# Validating Claims-Based Identification of Patients with Overweight and Obesity Using a Linked Claims-Electronic Medical Record Database

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MarketScan by MERATIVE

Study Summary

Study Question: What is the agreement between body mass index (BMI) diagnosis on medical claims and BMI measurements in the electronic medical record (EMR)?

Study Results: For all BMI categories, there was a high level of agreement between the EMR and diagnosis in claims
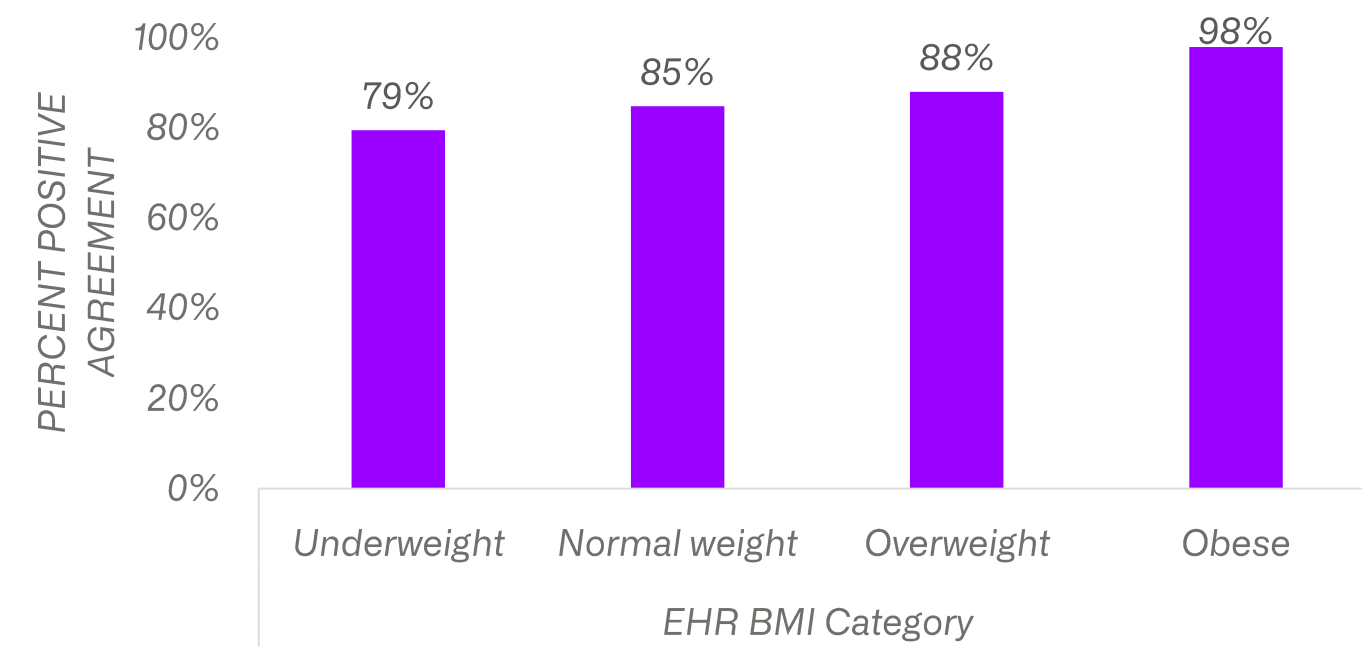
Conclusion: Diagnosis codes indicating BMI on medical claims can be reliably used to identify patients with overweight and obesity. However, BMI reporting in both the claims and EMR data was low overall and differential across BMI categories, with obese and overweight BMI most frequently reported.

Background

- The identification of overweight or obesity in claims databases often relies on the presence of diagnosis codes on medical claims.
- The performance of diagnosis-based identification of patients with overweight and obesity varies widely across studies [1].
- Use of ICD-9-CM and ICD-10-CM diagnosis codes to identify patients with overweight and obesity has been validated in other administrative claims databases [2,3] but the performance of these diagnosis codes in the MarketScan Database has not been assessed.

Objective

- To describe the agreement between claims and EMR databases to evaluate the validity of overweight and obese BMI diagnoses in claims.

Methods

- This retrospective study used data from the MarketScan Claims and EMR Database (CED) spanning 1/1/2016-12/31/2021.
- Three non-mutually exclusive cohorts of adults with a medical claim with a diagnosis indicating BMI, diagnosis of obesity, or diagnosis of overweight were identified. Date of the first medical claim was the index date. (Figure 1)
- All patients were required to have a valid BMI measurement within the EMR (i.e., non-missing BMI >10 kg/m² and <100 kg/m²); those with >1 BMI measurement in the EMR on the index date (<5%) were excluded from the study.
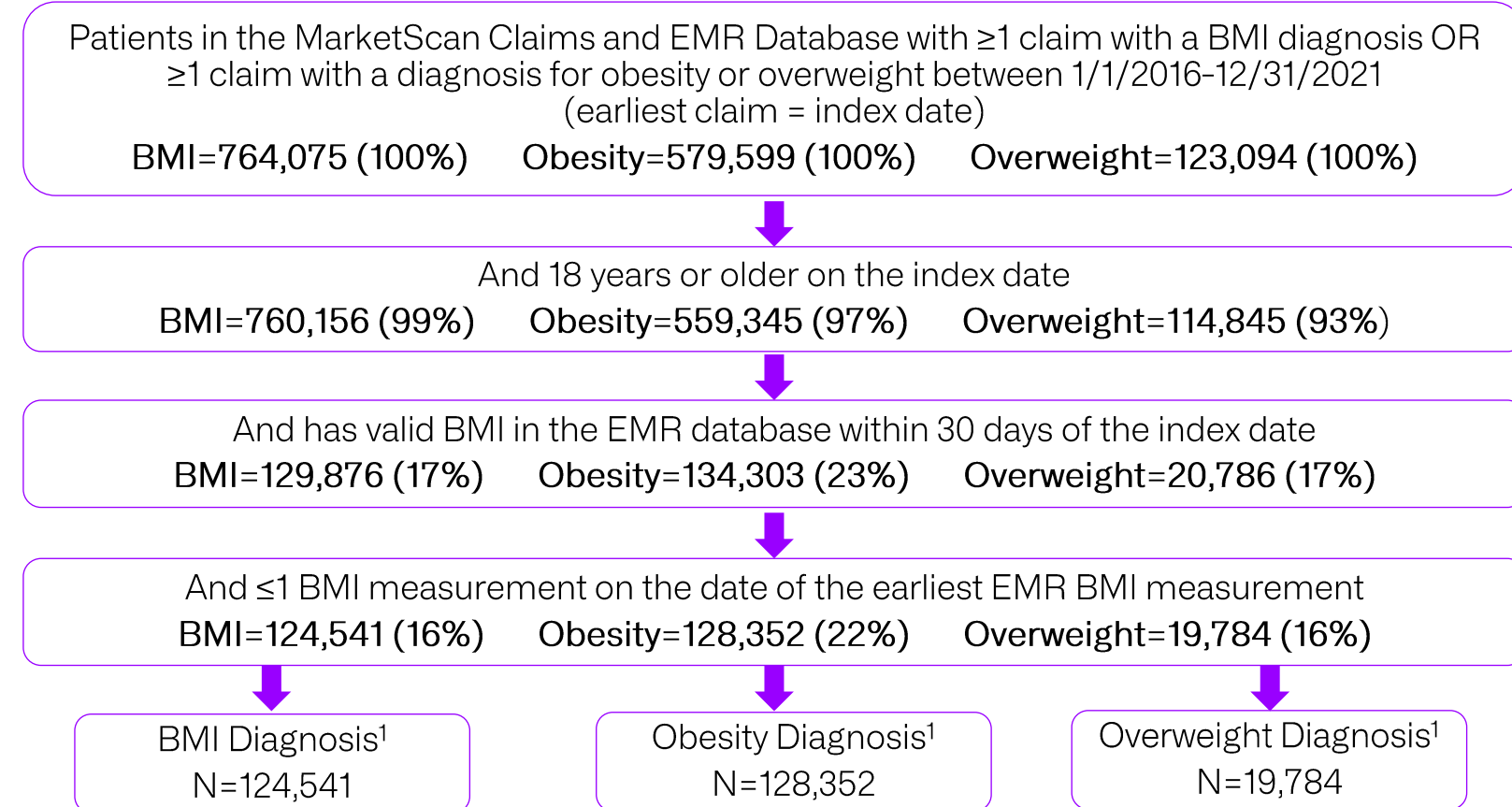
References
[1] Obes Sci Pract. 2020;6(6):677-693.
[2] Diabetes Obes Metab. 2021 Dec;23(12):2623-2631.
[3] Pharmacoepidemiol Drug Saf. 2018 Oct;27(10):1092-1100.
[4] National Center for Health Statistics. https://www.cdc.gov/nchs/hus/data-finder.htm

Methods (cont.)

- Patients with a BMI diagnosis were categorized into four groups based on the value of BMI measurement in the EMR; the same categorization applied to those with an obesity and overweight diagnosis:
  - Underweight: BMI <20 kg/m²
  - Normal weight: BMI 20 to <25 kg/m²
  - Overweight: BMI 25 to <30 kg/m²
  - Obese: BMI ≥30 kg/m²
- Within each EMR BMI category, the number of patients with a diagnosis in claims for underweight, normal weight, overweight, and obese were identified, and the percent positive agreement (PPA) was calculated.

Figure 1. Patient Selection

Patients in the MarketScan Claims and EMR Database with ≥1 claim with a BMI diagnosis OR ≥1 claim with a diagnosis for obesity or overweight between 1/1/2016-12/31/2021 (earliest claim = index date)
BMI=764,075 (100%)   Obesity=579,599 (100%)   Overweight=123,094 (100%)

And 18 years or older on the index date
BMI=760,156 (99%)   Obesity=559,345 (97%)   Overweight=114,845 (93%)

And has valid BMI in the EMR database within 30 days of the index date
BMI=129,876 (17%)   Obesity=134,303 (23%)   Overweight=20,786 (17%)

And ≤1 BMI measurement on the date of the earliest EMR BMI measurement
BMI=124,541 (16%)   Obesity=128,352 (22%)   Overweight=19,784 (16%)

BMI Diagnosis[1] N=124,541   Obesity Diagnosis[1] N=128,352   Overweight Diagnosis[1] N=19,784

[1] Diagnosis was captured in claims.

Results

- In total 124,541 patients with a diagnosis indicating BMI, 128,352 with an obesity diagnosis, and 19,784 patients with an overweight diagnosis with a valid BMI measurement in the EMR met the inclusion criteria for the study.
- A majority of the patients in each cohort were female and a higher proportion of patients in the cohort with an obesity diagnosis in claims were Black. (Table 1)
- Among patients with a diagnosis indicating BMI, the proportion with obesity was higher than U.S. population estimates and the proportion of normal weight and overweight patients was lower than U.S. population estimates. (Figure 2)
- A high level of agreement was found when comparing BMI category in the EMR and in claims; highest agreement was observed in the patients with obesity. (Figure 3)
- Nearly all patients (94%) with a diagnosis of obesity in claims also had a BMI ≥30 kg/m² in the EMR. (Figure 4A)
- Though a majority of patients with an overweight diagnosis also had a BMI indicating overweight in the EMR (64%), many had a BMI ≥30 kg/m² in the EMR (35%). (Figure 4B)

Table 1. Demographic characteristics among patient cohorts with diagnosis in claims

	BMI Diagnosis N=124,541		Obesity Diagnosis N=128,532		Overweight Diagnosis N=19,784	
	N/Mean	%/SD	N/Mean	%/SD	N/Mean	%/SD
Age (Mean, SD)	51.5	15.9	51.3	14.8	52.9	15.6
Age group (N, %)						
18-34	20,994	16.9%	19,288	15.0%	2,634	13.3%
35-44	20,917	16.8%	22,256	17.3%	3,285	16.6%
45-54	27,237	21.9%	30,450	23.7%	4,399	22.2%
55-64	31,471	25.3%	34,425	26.8%	5,334	27.0%
65+	23,922	19.2%	21,933	17.1%	4,132	20.9%
Sex (N, %)						
Male	47,306	38.0%	50,167	39.0%	7,993	40.4%
Female	77,235	62.0%	78,185	60.8%	11,791	59.6%
Race (N, %)						
Black	20,045	16.1%	24,417	19.0%	2,749	13.9%
White	94,453	75.8%	94,688	73.7%	15,322	77.4%
Other	6,649	5.3%	6,165	4.8%	1,222	6.2%
Missing	3,394	2.7%	3,082	2.4%	491	2.5%
Insurance plan type (N, %)						
EPO/PPO	64,377	51.7%	66,648	51.9%	10,466	52.9%
CDHP/HDHP	11,973	9.6%	10,571	8.2%	1,815	9.2%
HMO	17,336	13.9%	19,418	15.1%	2,847	14.4%
Other	24,903	20.0%	25,331	19.7%	3,648	18.4%

CDHP/HDHP, consumer-directed health plan/high-deductible health plan; EPO/PPO, exclusive /preferred provider organizations; HMO, health maintenance organization; SD, standard deviation

Figure 2. Distribution of EMR BMI category in patients with BMI diagnosis in claims vs. U.S. estimates [4]
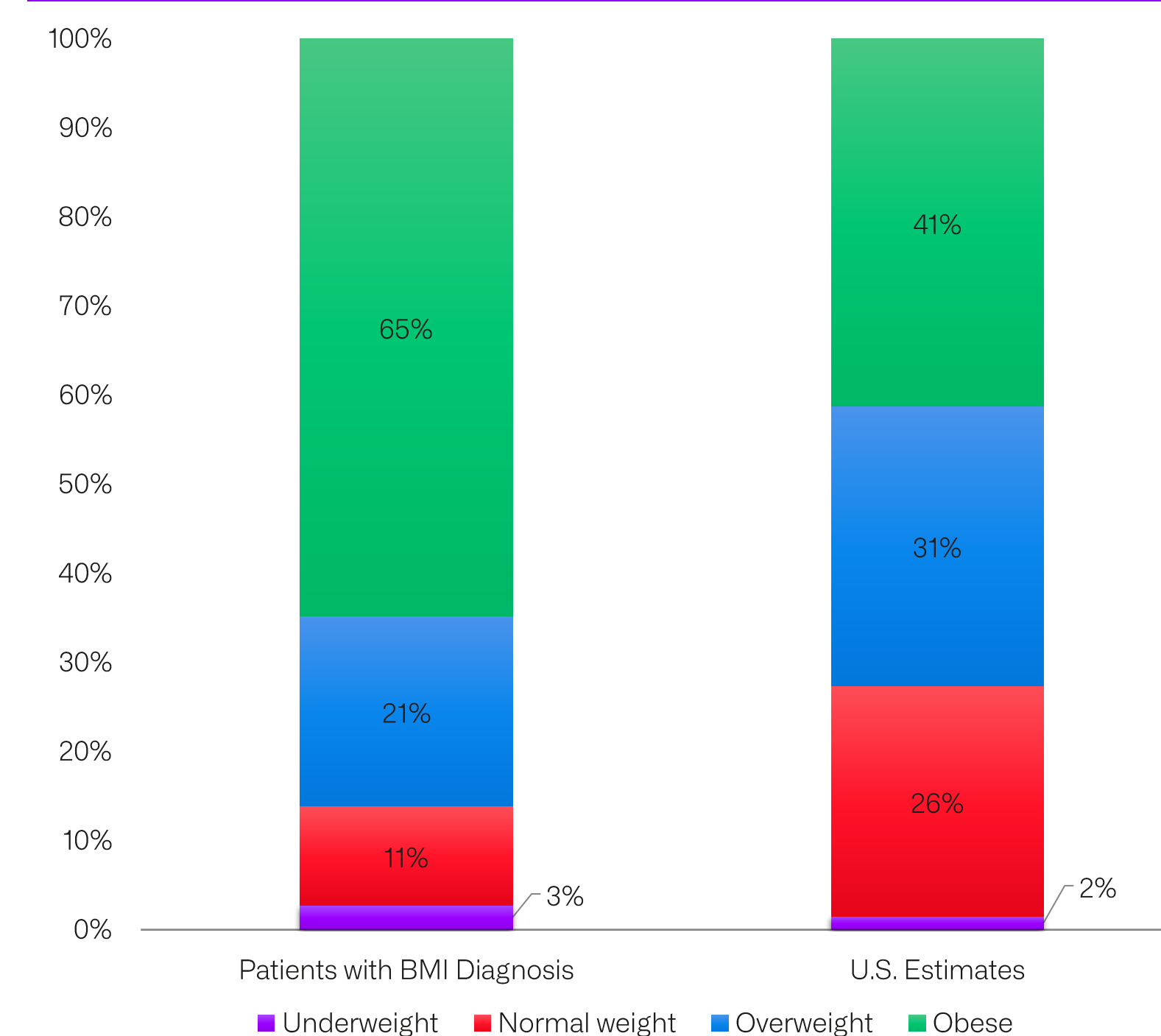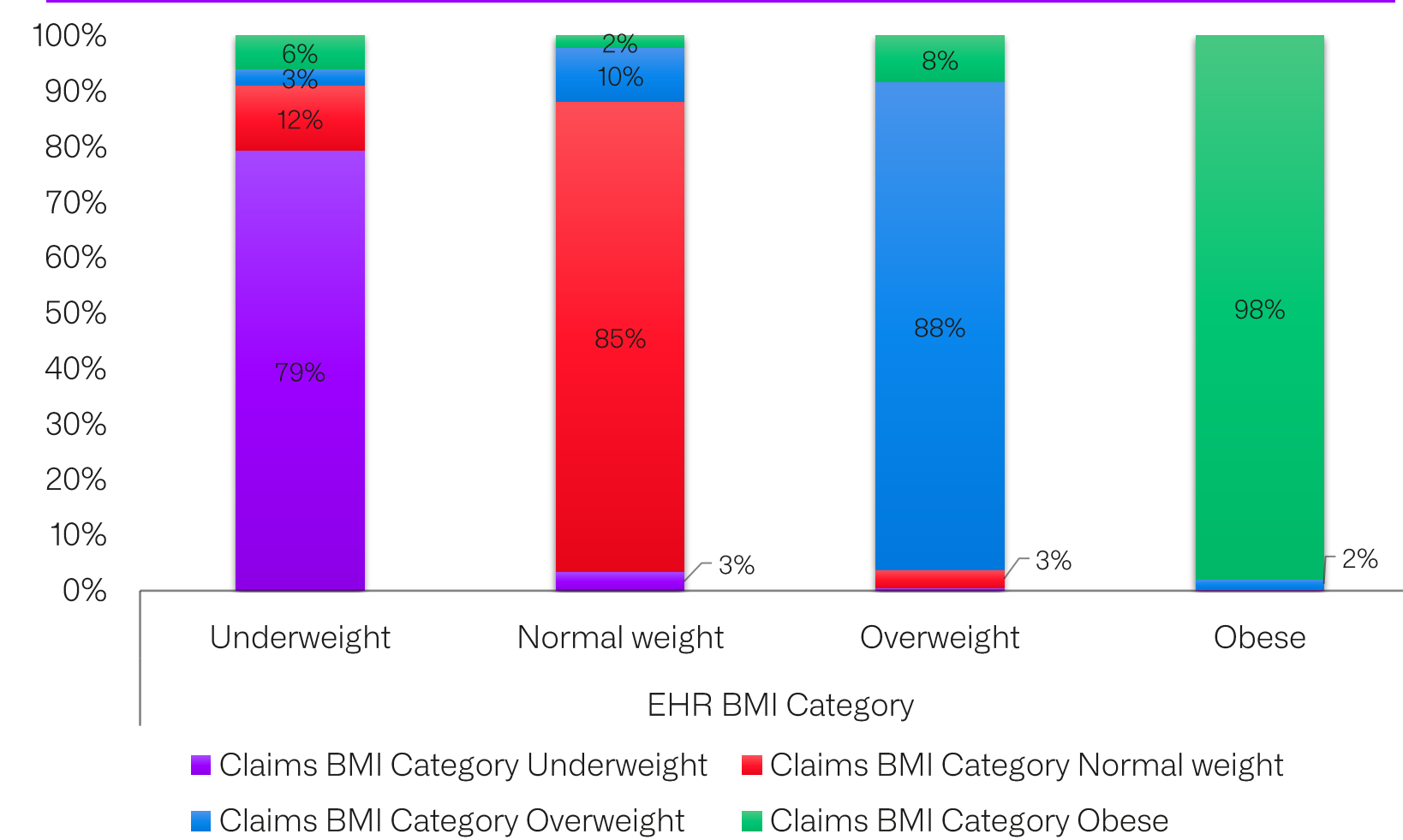

Figure 3. Distribution of BMI category according to diagnoses in claims by EMR BMI category

<1% of overweight patients (EMR) had an underweight diagnosis in claims.
<1% of obese patients (EMR) had underweight or normal weight diagnoses in claims.

Figure 4. Distribution of EMR BMI category for patients with A) obesity diagnosis in claims and B) overweight diagnosis in claims
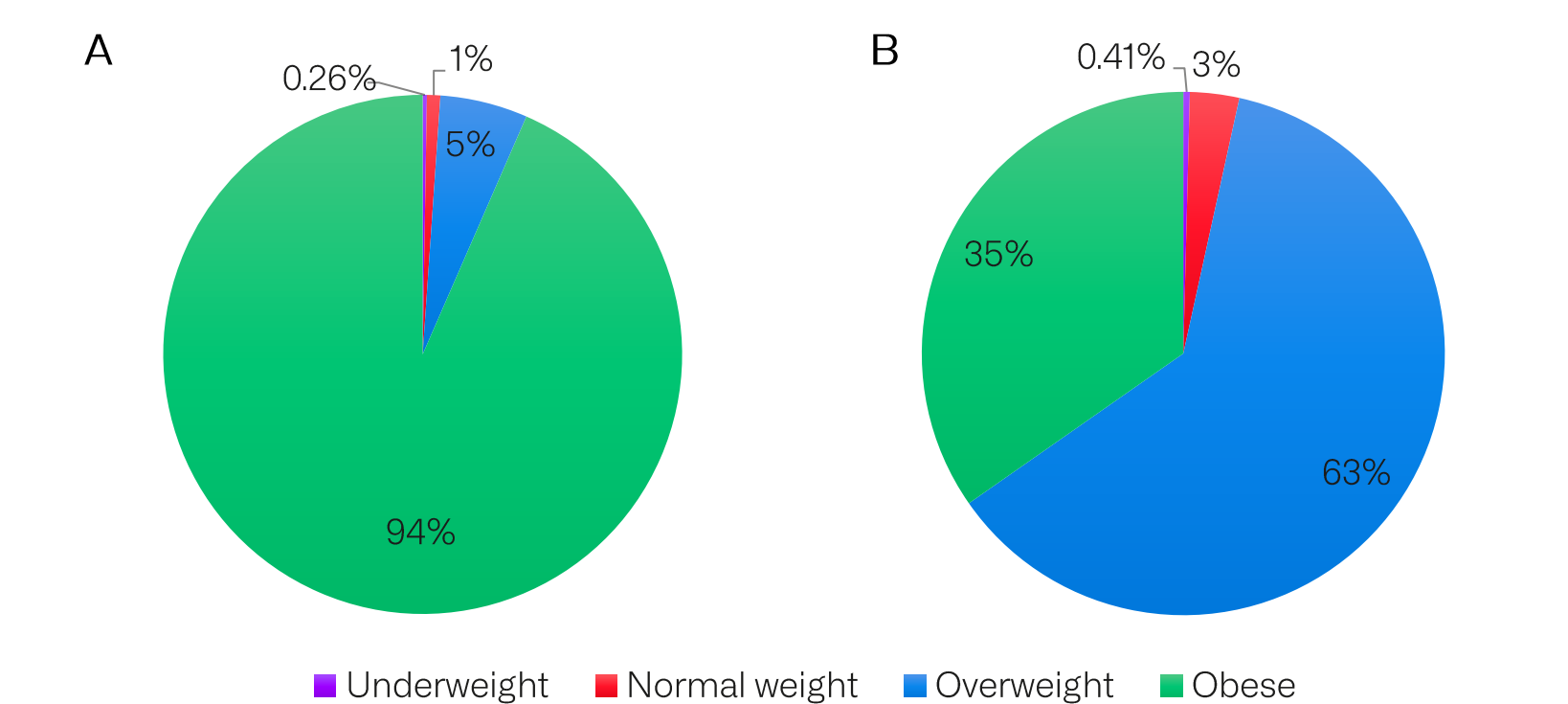
Limitations

- This study was based on patients with commercial health coverage, and results may not be generalizable to patients with other types of insurance or without health insurance coverage.

Conclusions

- Diagnosis codes indicating BMI on medical claims can be reliably used to identify BMI category with highest agreement between claims and EMR observed in patients with BMI measurements in the obese category.
- BMI reporting in claims was low overall and differential across BMI categories, with obesity most frequently reported.
- High levels of agreement between claims and EMR were observed in patients with a diagnosis of obesity with moderate agreement between claims and EMR in patients with a medical claim for overweight.

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