					
<i>All</i>	<i>n=24,356</i>	<i>n=24,508</i>	<i>n=35,428</i>	<i>n=46,903</i>	
50–59	57.7 (56.4–59.1)	57.1 (55.7–58.5)	57.8 (56.5–59.0)	57.3 (56.1–58.4)	–0.5 (–1.7 to 0.8)
60–69	64.0 (62.7–65.4)	62.6 (61.3–63.9)	62.9 (61.8–64.0)	62.7 (61.7–63.6)	–1.4 (–2.5 to –0.3)
70–79	62.1 (60.4–63.7)	64.7 (63.1–66.2)	63.4 (62.1–64.7)	62.5 (61.4–63.6)	0.4 (–0.9 to 1.7)
≥ 80	51.3 (48.5–54.1)	53.7 (51.2–56.3)	55.1 (53.2–57.0)	56.2 (54.6–57.9)	4.9 (3.0–6.8)
Total	60.1 (59.3–60.9)	60.3 (59.5–61.1)	60.5 (59.9–61.2)	60.3 (59.7–60.9)	0.2 (–0.4 to 0.9)
<i>Men</i>					
50–59	65.5 (63.7–67.4)	65.6 (63.7–67.6)	67.1 (65.4–68.7)	66.5 (65.0–68.1)	1.0 (–1.0 to 2.9)
60–69	68.7 (66.9–70.5)	68.7 (66.9–70.5)	69.4 (68.0–70.9)	69.6 (68.4–70.9)	0.9 (–0.8 to 2.7)
70–79	64.0 (61.6–66.4)	67.4 (65.3–69.6)	67.3 (65.5–69.0)	65.9 (64.4–67.5)	1.9 (–0.3 to 4.1)
≥ 80	53.0 (48.5–57.5)	53.9 (50.0–57.9)	55.8 (52.8–58.8)	56.8 (54.3–59.3)	3.8 (–0.1 to 7.8)
Total	65.2 (64.1–66.3)	65.9 (64.8–67.0)	66.6 (65.7–67.5)	66.3 (65.5–67.0)	1.0 (–0.1 to 2.1)
<i>Women</i>					
50–59	51.2 (49.2–53.2)	50.4 (48.4–52.5)	50.7 (48.9–52.5)	50.5 (48.9–52.1)	–0.7 (–2.7 to 1.4)
60–69	59.8 (57.9–61.8)	57.3 (55.4–59.3)	57.3 (55.7–58.9)	56.4 (55.0–57.8)	–3.4 (–5.4 to –1.5)
70–79	60.4 (58.0–62.7)	62.1 (59.9–64.4)	60.0 (58.1–61.8)	59.3 (57.7–60.9)	–1.0 (–3.3 to 1.2)
≥ 80	50.3 (46.7–53.9)	53.6 (50.2–56.9)	54.6 (52.1–57.2)	55.8 (53.7–58.0)	5.5 (2.2–8.8)
Total	55.7 (54.6–56.9)	55.6 (54.5–56.7)	55.6 (54.6–56.5)	55.3 (54.5–56.1)	–0.4 (–1.6 to 0.7)
<i>Obesity (BMI ≥ 30 kg/m²)</i>					
<i>All</i>					
50–59	17.4 (15.5–19.3)	17.5 (15.5–19.4)	18.3 (16.6–20.1)	19.0 (17.4–20.6)	1.6 (–0.2 to 3.4)
60–69	18.8 (16.8–20.8)	19.4 (17.5–21.4)	21.0 (19.4–22.6)	20.5 (19.2–21.9)	1.7 (0.2–3.3)
70–79	17.6 (15.2–20.0)	19.0 (16.6–21.3)	20.4 (18.5–22.3)	19.6 (17.9–21.2)	2.0 (0.1–3.8)
≥ 80	13.7 (10.0–17.5)	14.3 (10.8–17.8)	14.7 (12.0–17.3)	15.3 (13.0–17.5)	1.5 (–1.2 to 4.2)
Total	17.5 (16.4–18.7)	18.1 (17.0–19.2)	19.2 (18.3–20.2)	19.2 (18.4–20.0)	1.6 (0.7–2.6)
<i>Men</i>					
50–59	17.0 (14.2–19.8)	17.8 (14.8–20.8)	19.3 (16.7–21.9)	19.2 (16.8–21.6)	2.1 (–0.9 to 5.2)
60–69	17.2 (14.3–20.1)	18.9 (16.1–21.8)	21.4 (19.0–23.7)	20.6 (18.6–22.6)	3.4 (0.4–6.3)
70–79	14.8 (11.2–18.5)	17.0 (13.6–20.5)	18.9 (16.0–21.7)	17.4 (15.0–19.8)	2.5 (–0.9 to 6.0)
≥ 80	10.1 (3.9–16.2)	11.0 (5.5–16.5)	11.5 (7.2–15.7)	12.2 (8.7–15.7)	2.1 (–3.6 to 7.9)
Total	16.0 (14.3–17.7)	17.3 (15.6–19.0)	19.0 (17.6–20.4)	18.3 (17.1–19.6)	2.3 (0.6–4.0)
<i>Women</i>					
50–59	17.7 (15.2–20.3)	17.2 (14.5–19.9)	17.6 (15.3–19.9)	18.9 (16.8–20.9)	1.2 (–1.6 to 3.9)
60–69	20.2 (17.5–22.9)	19.8 (17.2–22.5)	20.6 (18.5–22.8)	20.5 (18.6–22.4)	0.3 (–2.4 to 2.9)
70–79	20.0 (16.8–23.3)	20.8 (17.5–24.0)	21.7 (19.2–24.3)	21.6 (19.4–23.8)	1.5 (–1.7 to 4.8)
≥ 80	16.0 (11.3–20.7)	16.6 (12.2–21.1)	16.9 (13.5–20.3)	17.6 (14.6–20.5)	1.5 (–3.0 to 6.1)
Total	18.8 (17.3–20.3)	18.8 (17.2–20.3)	19.5 (18.2–20.7)	19.9 (18.8–21.0)	1.1 (–0.5 to 2.6)

In every country, more than half of the participants were overweight (Figure 1). In 2013, Switzerland (53.9%, 95% CI: 51.5–56.3%), Denmark (55.0%, 95% CI: 53.0–57.1%) and Sweden (56.0%, 95% CI: 54.0–57.9%) had the lowest prevalence of overweight, while Spain (67.4%, 95% CI: 66.0–68.8%), Germany (64.0%, 95% CI: 62.5–65.6%) and Austria (62.9%, 95% CI: 61.1–64.7%) had the highest prevalence. Overall, the prevalence of overweight was stable between 2005 and 2013. However, there are some differences when analysing countries separately. For example, France's (2.7, 95% CI: –0.3 to 5.7), Denmark's (2, 95% CI: –1.9 to 6.0) and Switzerland's (2, 95% CI: –3.0 to

7.0) prevalence of overweight rose $>1.9\%$ from 2005 to 2013, although the increase was not significant. On the other hand, a significant decrease in the prevalence of overweight was observed for Spain (–3.5, 95% CI: –6.1 to –0.9) and Italy (–4.3, 95% CI: –7.3 to –1.3).

The prevalence of obesity ranged between 13.4% in Switzerland and 25.6% in Spain in 2005 and between 15.8% in Sweden and 23.1% in Spain in 2013 (Figure 2). From 2005 to 2013, the prevalence of obesity increased 1.6 points (95% CI: 0.7–2.6). Although in most countries the prevalence of obesity rose, the only significant increase was observed in Germany (5.8, 95% CI: 1.8–9.9). Contrary to that,

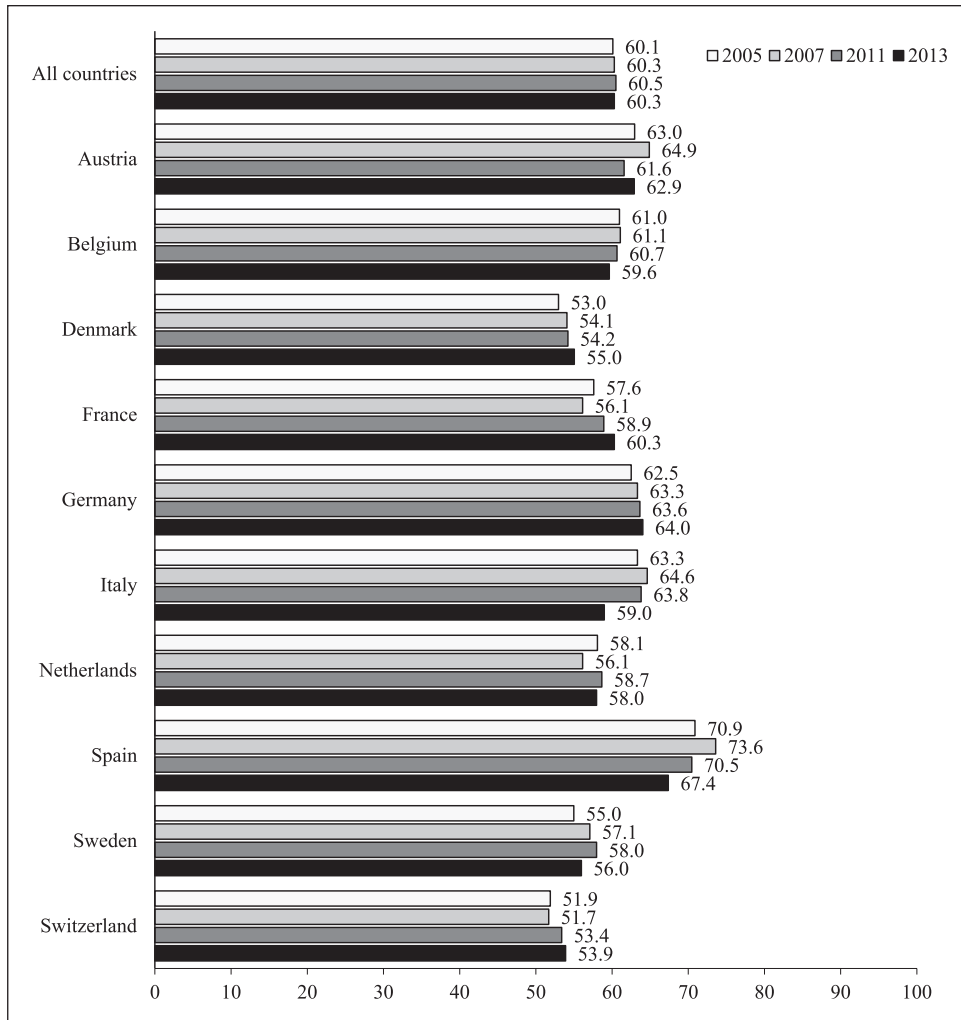


Figure 1. Prevalence of overweight (BMI ≥ 25 kg/m²) in 2005, 2007, 2011 and 2013 amongst European adults aged ≥ 50 years by country.

in Spain, the prevalence of obesity decreased significantly (-4.7 , 95% CI: -8.8 to -0.5).

Discussion

This study aimed to provide current data regarding the prevalence and trends of overweight and obesity of adults aged ≥ 50 years from 2005 to 2013 from 10 European countries. Based on the results from this study, between 2005 and 2013, the general prevalence of overweight in European adults was slightly above 60%, being stable from 2005 to 2013, and the general prevalence of obesity increased from 17.5% to 19.2% in the same time period. Although the prevalence of obesity increased slightly, these results are in line with previous research conducted in Europe in which $>50\%$ of the European population was classified as overweight [12–14,24], and in line with the tendency for prevalence to remain stable, as observed in the last decades [4]. Corroborating previous

findings, the steady prevalence of overweight and obesity suggest that the efforts made by national governments and international institutions to reduce overweight and obesity are possibly not achieving their goals on a large scale or have not yielded results yet.

Country-specific analysis in 2013 revealed that Spain (overweight 67.4%; obesity 20.9%), Germany (overweight 64.0%; obesity 23.1%) and Austria (overweight 62.9%; obesity 21.3%) had the highest prevalence of overweight and the highest prevalence of obesity. Although Spain was amongst the highest prevalence countries, it was the only country where the prevalence of both overweight and obesity decreased between 2005 and 2013. Alongside Spain, Italy was the only country where the prevalence of overweight decreased significantly. This finding is consistent with a previous study on trends and determinants of excessive body weight in Italian adults, showing that there are no unfavourable trends in

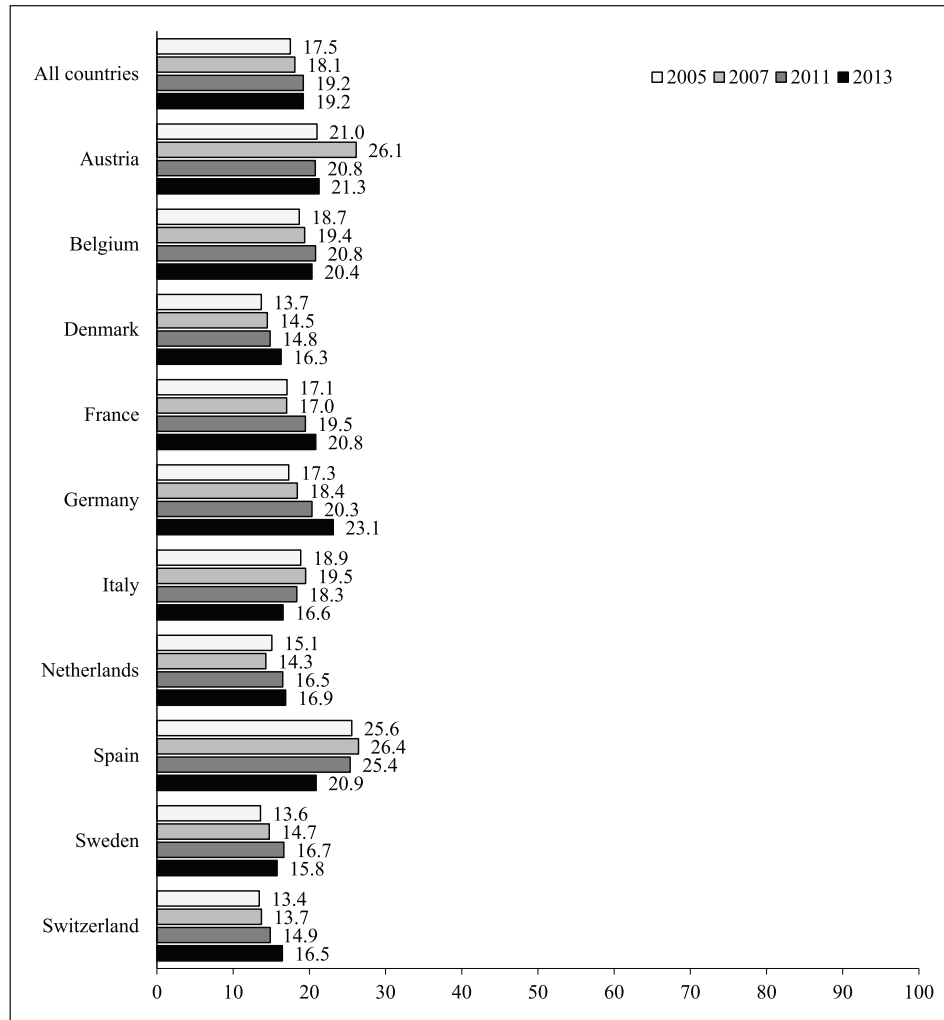


Figure 2. Prevalence of obesity (BMI ≥ 30 kg/m²) in 2005, 2007, 2011 and 2013 among European adults aged ≥ 50 years by country.

overweight and obesity prevalence [25]. However, in a general manner, this study's findings are in contrast with a previous study reporting a higher prevalence of obesity in Central, Eastern and Southern European countries concerning geographic variation of prevalence rates [26]. The variations in the prevalence observed in different European populations may be due in part to differences in sedentary lifestyle and a lack of physical activity [27–29] and also to ethnic affiliation. In studies including various groups of immigrants in Canada [30] and Sweden [31], ethnicity has been shown to be a major determinant of obesity independently of socio-economic factors. Many European countries have undergone substantial population changes due to immigration from Eastern Europe, as well as from outside of Europe, over the past two decades.

The current study shows that in every country, more than half of the participants were characterised by excessive body weight. However, there were some

noticeable differences in the trends of the prevalence of overweight and obesity, depending on age and sex. While the prevalence of overweight increased for the ≥ 80 years age group between 2005 and 2013, it decreased for the 60–69 years age group. On the other hand, the prevalence of obesity only increased for the middle-age groups, ranging from 60–79 years. Regarding sex, while the prevalence of obesity in men increased in this time period, the prevalence in women remained unchanged. Additionally, while the prevalence of overweight in men remained stable, the prevalence of overweight in women decreased slightly. Similar associations between excessive body weight, sex and age have been reported in other studies within specific European countries, including Spain, Germany and the UK [32,33].

Findings indicate that although the estimated prevalence of overweight and obesity is different in various studies, the prevalence of overweight and obesity is high amongst the elderly European

population. It is similar to what has been reported in the USA [34]. Based on the data currently available for Europe, the prevalence of obesity in older European adults has already reached epidemic proportions. As obesity is a risk factor for a number of diseases, its higher prevalence nurtures the supposition that obesity is related to a growing and significant economic burden to society [35]. This study highlights that obesity in Europe is a serious disorder and reinforces the need for the development of effective healthy lifestyle programs, enhancing health literacy about this condition, and that health-care professionals should advise patients on the importance of maintaining a healthy weight [36]. There is a need for a medical management approach to obesity and shifts in public-health policy. Even modest weight loss (approximately 5% of initial weight) has been associated with important improvements in health and is likely to be associated with reduced costs to the health-care system and society at large.

A major strength of this study is providing important insight into the prevalence of overweight and obesity in Europe using standardised research methodology across a large representative sample. The study analysed data collected over a long time period, presenting a clearer picture of the prevalence of overweight and obesity in the European population than if calculated from data for just one year. Furthermore, despite the multifaceted burden imposed by obesity, a paucity of research pertaining to consider the prevalence of overweight and obesity in adult population in Europe is noticeable. However, even if this study aims to bring more contributions to this discussion, it has some limitations that should be emphasised. First, the results concern only 10 European countries, as other countries were excluded due to the lack of data. Consequently, our results cannot be generalised to the whole of Europe. Second, whereas the BMI classification system possesses important utility in studying population health, it is not without its limitations [37]. BMI can be biased when based on self-reported height and weight, with individuals traditionally overestimating their height and underestimating their weight. In addition, BMI classifications can be inaccurate for certain groups (e.g. professional athletes or those possessing a high level of muscle mass) [24], as higher BMI can be due to both greater muscle mass and higher bone mineral density, especially in athletes.

Conclusions

Although the estimated prevalence of overweight and obesity is different in various studies, a great proportion of the elderly European population is overweight

and obese, similar to what has been reported in the USA [34]. Based on the data currently available for Europe, the prevalence of obesity in older European adults has already reached epidemic proportions. Obesity in Europe is a serious disorder, and there is a real need for the development of effective healthy lifestyle programs, as well as for enhancing health literacy regarding obesity and for health-care professionals to advise patients on the importance of maintaining a healthy weight [36].

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References

- [1] Finucane MM, Stevens GA, Cowan MJ, et al. National, regional, and global trends in body-mass index since 1980: systematic analysis of health examination surveys and epidemiological studies with 960 country-years and 9.1 million participants. *Lancet* 2011;377:557–567.
- [2] Health and Social Care Information Centre. *Statistics on obesity, physical activity and diet – England 2015*. Leeds, UK: NHS Digital, 2015.
- [3] Flegal K, Carroll M, Ogden C, et al. Prevalence and trends in obesity among US adults, 1999–2008. *J Am Med Assoc* 2010;303:235–241.
- [4] Ng M, Fleming T, Robinson M, et al. Global, regional, and national prevalence of overweight and obesity in children and adults during 1980–2013: a systematic analysis for the Global Burden of Disease Study 2013. *Lancet* 2014;384:766–781.
- [5] Pinto G and Beltran-Sanchez H. Prospective study of the link between overweight/obesity and diabetes incidence among Mexican older adults: 2001–2012. *Salud Publica Mex* 2015;57:S15–21.
- [6] Matsuo T, Sairenchi T, Suzuki K, et al. Long-term stable obesity increases risk of hypertension. *Int J Obes* 2011;35:1056–1062.
- [7] Mann DM, Lee J, Liao Y, et al. Independent effect and population impact of obesity on fatal coronary heart disease in adults. *Prev Med* 2006;42:66–72.
- [8] Rapp K, Schroeder J, Klenk J, et al. Obesity and incidence of cancer: a large cohort study of over 145,000 adults in Austria. *Br J Cancer* 2005;93:1062–1067.
- [9] Dixon JB. The effect of obesity on health outcomes. *Mol Cell Endocrinol* 2010;316:104–108.
- [10] Eurostat. Population by age group Brussels: European Commission. Share of population in a certain age group compared to the total population, <http://ec.europa.eu/eurostat/tgm/refreshTableAction.do?tab=table&plugin=1&pcode=tp00010&language=en> (2016, accessed 20 January 2018).

- [11] Withrow D and Alter DA. The economic burden of obesity worldwide: a systematic review of the direct costs of obesity. *Obes Rev* 2011;12:131–141.
- [12] Peytremann-Bridevaux I, Faeh D and Santos-Eggimann B. Prevalence of overweight and obesity in rural and urban settings of 10 European countries. *Prev Med* 2007;44:442–446.
- [13] Peytremann-Bridevaux I and Santos-Eggimann B. 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 > or = 50 years. *Swiss Med Wkly* 2008;138:261–266.
- [14] Andreyeva T, Michaud PC and van Soest A. Obesity and health in Europeans aged 50 years and older. *Public Health* 2007;121:497–509.
- [15] Wang Y, Mi J, Shan XY, et al. Is China facing an obesity epidemic and the consequences? The trends in obesity and chronic disease in China. *Int J Obes (Lond)* 2007;31:177–188.
- [16] Ng SW, Zaghoul S, Ali HI, et al. The prevalence and trends of overweight, obesity and nutrition-related non-communicable diseases in the Arabian Gulf States. *Obes Rev* 2011;12:1–13.
- [17] Flegal KM, Kruszon-Moran D, Carroll MD, et al. Trends in obesity among adults in the United States, 2005 to 2014. *JAMA* 2016;315:2284–2291.
- [18] Tucker JM, Tucker LA, Lecheminant J, et al. Obesity increases risk of declining physical activity over time in women: a prospective cohort study. *Obesity* 2013;21:E715–720.
- [19] Brown CJ and Flood KL. Mobility limitation in the older patient: a clinical review. *JAMA* 2013;310:1168–1177.
- [20] Jensen GL and Hsiao PY. Obesity in older adults: relationship to functional limitation. *Curr Opin Clin Nutr Metab Care* 2010;13:46–51.
- [21] Börsch-Supan A, Brandt M, Hunkler C, et al. Data resource profile: the Survey of Health, Ageing and Retirement in Europe (SHARE). *Int J Epidemiol* 2013;42:992–1001.
- [22] CJSM. Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly Work in Medical Journals, 2014.
- [23] World Health Organization. *Obesity: preventing and managing the global epidemic. Report of a WHO consultation*. Geneva, Switzerland: World Health Organization, 2000.
- [24] Gupta S, Richard L and Forsythe A. The humanistic and economic burden associated with increasing body mass index in the EU5. *Diabetes Metab Syndr Obes* 2015;8:327–338.
- [25] Gallus S, Odone A, Lugo A, et al. Overweight and obesity prevalence and determinants in Italy: an update to 2010. *Eur J Nutr* 2013;52:677–685.
- [26] Berghofer A, Pischon T, Reinhold T, et al. Obesity prevalence from a European perspective: a systematic review. *BMC Public Health* 2008;8:200.
- [27] Lee IM, Shiroma EJ, Lobelo F, et al. Effect of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy. *Lancet* 2012;380:219–229.
- [28] Kohl HW, Craig CL, Lambert EV, et al. The pandemic of physical inactivity: global action for public health. *Lancet* 2012;380:294–305.
- [29] Murtagh EM, Murphy MH, Murphy NM, et al. Prevalence and correlates of physical inactivity in community-dwelling older adults in Ireland. *PLoS One* 2015;10:e0118293.
- [30] Tremblay MS, Perez CE, Ardern CI, et al. Obesity, overweight and ethnicity. *Health Rep* 2005;16:23–34.
- [31] Gadd M, Sundquist J, Johansson SE, et al. Do immigrants have an increased prevalence of unhealthy behaviours and risk factors for coronary heart disease? *Eur J Cardiovasc Prev Rehabil* 2005;12:535–541.
- [32] Oliva-Moreno J and Gil-Lacruz A. Body weight and health-related quality of life in Catalonia, Spain. *Eur J Health Econ* 2013;14:95–105.
- [33] König HH, Lehnert T, Brenner H, et al. Health service use and costs associated with excess weight in older adults in Germany. *Age Ageing* 2015;44:616–623.
- [34] Ogden CL, Carroll MD, Kit BK, et al. Prevalence of childhood and adult obesity in the United States, 2011–2012. *JAMA* 2014;311:806–814.
- [35] Wolfenstetter SB. Future direct and indirect costs of obesity and the influence of gaining weight: results from the MONICA/KORA cohort studies, 1995–2005. *Econ Hum Biol* 2012;10:127–138.
- [36] Wilkinson ML, Brown AL, Poston WS, et al. Physician weight recommendations for overweight and obese firefighters, United States, 2011–2012. *Prev Chronic Dis* 2014;11:E116.
- [37] Connor Gorber S, Tremblay M, Moher D, et al. A comparison of direct vs. self-report measures for assessing height, weight and body mass index: a systematic review. *Obes Rev* 2007;8:307–326.