

Obesity is associated with substantial costs for society – a Danish register-based study from 2002 to 2018

Madsen ME¹; Bøgelund M¹; Dirksen C²; Jørgensen NB²; Madsbad S²; Panton UH³; Pedersen MH¹; Johansen P³

Aim

- To investigate the direct and indirect costs associated with obesity in a large-scale study using the Danish registers by assessing the direct and indirect costs and labour productivity among people with obesity compared with controls not registered with obesity during the study period.

Introduction

- Obesity is associated with a high number of comorbidities; thus, people with obesity might have higher use of healthcare resources compared with people without obesity.
- In Denmark, nearly 17% of the adult population is living with obesity (defined as having a BMI $\geq 30 \text{ kg/m}^2$) (1).
- We used national Danish health registers to identify a population of people living with obesity and estimated the direct and indirect costs associated with this condition between 2002 and 2018.

Methods

- The study population comprised Danish citizens (≥ 18 years) registered with a primary or secondary diagnosis of obesity in the Danish National Patient Register between 2002 and 2018 (ICD-10 diagnosis codes: E660B-E660H and E662), excluding women only identified with obesity in relation to pregnancy.
- For each person with obesity (identified as cases), we identified five unique controls through the Central Person Register and matched according to sex, year of birth, region of residence and highest obtained education in the index year.

- Average annual direct costs for primary care visits, hospital admissions, outpatient contacts including medicine dispensed from hospitals, home care and prescription medicine, and indirect costs, including average gross earnings and transfer payments (i.e., unemployment benefits, social security and early retirement benefits), were calculated by calendar year from 2002 to 2018.
- Obesity-related contacts were defined as contacts where obesity was registered as the primary or secondary diagnosis.
- All prices were inflated and converted to 2020-EUR.

Table 1: Average annual direct costs and differences per person compared to controls from 2002 to 2018, EUR (cases = 105,186; controls = 524,255)

	Cases	Controls	Difference	P-value
Cost of inpatient hospitalisation	2,567	1,079	1,488 (138%)	<.0001
Obesity-related	398		398	
Non-obesity-related	1,801	902	899 (100%)	<.0001
Psychiatry-related	368	177	191 (108%)	<.0001
Cost of outpatient visits	1,679	928	752 (81%)	<.0001
Obesity-related	151		151	
Non-obesity-related	1,384	843	541 (64%)	<.0001
Psychiatry-related	145	84	60 (71%)	<.0001
Primary care visits	543	377	166 (44%)	<.0001
Cost of home care	360	162	198 (122%)	<.0001
Cost of prescription medicine	376	156	220 (141%)	<.0001
AOM*	3	0	3	<.0001
Total per year	5,525	2,701	2,823 (105%)	<.0001
Total for the full study period	93,919	45,924	47,995 (105%)	<.0001

*AOM = anti-obesity medication

Results

- The analysis included 105,186 people with obesity (80% women, mean age was 48 years). The population included 51% in obesity class I (BMI 30-34.9 kg/m²), 31% in obesity class II (BMI 35-39.9 kg/m²) and 17% in obesity class III (BMI $\geq 40 \text{ kg/m}^2$). 81% of controls had at least one hospital contact in the five years prior to index date (i.e., the first date of an obesity registration among cases).
- The average annual direct healthcare costs were higher among cases than controls (EUR 5,525 vs. EUR 2,701, $p < 0.001$), resulting in an annual difference of EUR 2,823 (+105%) (Table 1).
- Direct costs were found to increase when BMI increased (Figure 1). People in obesity class I had excess healthcare costs of 81% (EUR 5,052 vs. EUR 2,795, $p < 0.001$) compared with their controls, while people in obesity class II and obesity class III had excess healthcare costs of 120% (EUR 5,761 vs. EUR 2,616, $p < 0.001$) and 133% (EUR 5,952 vs. EUR 2,550, $p < 0.001$) compared with their controls, respectively.

Figure 1: Higher BMI is associated with higher direct costs
Differences in average annual healthcare costs between cases and controls by obesity class, EUR

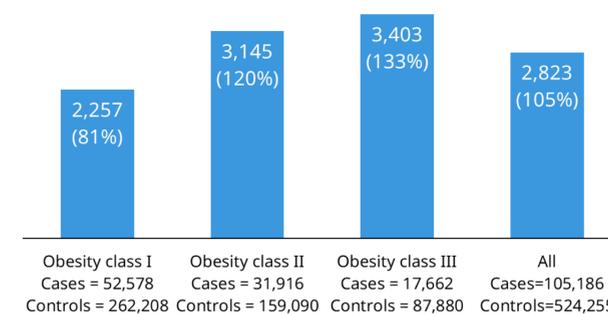
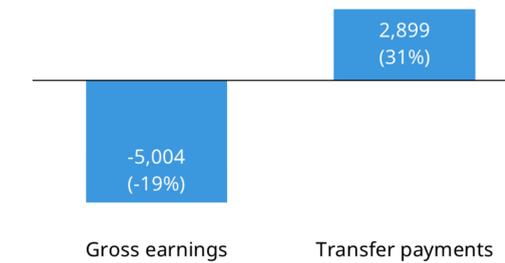


Figure 2: People with obesity have lower earnings and receive more transfer payments than controls
Differences in average annual indirect costs between cases and controls, EUR

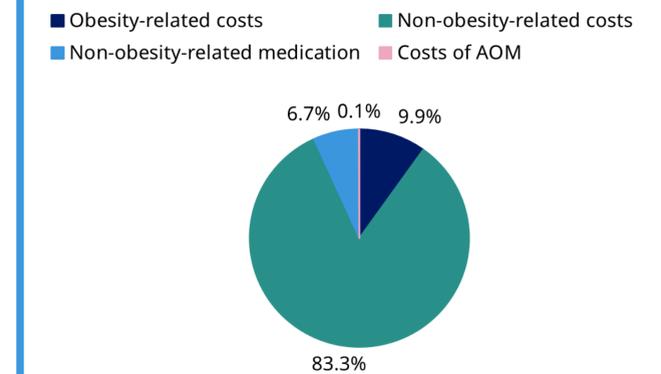


- Differences in indirect costs between cases and controls per year were EUR 5,004 (EUR 21,853 vs. EUR 26,826, $p < 0.001$) (-19%) and EUR 2,899 (EUR 12,342 vs. EUR 9,443, $p < 0.001$) (+31%) in gross earnings and transfer payments, respectively (Figure 2).
- These results reflect that cases were more likely to have lower labour market attachment and receive transfer payments compared with controls.
- Of the total healthcare costs, only 9.9% of the costs were obesity-related and 0.1% were related to anti-obesity medication (AOM), while the remaining 90% of the healthcare costs were associated with treating other diseases (Figure 3). Moreover, the indirect costs increased the total costs even more.
- The obesity-related costs were primarily driven by contacts related to type 2 diabetes, obstructive sleep apnoea and urinary incontinence.

Discussion

- This study is the first large-scale study assessing the direct and indirect costs associated with obesity including data for 17 years.

Figure 3: 90% of the costs are related to treatment of comorbidities
Breakdown of total direct costs for cases



- The strength of the study lies in its retrospective register-based design, which enables us to include all people registered with obesity at Danish hospitals between 2002 and 2018.
- By design, people with obesity has at least one contact to the healthcare sector in the index year, while only 81% of controls had a hospital contact in the period up to index date. This may cause a selection bias.
- Moreover, there is a risk that people in the control group have obesity, but have not been at the hospital; thus, we cannot identify those.

Conclusion

- We found a difference in both direct healthcare costs, indirect costs and labour market attachment between people registered with obesity and matched controls.
- This highlights that obesity is associated with an increased economic burden to the healthcare system and society.