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Introduction

- Over 100 million American adults are currently living with obesity; 75% of whom also suffer from one or more obesity-related comorbidities (ORC).¹
- In 2016, nationwide medical spending for obesity and related comorbidities was \$261 billion,² and as the prevalence and severity of obesity increases, so will the prevalence of ORC and their associated costs.
- While trends in direct medical costs over time in the US have remained stable for normal- and over-weight individuals, costs have increased substantially among people with obesity, and factors such as ORC are an important contributor to these increasing costs.³
- A comprehensive review of published evidence on the current direct medical cost burden of obesity in the US is warranted.

Objective

- To summarize estimates of direct medical costs among adults with obesity in the US, by obesity severity and by the presence of ORC.

Methods

- A systematic literature review (SLR) was performed following PRISMA guidelines using Medline/EMBASE to identify manuscripts (2012-2023) and conference abstracts (2021-2023) published on or before February 21, 2023.
- The population, exposure, comparator, outcomes, and study design (PECOS) criteria guiding the review is presented in Figure 1.
- Data on all-cause, per-person, direct medical costs among samples of adults with obesity were extracted.
- Mean direct medical cost data were synthesized by obesity severity and the presence of ORC, and a gaps analysis performed.

Figure 1. PECOS criteria

	Population: Adults (≥18 yrs) with obesity (BMI ≥ 30mg/m ²) in the US
	Exposure: Obesity severity and ORC
	Comparator: Any
	Outcome: Direct medical costs
	Study design: Observational studies, economic models

Abbreviations: BMI, body mass index; ORC, obesity-related comorbidity; US, United States; yrs, years

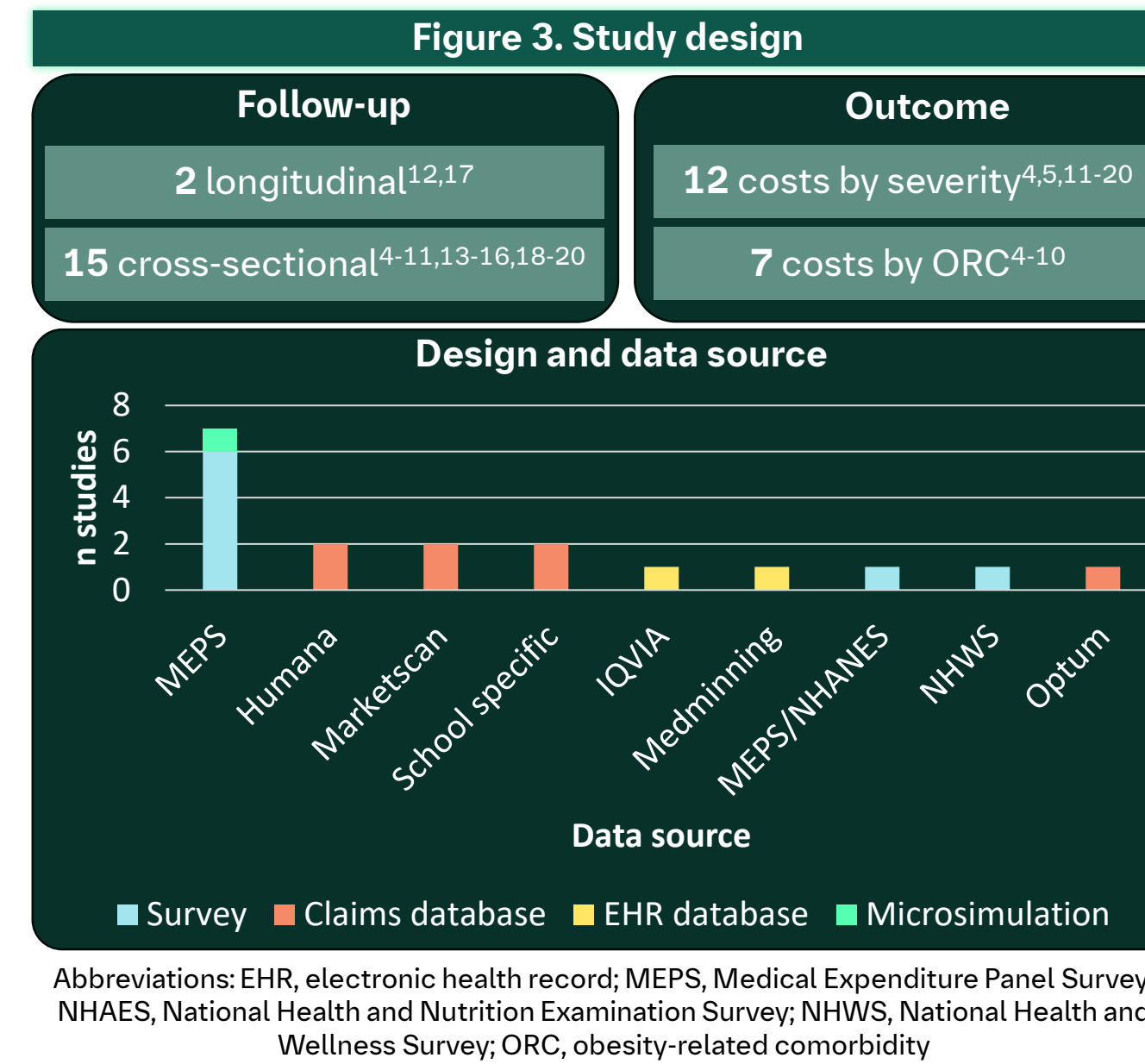


Study and sample characteristics

- From 8,500 records, 17 studies included estimates of per-person, per year, mean direct medical costs.⁴⁻²⁰
- An overview of the sample characteristics is presented in Figure 2, and an overview of the study designs is presented in Figure 3.

	n studies	Sample size
Nationally representative samples, US adults with obesity		
Adults with obesity	5	13,914 ²⁰ to 194,903 ⁷
Adults with incident obesity	1	28,583 ¹²
Older adults with Medicare insurance	1	172,866 ¹⁸
Adults with Commercial insurance	1	9,651 ¹³
Employees or adults of working age	4	38,380 ¹⁹ to 50,717 ¹⁰
Employees with Commercial insurance	1	86,221 ¹⁶
Other samples of US adults with obesity		
Adults in Northern Pennsylvania	1	89,261 ⁹
Employees of a large Western US school district	1	2,531 ¹⁴
Employees of Duke University	1	17,703 ¹⁵

Abbreviations: US, United and States.

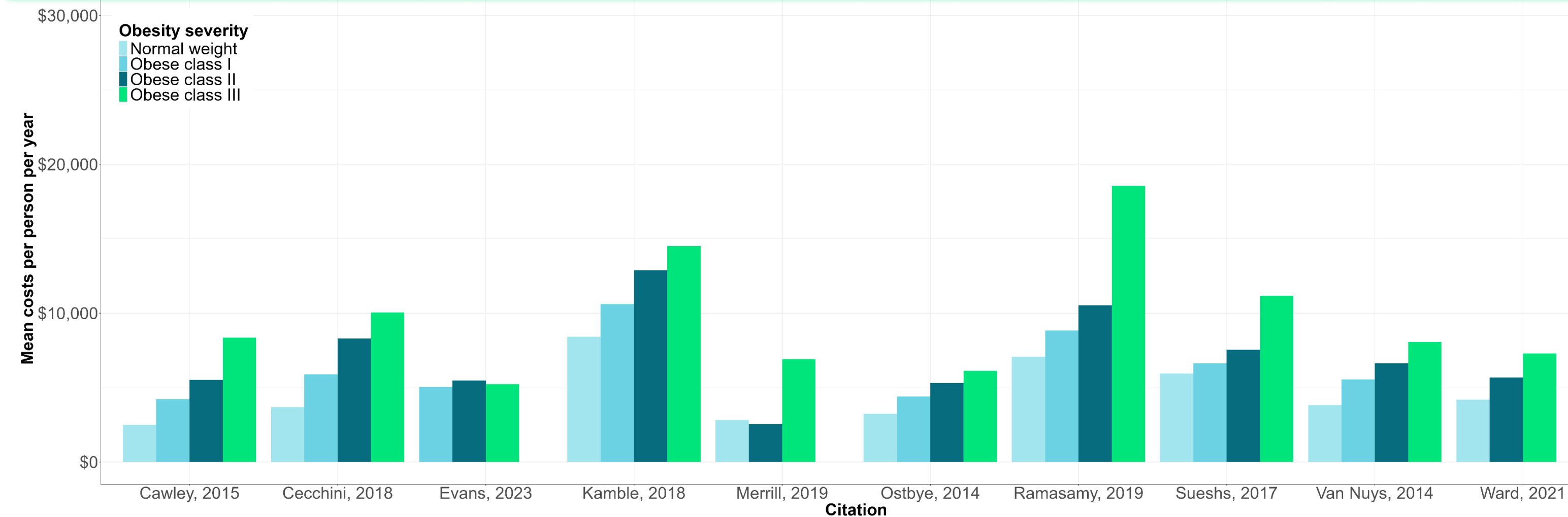


Abbreviations: EHR, electronic health record; MEPS, Medical Expenditure Panel Survey; NHAES, National Health and Nutrition Examination Survey; NHWS, National Health and Wellness Survey; ORC, obesity-related comorbidity

Direct medical costs increased with increasing obesity severity

- In 10 studies, all-cause per-person, per-year, mean direct medical costs were reported by obesity severity relative to a normal weight comparison (Figure 4).^{4,5,11,13-16,18-20}
 - Compared to those of normal weight, mean direct medical costs among those with obesity ranged from 1.1¹⁸⁻ to 1.7⁴⁻ times (obesity class I), 1.2¹¹⁻ to 2.2⁴⁻ times (obesity class II), and 1.2¹⁴⁻ to 3.3⁴⁻ times (obesity class III), higher.

Figure 4. All cause per-person, per year, mean direct medical costs by obesity severity relative to normal weight comparison group



Limitations

- This review provides a comprehensive overview of the direct medical cost burden of obesity in the US over the last ten years; summarizing key cost drivers and gaps in the current literature.
- However, as with any SLR, we were limited by the heterogeneity and reporting accuracy across the included studies. Comparisons and syntheses in this review were hampered by 1) differences between statistical analyses conducted to adjust costs, 2) the year of costs reported, 3) the characteristics of study samples; and 4) differences in the cost components included.

Conclusions

- Direct medical costs in obesity increase with increasing obesity severity and the development of ORC.
- Only one study was identified that characterized the impact of multiple concurrent ORCs; and this study was cross-sectional, limited in scope, and from 2014. Longitudinal studies that consider a wider range and overlap of ORCs are needed to help document and quantify the current direct medical cost burden of obesity.
- Nonetheless, **this summary quantifies the substantial contemporary direct medical cost burden of obesity; and highlights the importance of access to and early treatment with effective interventions to avoid progression to other burdensome and high-cost health conditions among those with obesity.**

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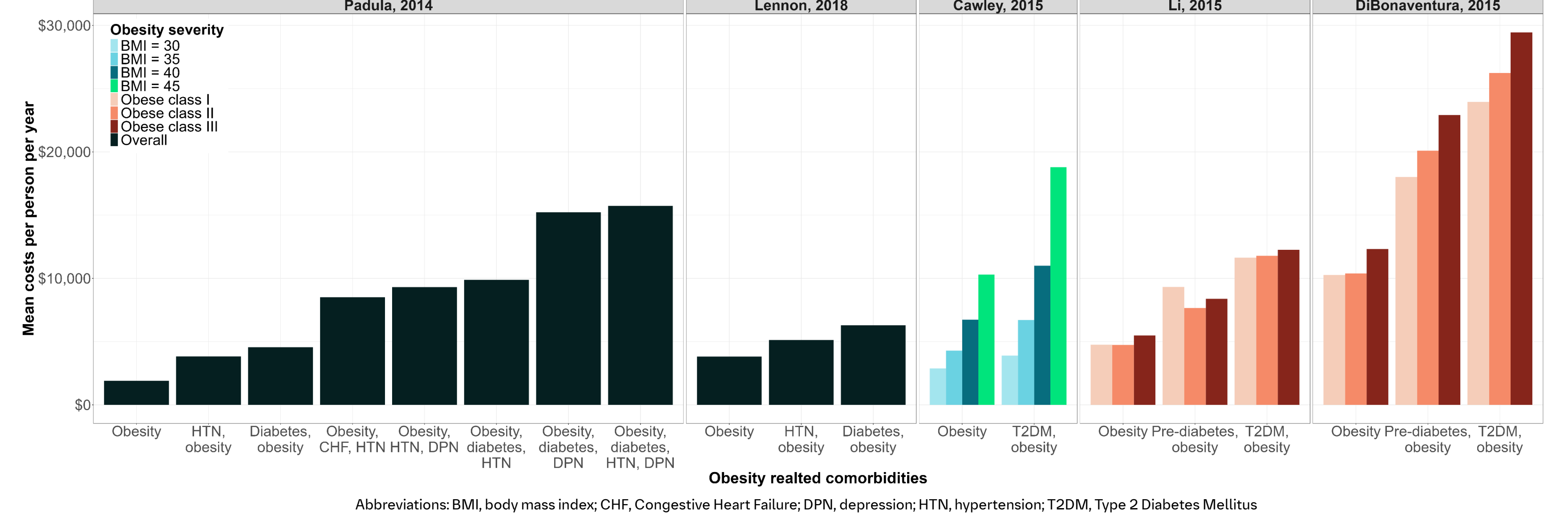
Results

- Between study differences in costs were driven by variation in age, year, inclusion of co-pays, and statistical analyses applied.
- Increasing mean direct medical costs with increasing obesity severity were driven by increases in inpatient costs.^{11,12,16}
- In both longitudinal studies, mean direct medical costs and the prevalence of ORC increased over time, but increases were greater with increasing obesity severity.^{12,17}

Direct medical costs increased with the severity and number of obesity-related comorbidities

- Five studies focused on a single ORC.^{4-7,9}
 - Diabetes and hypertension were the most commonly reported single ORC (Figure 4).
 - One study of 44,252 employees with obesity aged 27-59 years working for employers with more than 50 employees, reported direct medical costs by the presence of multiple single comorbidities using MEPS data; individuals with comorbid arthritis (\$7,088), coronary heart disease (\$9,275), or myocardial infarction (\$9,783) incurred the highest mean costs, resulting in costs 1.9-, 2.4-, and 2.6- times higher, respectively, compared to those with obesity alone (\$3,816) without any comorbid conditions.⁸
- Another study of 50,717 adults aged 18-64 with a primary or secondary diagnosis of obesity characterized costs among those with multiple ORCs using MarketScan data.¹⁰
 - In that study mean medical costs among those with obesity and T2DM, hypertension, and depression were 7 times higher than with obesity alone (\$15,734 vs. \$1,908); largely driven by inpatient costs.
 - This study was cross-sectional, did not assess medication costs, was limited to a predefined set of ORC, and evidence is dated as it was published in 2014.

Figure 5. All cause per-person, per year, mean direct medical costs by commonly reported obesity related comorbidities



Abbreviations: BMI, body mass index; CHF, Congestive Heart Failure; DPN, depression; HTN, hypertension; T2DM, Type 2 Diabetes Mellitus

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