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## Health Care Utilization by Body Mass Index in a Pediatric Population

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### Abstract

**Objective**—We tested the hypothesis that the frequency of emergency department (ED) visits, outpatient clinic visits, and hospitalizations were higher among children with higher body mass index (BMI) categories, even after controlling for demographics, socio-economic status (SES) and other chronic medical conditions.

**Methods**—We obtained electronic height, weight, and utilization data for all residents of Olmsted County, MN, aged 2 to 18 years on January 1, 2005 (n=34,335) and calculated baseline BMI (kg/m<sup>2</sup>). At least one BMI measurement and permission to use medical record information was available for 19,771 (58%) children; 19,528 with follow-up comprised the final cohort. BMIs were categorized into under/healthy weight (< 85<sup>th</sup> percentile), overweight (85–<95<sup>th</sup> percentile), and obese (≥ 95<sup>th</sup> percentile). Negative binomial models were used to compare the rate of utilization across BMI categories. Multivariable models were used to adjust for the effects of age, race, sex, SES, and chronic medical conditions.

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**Conflicts of interest:** The authors have no conflicts of interest to disclose.

**Results**—Compared to children with BMI < 85<sup>th</sup> percentile, overweight and obese status were associated with increased ED visits [adjusted incident rate ratio (IRR): 1.16, 95% confidence interval (CI): 1.10, 1.23 and IRR:1.27, 95% CI: 1.19, 1.35, respectively (p for trend <0.0001)], and outpatient clinic visits [IRR: 1.05, 95% CI: 1.02, 1.08 and IRR: 1.07, 95% CI: 1.04-1.11, respectively (p for trend < 0.0001)]. No associations were observed between baseline BMI category and hospitalizations in the adjusted analyses.

**Conclusions**—Children who are overweight or obese utilize the ED and outpatient clinic visits, but not hospitalizations, more frequently than those who are under/healthy weight.

### Keywords

Adolescent; Child; Emergency Service; Health Services/UT (Utilization); Hospital/UT (utilization); Pediatric Obesity; Obesity; Preschool

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### Introduction

Pediatric obesity is a pressing population health problem. Data from the 2011-2012 National Health and Nutrition Examination Survey (NHANES) demonstrated that 16.9% of youth ages 2 to 19 years were obese, defined by body mass index (BMI) at the 95<sup>th</sup> percentile or higher.<sup>1</sup> It is estimated that 50% of children and 70% of teenagers with obesity will remain obese as adults.<sup>2</sup> In adulthood, obesity is associated with the development of several chronic diseases including diabetes, hypertension, heart disease, hyperlipidemia, asthma, and sleep disorders.<sup>3</sup>

The increased health care costs of pediatric obesity are well-described.<sup>4-10</sup> However, few studies have evaluated the effect of pediatric obesity on health care utilization. In some studies, children with obesity have been shown to have greater frequency of emergency department (ED) visits,<sup>9, 11-13</sup> acute care visits,<sup>14, 15</sup> and hospitalizations<sup>15, 16</sup>. In contrast, other studies have found no difference in outpatient visits,<sup>4, 11</sup> ED visits<sup>4, 11</sup> or hospitalizations<sup>14</sup> in children with obesity. However, the specific visit types leading to increased utilization have not been well delineated while concurrently controlling for demographic factors, socioeconomic status (SES), and chronic medical conditions. In addition, most studies of health care utilization in children with obesity have utilized parental reports of weight and height rather than measured anthropometric data. Parental reports of height and weight can underestimate BMI and the prevalence of obesity in children.<sup>17, 18</sup>

To address these limitations, we conducted a study to identify the frequency of health care utilization by BMI category in a defined population using the Rochester Epidemiology Project (REP) data linkage system. We hypothesized that increased health care utilization in the outpatient, ED, and inpatient settings would occur among children categorized in higher BMI categories, independent of their chronic medical conditions, SES, and demographics.

## Methods

### Study design and setting

We conducted a retrospective cohort study using data from children residing in Olmsted County, Minnesota (MN) on January 1, 2005. Study participants' medical records were followed longitudinally from their 1<sup>st</sup> BMI measurement after January 1, 2005 through last follow-up or December 31, 2013 (whichever came first) for documentation of hospitalizations, ED visits, and clinic visits. The study protocol was approved by the Institutional Review Boards at both Mayo Clinic and Olmsted Medical Center. The vast majority of medical care in Olmsted County is provided by Mayo Clinic and its affiliated hospitals, Olmsted Medical Center and its affiliated hospital, and the Rochester Family Medicine Clinic. The health care records from these institutions have been linked and indexed since 1966 through the REP research infrastructure.<sup>19, 20</sup>

### Study Population

We used the REP to identify all children aged 2 to 18 years who resided in Olmsted County on January 1, 2005. Children whose parents had provided research authorization to review their child's medical records for general research studies were included in this study, in accordance with Minnesota Statute 144.335.<sup>21, 22</sup> Individuals who had not given permission to at least one health care institution in Olmsted County to use their medical records for research were excluded. Children who had at least one BMI measurement recorded in the electronic medical record between January 1, 2005, and December 31, 2013 were included, and their BMI category (age and gender based) was based upon their first measurement during this time period. Out of 34,335 potential participants, at least one BMI measurement was recorded in 19,863 children (58%). Research authorization was available for 19771/19863 (99.5%) of these children. There was no follow-up for 243 children (1.2%) after their initial BMI measurement, leaving 19,528 children for this analysis. The characteristics of those with at least one BMI measurement were similar to those of the 2005 Olmsted County population (sample population median age 9.8, 50.2% male; total population median age 10.0, 51.1% male).<sup>23</sup>

### Measures of BMI (Exposure Variables)

Height, weight, calculated baseline BMI ( $\text{kg}/\text{m}^2$ ), and health care utilization data for all study participants were obtained from the electronic medical record. BMI data under the 1<sup>st</sup> percentile and above the 99<sup>th</sup> percentile were considered potentially erroneous outliers and were manually reviewed using medical records to ensure accuracy. BMI measurements made in the last 6 months of pregnancy and first 3 months post-partum were excluded. Baseline BMI measurements (first BMI measurement after January 1, 2005) were categorized into under/healthy weight (<85<sup>th</sup> percentile), overweight (85-<95<sup>th</sup> percentile), and obese (>95<sup>th</sup> percentile) by Center for Disease Control standards using the patient's age and gender.<sup>24</sup> In addition, age, sex, race, chronic medical conditions, and SES were included as potential confounding variables. The diagnostic indices of the REP were searched electronically to extract all International Classification of Diseases, Ninth Revision (ICD-9) codes in the medical records of all children ages 2-18 years assigned to any health care institution in Olmsted County in the 5 years prior to January 1, 2005. These ICD-9 codes

were grouped into the clinical classification code categories proposed by the Agency for Healthcare Cost and Utilization Project.<sup>25, 26</sup> Ten chronic conditions (other upper respiratory, skin disorders, osteoarthritis and joint, anxiety/depression/bipolar, attention deficit disorder/behavior, asthma, chronic neurologic, developmental, headaches/migraines, and back problems) with a prevalence of > 5% of children in Olmsted County were assessed.<sup>27</sup> Two additional conditions, diabetes and dyslipidemia, which have been associated with elevated BMI, were also included. The number of comorbidities was classified as 0, 1, 2, or 3 or more.

### Measures of Health Care Utilization

Using the REP research infrastructure, outpatient clinic visits, ED visits, and hospitalizations from the first BMI measurement after January 1, 2005, through last follow-up or December 31, 2013 (whichever came first) in Olmsted, County were identified for each child. After assessing the distribution, outpatient clinic visits were classified into quartiles, hospitalizations were categorized into 0 or 1 or more, and ED visits were categorized as 0, 1-2, or 3 or more.

### Measure of Socioeconomic Status

Socioeconomic status (SES) was measured by an individual housing-based index (HOUSES) which has previously been shown to be associated with health outcomes in both children and adults.<sup>28-31</sup> Briefly, geocoded address information was used to match study subject address to geographic reference data and real property data from the Assessor's Office of the county government. A standardized HOUSES Index score was formulated by summing z-scores for 4 real property features (value, square footage, number of bedrooms and number of bathrooms) with a higher HOUSES Index score indicating a higher SES.

### Statistical Analysis

Demographic characteristics and utilization measures were compared across BMI categories using Chi-square tests. The utilization rates (count / per person-year) of ED visits, outpatient clinic visits, and hospitalizations during follow-up were determined. Follow-up was from the initial BMI measurement through last follow-up or December 31, 2013, whichever came first. Rates of utilization were compared across BMI levels using Poisson and negative binomial models to model utilization counts, with the natural log of the person-years of follow-up used as an offset.<sup>32-34</sup> Over-dispersion was detected using a likelihood ratio test; therefore negative binomial models were used and results are presented as adjusted rate ratios and 95% confidence intervals. Multivariable negative binomial models were used to adjust for age, race, sex, SES, and chronic medical conditions. The primary indication for each ED visit was determined and was categorized using classification codes proposed by the Agency for Healthcare Cost and Utilization Project.<sup>25, 26</sup> Only indications which accounted for more than 5% of all ED visits are reported. The count for each indication group was classified as 0, 1, or more than 1 per person and compared using Chi-square tests for trend. Analyses were performed using SAS version 9.3 (SAS Institute, Cary, NC, Version 9.3).

## Results

The characteristics of the study population overall, and by baseline BMI group, are outlined in Table 1. At baseline, 14.5% of children were overweight and 11.7% of children were obese. Older children and males were more likely to be obese than younger children and females. The baseline prevalence of obesity also varied by race: 22.0% for Hispanic children, 15.3% for Black children, 10.9% for White children, and 10.1% for Asian children. The percentage of children with three or more chronic medical conditions increased with increasing BMI category; 23% among children who were underweight or had a healthy weight, 27% among those who were overweight, and 33% among those who were obese. Obesity status was also associated with an increased number of outpatient clinic visits ( $p < 0.0001$ ), ED visits ( $p < 0.0001$ ) and hospitalizations in the unadjusted model ( $p=0.02$ ) (Table 1). As expected, deaths were rare in this age group, and death was not included as an outcome in any further analyses.

Seventy-four percent of the children had their 1<sup>st</sup> BMI measurement in 2005 or 2006. Median (Q1, Q3) follow-up was 7.4 (5.6, 8.4) person years and did not differ by baseline BMI level ( $p=0.52$ ). However, the rate of ED visits increased from 0.28 per person year in children who were healthy weight or underweight to 0.42 per person year in children with obesity ( $p<0.05$ ). The incident rate ratios of the different types of visits among children in different weight groups are shown in Table 2. Compared to children with BMI  $< 85^{\text{th}}$  percentile, children who were overweight and obese had increased ED visits [adjusted incident rate ratio (IRR): 1.16, 95% confidence interval (CI): 1.10, 1.23 and IRR: 1.27, 95% CI: 1.19, 1.35, respectively ( $p$  for trend  $<0.0001$ )], even when adjusting for age, sex, race, SES, and chronic medical conditions. There was no increased risk of hospitalizations by baseline BMI category and a minimally increased risk of outpatient clinic visits for both children who were overweight (IRR: 1.05, 95% CI: 1.02-1.08) or obese (IRR: 1.07, 95% CI: 1.04-1.11) in the adjusted model. Results were similar when the relationship with BMI z-score was examined, with a significant association of BMI z-scores with ED and outpatient visits observed (data not shown).

As described above, we adjusted for SES. We used the HOUSES Index to do this. Data were missing for 25% of our study participants, but we found no difference in BMI level of those with and without available HOUSES Index data. Furthermore, we found the association of BMI and utilization similar for those with and without HOUSES Index data (data not shown).

Of 19,528 children with at least one documented BMI measurement, 12,101 (62.0%) had at least one ED visit during the study period. We assessed the primary indication for each ED visit and identified four types of indications which accounted for 68% of all ED visits: accident/injury (34.2%), acute respiratory disease (16.8%), acute gastrointestinal (10.4%) and psychiatric/substance abuse (6.4%; Table 3). All other indications represented less than 5% of all ED visits. Children who were overweight or obese were more likely to have an ED visit for an accident/injury or acute respiratory disease than children who were under/healthy weight (Table 3).

## Discussion

We found a significantly increased risk of ED utilization and outpatient visits among children with higher BMIs even after adjusting for age, sex, race, chronic medical conditions, and SES. In addition, we found that children who were overweight and obese had more ED visits for accidents and injuries and acute respiratory problems compared to children who are under/healthy weight. This study adds to the emerging evidence suggesting that pediatric obesity contributes significantly to increased health care utilization in children.<sup>4, 9, 11, 14, 35</sup>

The relationship between pediatric obesity and overweight status and health care utilization has been evaluated most extensively using the Medical Expenditure Panel Survey (MEPS), a national probability survey of the noninstitutionalized civilian population in the United States.<sup>8, 9, 11</sup> Our data are very similar to MEPS data from 2002-05 in 19,613 children ages 6-19 years which identified increased utilization of ED and outpatient visits in adolescents with obesity.<sup>9</sup> MEPS data from 2005-09 in 10-17 year old children found that those who were overweight or obese had more ED visits compared to healthy weight children, while no difference with outpatient visits or total expenditures were observed.<sup>11</sup> Although the MEPS database has been the most utilized tool to evaluate health care utilization in children with obesity, it uses self-reported rather than measured BMI data.

Studies utilizing chart review to evaluate the effect of obesity status on outpatient and ED visit utilization have demonstrated conflicting findings. One prospective health care system study of 11,636 children with at least 1 BMI measured in between 2000-2004 found an increase in overall medical visits but not ED visits or inpatient hospitalizations.<sup>14</sup> In contrast, a retrospective health system study of 8,404 predominantly African-American and Medicaid-insured children aged 5 to 18 years presenting for well child visits in 2002-03, the rates of primary care and ED visits were no different based on weight status.<sup>4</sup> Neither of these other studies controlled for chronic medical conditions, SES, or demographic factors which could significantly affect health care utilization patterns in these patient populations.

We observed increased ED visits and moderately increased outpatient clinic visits in children who were overweight and obese. The top two indications for ED visits in our study population were accidents/injuries and acute respiratory problems, which both occurred more frequently with increasing obesity status. Our findings concur with a recent analysis of five combined NHANES datasets between 2001 to 2010 that found that, in comparison to healthy-weight peers in an unadjusted model, children who are overweight and obese are more likely to receive their routine medical care in an ED than a primary care setting (overweight odds ratio (OR): 1.95, 95% CI: 1.22-3.14 and obese OR: 1.88, 95% CI: 1.24-2.86).<sup>13</sup> When this analysis adjusted for relevant covariates such as household income, educational attainment of the head of household, health insurance status, and race, the relationship persisted for children who were overweight (OR: 1.81, 95% CI: 1.11-2.96) but not those who were obese (OR: 1.36, 95% CI: 0.83-2.22). This analysis adjusted for SES but relied on parental recall to determine the frequency of health care utilization and only adjusted for the chronic medical conditions of asthma and diabetes. It is unclear why overweight or obese status in children is associated with more frequent ED visits as

compared to other outpatient visits or hospitalizations in our study. One possible explanation for our findings is that children who are overweight or obese are more likely delay or avoid preventative care, which has been reported with adult women.<sup>36-38</sup> These children would be less likely to have a strong relationship to a medical home and more likely to suffer discontinuity of care. This discontinuity could lead these families to go to the ED for routine medical conditions.

Our finding of increased ED visits for injuries/accidents with increasing obesity status differs from an analysis of cross-sectional data from 132,221 adolescents completing the Canadian Community Health Survey, where no increased risk of injury was observed in adolescents who are overweight [OR: 1.10, 95 % CI: 0.97, 1.24] or obese (OR: 1.12, 95% CI: 0.92, 1.37).<sup>39</sup> This study adjusted for activity levels, which we were not able to do for our analysis. Furthermore, this study was focused on adolescents and relied on cross-sectional survey data as compared to analysis of a retrospective cohort. Further study is needed regarding the indications for ED visits in children with obesity.

Pediatric obesity-related hospital expenditures increased 3-fold between 1980 and 2000<sup>40</sup> and increased 2-fold between 2001 and 2005.<sup>16</sup> Children with overweight status admitted to the hospital with asthma and fractures or dislocations had higher median charges than those with healthy weight.<sup>41</sup> We did not observe an increase in number of hospitalizations, but did not evaluate the number of inpatient days or the specific cost associated with these stays. However, the reasons for increased inpatient costs in children with obesity may not be due to more frequent hospitalizations but rather factors associated with the hospitalization itself may account for increased costs. For example, length of stay may be greater for children with obesity<sup>15</sup> or involve more consultations and tests.

Strengths of our study include the large population-based sample across children ages 2 to 18 years, the use of measured instead of self-reported BMI, and the availability of individual level diagnostic codes and adjustment for SES status. This study adds to existing literature by controlling for chronic medical conditions as well as demographic factors when evaluating health care utilization by BMI category. Additionally, we used the HOUSES Index—a validated SES measurement based on property value data, not self-reported data.

We recognize a number of limitations with our study methods. First, we evaluated only the frequency of healthcare visits and not the cost of visits, although utilization is often used as a marker for cost. Second, we determined the BMI category by the initial BMI measurement, and the actual BMI category may have changed during the study period. Multiple studies indicate that BMI percentiles increase gradually over time in children.<sup>42, 43</sup> However, baseline BMI is a strong risk factor for eventual development of obesity, and children that become obese by age 3 to 5 years are likely to remain obese.<sup>43-46</sup> Therefore, the misclassification that is likely to result from our use of baseline BMI category as opposed to changes in BMI over time should be minimal. Third, the electronic BMI records were only available in 58% of potential participants; however, the various characteristics of included study participants were similar to the Olmsted County population.<sup>23</sup> Fourth, in our application of the HOUSES Index, those data were missing for 25% of our included study participants. However, there was no difference in BMI level or the association of BMI level

and utilization for those with and without available HOUSES Index data. Fifth, our study cannot identify the direction of cause-and-effect between obesity status and outpatient visits and ED utilizations; we will investigate this further through additional samples and other study designs. Sixth, bias can be introduced in longitudinal studies due to loss to follow-up. In this study there was no difference in person-years of follow-up for our BMI groups, suggesting follow-up is not biasing the results. Finally, while health care utilization patterns may be impacted by the design of health systems, data sharing agreements among institutions participating in the REP preclude comparative evaluations; thus we cannot compare patients from different healthcare organizations participating in the REP.

Our study identified an association between children who are overweight and obese and more frequent ED and outpatient clinic visits as compared to those who are healthy or underweight. Further research is needed to understand the nature of the association between overweight/obese status and ED and outpatient clinic utilization and whether there are specific issues amenable to intervention that are driving that greater use of these services in this population. Depending on what those studies find, the reduction in ED and outpatient clinic utilization might help justify the institutional and government funding for the development of interventions to prevent or treat obesity. Similarly, depending on what those studies show, interventions might be designed for children who are overweight and obese to decrease ED and outpatient clinic utilization.

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**What's New**

Adjusting for demographics, socio-economic status, and chronic medical conditions, we show that children who are overweight or obese more frequently utilize the emergency department and outpatient clinic visits than under/healthy weight children.

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**Table 1**

Characteristics of the 2005 Olmsted County, MN population (2-18 years) who have at least one BMI measure (N=19,528)

	Total N=19,528	Under/healthy weight (<85 <sup>th</sup> percentile) N= 14,422	Overweight (85-<95 <sup>th</sup> percentile) N= 2830	Obesity (>=95 <sup>th</sup> percentile) N= 2276	<i>f</i> <i>p</i>
Age (years; N, %)					<0.0001 <sup>f</sup>
2-<5	2851 (14.6%)	2249 (15.6%)	345 (12.2%)	257 (11.3%)	
5-<13	9324 (47.7%)	6788 (47.1%)	1405 (49.6%)	1131 (49.7%)	
13-18	7353 (37.7%)	5385 (37.3%)	1080 (38.2%)	888 (39.0%)	
Male sex (N, %)	9812 (50.2%)	7066 (49.0%)	1438 (50.8%)	1308 (57.5%)	<0.0001 <sup>f</sup>
Race (N, %)					<0.0001 <sup>f</sup>
White	15451 (79.1%)	11549 (80.1%)	2213 (78.2%)	1689 (74.2%)	
Black	1153 (5.9%)	786 (5.5%)	191 (6.7%)	176 (7.7%)	
Asian	735 (3.8%)	570 (4.0%)	91 (3.2%)	74 (3.3%)	
Hispanic	644 (3.3%)	387 (2.7%)	115 (4.1%)	142 (6.2%)	
Other/unknown	1545 (7.9%)	1130 (7.8%)	220 (7.8%)	195 (8.6%)	
Number of chronic conditions <sup>2</sup>					<0.0001
0	5070 (26.0)	3941 (27.3)	689 (24.4)	440 (19.3)	
1	5615 (28.8)	4226 (29.3)	778 (27.5)	611 (26.9)	
2	4049 (20.7)	2955 (20.5)	614 (21.7)	480 (21.1)	
+3	4794 (24.6)	3330 (22.9)	749 (26.5)	745 (32.7)	
Number of outpatient clinic visits (Quartiles; N, %)					<0.0001 <sup>f</sup>
6	5359 (27.4%)	4043 (28.0%)	735 (26.0%)	581 (25.5%)	
7- 12	4948 (25.3%)	3731 (25.9%)	687 (24.3%)	530 (23.3%)	
13- 21	4616 (23.6%)	3388 (23.5%)	699 (24.7%)	529 (23.2%)	
>21	4605 (23.6%)	3260 (22.6%)	709 (25.1%)	636 (27.9%)	
Number of hospitalizations (N, %)					0.0195 <sup>f</sup>
0	18052 (92.4%)	13371 (92.7%)	2608 (92.2%)	2073 (91.1%)	
1 or more	1476 (7.6%)	1051 (7.3%)	222 (7.8%)	203 (8.9%)	

	Total	Under/healthy weight (<85 <sup>th</sup> percentile)	Overweight (85-<95 <sup>th</sup> percentile)	Obesity (>=95 <sup>th</sup> percentile)	<sup>1</sup> / <sub>p</sub>
	N=19,528	N= 14,422	N= 2830	N= 2276	
Number of emergency department visits (N, %)					<0.0001 <sup>1</sup>
0	7518 (38.5%)	5777 (40.1%)	1002 (35.4%)	739 (32.5%)	
1-2	7026 (36.0%)	5254 (36.4%)	993 (35.1%)	779 (34.2%)	
3 or more	4984 (25.5%)	3391 (23.5%)	835 (29.5%)	758 (33.3%)	
Deaths (n, %)	46 (0.2%)	35 (0.2%)	7 (0.2%)	4 (0.2%)	0.82 <sup>1</sup>
Houses Index					<0.0001
	N 14531	10721	2141	1669	
Mean (SD)	1.4 (3.8)	1.7 (3.9)	1.0 (3.8)	0.1 (3.4)	
Range	(-6.6-28.4)	(-6.6-28.4)	(-6.6-25.9)	(-6.6-19.7)	

<sup>1</sup>The p values are from Chi-square tests for categorical variables and Kruskal-Wallis tests for continuous variables

<sup>2</sup>These are the counts of the number of chronic conditions at baseline (Other upper respiratory tract; skin disorders; osteoarthritis and joint disorders; anxiety, depression, and bipolar disorders; attention deficit, conduct, and disruptive behavior disorders; asthma; chronic neurologic disorders; developmental disorders; headaches, including migraines; back problems; dyslipidemia; and diabetes with and without complications)

Table 2

Risk<sup>1</sup> of adverse outcomes by baseline BMI category

Baseline BMI group	Unadjusted			Adjusted <sup>2</sup>		
	Number of hospitalizations	Number of ED visits	Number of outpatient clinic visits	Number of hospitalizations	Number of ED visits	Number of outpatient clinic visits
	<b>IRR (95% CI)</b>	<b>IRR (95% CI)</b>	<b>IRR (95% CI)</b>	<b>IRR (95% CI)<sup>2</sup></b>	<b>IRR (95% CI)<sup>2</sup></b>	<b>IRR (95% CI)<sup>2</sup></b>
Under/healthy	Ref	Ref	Ref	Ref	Ref	Ref
Overweight	0.98 (0.82, 1.17)	1.27 (1.20, 1.34)	1.05 (1.02, 1.08)	0.98 (0.81, 1.19)	1.16 (1.10, 1.23)	1.05 (1.02, 1.08)
Obese	1.15 (0.95, 1.39)	1.50 (1.42, 1.60)	1.12 (1.09, 1.16)	1.03 (0.84, 1.27)	1.27 (1.19, 1.35)	1.07 (1.04, 1.11)
p for trend	0.24	<0.0001	<0.0001	0.86	<0.0001	<0.0001

<sup>1</sup> Incidence rate ratios for hospitalizations, ED visits, and number of outpatient clinic visits

<sup>2</sup> Adjusted for age, sex, race, baseline diagnosis, and HOUSES index

**Table 3**

Number and percent of type of ED visit among patients who had at least one ED visit (N=12,010)<sup>1</sup>

Indication	Percent of Indications <sup>2</sup>	Under/healthy weight (N=8640)	Overweight (N=1827)	Obesity (N=1536)	p value trend <sup>3</sup>
Accident/Injury	34.2%				<0.0001
0		2885 (33.4%)	557 (30.5%)	471 (30.7%)	
1		3180 (36.8%)	642 (35.1%)	474 (30.9%)	
>1		2575 (29.8%)	628 (34.4%)	591 (38.5%)	
Acute respiratory	16.8%				<0.0001
0		5629 (65.2%)	1132 (62.0%)	891 (58.0%)	
1		1944 (22.5%)	426 (23.3%)	375 (24.4%)	
>1		1067 (12.3%)	269 (14.7%)	270 (17.6%)	
Acute gastrointestinal	10.4%				0.1398
0		6544 (75.7%)	1369 (74.9%)	1123 (73.1%)	
1		1492 (17.3%)	310 (17.0%)	282 (18.4%)	
>1		604 (7.0%)	148 (8.1%)	131 (8.5%)	
Psychiatric/Substance abuse	6.4%				0.1034
0		7625 (88.3%)	1567 (85.8%)	1306 (85.0%)	
1		638 (7.4%)	158 (8.6%)	129 (8.4%)	
>1		377 (4.4%)	102 (5.6%)	101 (6.6%)	

<sup>1</sup> Primary indication was not available for 7 patients

<sup>2</sup> Percent of all indications for ED visit for each diagnosis; only diagnoses having a frequency >5% are reported

<sup>3</sup> Chi Square test for trend; p values adjusted for age, sex, race/ethnicity, and HOUSES Index