

TABLE E1. Unadjusted and adjusted associations of obesity with acute severity markers of asthma exacerbation and in-hospital mortality

Outcomes and strata	Obesity (95% CI)	Nonobesity (95% CI)	Unadjusted OR (95% CI)	P value	Adjusted OR* (95% CI)	P value
Overall (n = 72,086)						
Mechanical ventilation	8.3% (7.9%-8.7%)	5.0% (4.9%-5.2%)	1.89 (1.76-2.03)	<.001	1.77 (1.63-1.92)	<.001
Noninvasive	7.2% (6.8%-7.6%)	3.4% (3.2%-3.5%)	2.53 (2.32-2.75)	<.001	2.14 (1.96-2.35)	<.001
Invasive	1.4% (1.3%-1.6%)	1.9% (1.8%-2.0%)	0.76 (0.66-0.87)	<.001	0.88 (0.75-1.03)	.12
Hospital LOS ≥3 d	59.4% (58.7%-60.1%)	46.5% (46.1%-47.0%)	1.65 (1.60-1.71)	<.001	1.37 (1.32-1.43)	<.001
In-hospital mortality	0.15% (0.10%-0.21%)	0.16% (0.13%-0.20%)	0.99 (0.63-1.55)	.97	†	†
Age <40 y (n = 27,855)						
Mechanical ventilation	7.3% (6.6%-8.0%)	5.1% (4.8%-5.4%)	1.60 (1.41-1.80)	<.001	1.61 (1.40-1.85)	<.001
Noninvasive	6.0% (5.4%-6.7%)	3.0% (2.8%-3.2%)	2.28 (1.98-2.63)	<.001	2.05 (1.74-2.41)	<.001
Invasive	1.5% (1.2%-1.8%)	2.3% (2.1%-2.5%)	0.66 (0.52-0.84)	.001	0.82 (0.63-1.07)	.14
Hospital LOS ≥3 d	50.1% (48.8%-51.4%)	38.9% (38.2%-39.5%)	1.55 (1.46-1.64)	<.001	1.30 (1.22-1.39)	<.001
In-hospital mortality	0.07% (0.001%-0.01%)	0.13% (0.08%-0.18%)	0.55 (0.19-1.62)	.28	†	†
Age ≥40 y (n = 44,231)						
Mechanical ventilation	8.8% (8.3%-9.3%)	4.9% (4.7%-5.2%)	2.03 (1.86-2.22)	<.001	1.85 (1.67-2.04)	<.001
Noninvasive	7.7% (7.2%-8.2%)	3.6% (3.4%-3.8%)	2.56 (2.32-2.83)	<.001	2.19 (1.96-2.44)	<.001
Invasive	1.4% (1.2%-1.6%)	1.6% (1.5%-1.8%)	0.85 (0.71-1.02)	.09	0.89 (0.72-1.09)	.25
Hospital LOS ≥3 d	63.9% (63.0%-64.8%)	51.8% (51.2%-52.3%)	1.64 (1.57-1.71)	<.001	1.40 (1.34-1.47)	<.001
In-hospital mortality	0.19% (0.11%-0.27%)	0.18% (0.14%-0.23%)	1.09 (0.67-1.77)	.74	†	†
Male (n = 21,421)‡						
Mechanical ventilation	11.3% (10.2%-12.3%)	6.5% (6.1%-6.8%)	2.00 (1.76-2.26)	<.001	1.71 (1.48-1.97)	<.001
Noninvasive	10.2% (9.3%-11.2%)	4.2% (3.9%-4.5%)	2.93 (2.54-3.37)	<.001	2.25 (1.92-2.63)	<.001
Invasive	1.3% (1.0%-1.7%)	2.6% (2.4%-2.8%)	0.50 (0.36-0.68)	<.001	0.53 (0.37-0.76)	<.001
Hospital LOS ≥3 d	55.6% (54.0%-57.2%)	42.0% (41.3%-42.8%)	1.67 (1.55-1.79)	<.001	1.36 (1.25-1.47)	<.001
In-hospital mortality	0.25% (0.17%-0.32%)	0.25% (0.09%-0.41%)	1.01 (0.49-2.08)	.98	†	†
Female (n = 50,384)‡						
Mechanical ventilation	7.5% (7.1%-8.0%)	4.3% (4.1%-4.5%)	1.96 (1.80-2.14)	<.001	1.79 (1.63-1.97)	<.001
Noninvasive	6.4% (6.0%-6.8%)	3.0% (2.8%-3.1%)	2.49 (2.25-2.76)	<.001	2.09 (1.87-2.33)	<.001
Invasive	1.5% (1.3%-1.7%)	1.6% (1.5%-1.7%)	0.93 (0.79-1.09)	.367	1.04 (0.86-1.25)	.71
Hospital LOS ≥3 d	60.4% (59.6%-61.3%)	48.9% (48.4%-49.4%)	1.59 (1.52-1.65)	<.001	1.37 (1.31-1.44)	<.001
In-hospital mortality	0.12% (0.09%-0.16%)	0.13% (0.07%-0.19%)	1.10 (0.63-1.93)	.74	†	†
Non-Hispanic white (n = 30,866)§						
Mechanical ventilation	6.8% (6.3%-7.4%)	4.3% (4.1%-4.6%)	1.63 (1.46-1.82)	<.001	1.54 (1.36-1.75)	<.001
Noninvasive	5.7% (5.2%-6.2%)	2.7% (2.5%-2.9%)	2.20 (1.93-2.50)	<.001	1.92 (1.66-2.22)	<.001
Invasive	1.4% (1.2%-1.7%)	1.9% (1.7%-2.0%)	0.75 (0.60-0.93)	.01	0.81 (0.63-1.04)	.10
Hospital LOS ≥3 d	62.1% (61.0%-63.1%)	50.0% (49.4%-50.7%)	1.64 (1.56-1.73)	<.001	1.40 (1.32-1.49)	<.001
In-hospital mortality	0.11% (0.06%-0.20%)	0.13% (0.09%-0.22%)	0.88 (0.42-1.86)	.74	†	†
Non-Hispanic black (n = 19,308)§						
Mechanical ventilation	10.3% (9.5%-11.2%)	5.9% (5.5%-6.2%)	2.03 (1.79-2.29)	<.001	1.81 (1.57-2.08)	<.001
Noninvasive	9.2% (8.4%-10.0%)	4.1% (3.8%-4.5%)	2.66 (2.31-3.06)	<.001	2.22 (1.89-2.60)	<.001
Invasive	1.5% (1.2%-1.8%)	2.0% (1.8%-2.3%)	0.73 (0.56-0.95)	.02	0.78 (0.58-1.05)	.11
Hospital LOS ≥3 d	57.4% (56.1%-58.8%)	43.8% (43.0%-44.6%)	1.68 (1.58-1.79)	<.001	1.31 (1.22-1.41)	<.001
In-hospital mortality	0.17% (0.09%-0.33%)	0.19% (0.13%-0.28%)	0.91 (0.42-1.94)	.80	†	†
Hispanic (n = 14,080)§						
Mechanical ventilation	8.4% (7.5%-9.4%)	4.2% (3.9%-4.6%)	2.27 (1.94-2.27)	<.001	2.02 (1.68-2.43)	<.001
Noninvasive	7.5% (6.6%-8.4%)	3.0% (2.7%-3.4%)	2.88 (2.39-3.46)	<.001	2.42 (1.97-2.97)	<.001
Invasive	1.2% (0.9%-1.7%)	1.5% (1.3%-1.8%)	0.85 (0.60-1.19)	.34	0.82 (0.55-1.22)	.32
Hospital LOS ≥3 d	59.1% (57.4%-60.8%)	45.3% (44.4%-46.3%)	1.75 (1.61-1.89)	<.001	1.45 (1.33-1.59)	<.001
In-hospital mortality	0.15% (0.06%-0.37%)	0.17% (0.11%-0.26%)	0.94 (0.35-2.57)	.91	†	†

Unadjusted and adjusted logistic regression models to account for patient clustering within hospitals.

*Adjusted for age, sex, race/ethnicity, primary insurance, quartiles for household income, residential status, patient comorbidities, hospital state, and calendar year.

†Adjusted models were not constructed because of the relatively small number of in-hospital mortality (n = 116).

‡Two hundred eighty-one patients were excluded because sex variable was missing.

§The other races (Asian, Pacific Islander, and Native American) were excluded in this analysis because of the few number.

TABLE E2. Interactions of obesity with age, sex, and race/ethnicity

Interaction term and outcomes	<i>P</i> value for interactions
Obesity × Age	
Mechanical ventilation	.03
Noninvasive	.15
Invasive	.85
Hospital LOS ≥3 d	.03
In-hospital mortality	.06
Obesity × Sex	
Mechanical ventilation	.71
Noninvasive	.32
Invasive	.001
Hospital LOS ≥3 d	.80
In-hospital mortality	.61
Obesity × Race/ethnicity	
Mechanical ventilation	.12
Noninvasive	.31
Invasive	.72
Hospital LOS ≥3 d	.63
In-hospital mortality	.92

Adjusted for age, sex, race/ethnicity, primary insurance, quartiles for household income, residential status, patient comorbidities, hospital state, and calendar year as well as each of the interaction terms.

TABLE E3. Unadjusted and adjusted associations of obesity with acute severity markers of asthma exacerbation and in-hospital mortality, according to the estimated median household income and patient residence

Outcomes and strata	Obesity (95% CI)	Nonobesity (95% CI)	Unadjusted OR (95% CI)	P value	Adjusted OR* (95% CI)	P value
Median household income quartile 1 (lowest) (n = 26,329)†						
Mechanical ventilation	8.6% (7.9%-9.2%)	5.2% (4.9%-5.6%)	1.88 (1.67-2.10)	<.001	1.74 (1.53-1.99)	<.001
Noninvasive	7.4% (6.8%-8.1%)	3.6% (3.4%-3.9%)	2.48 (2.17-2.84)	<.001	2.17 (1.87-2.52)	<.001
Invasive	1.5% (1.3%-1.8%)	1.9% (1.7%-2.1%)	0.80 (0.64-1.00)	.05	0.84 (0.65-1.09)	.19
Hospital LOS ≥3 d	59.4% (58.3%-60.6%)	45.8% (45.1%-46.5%)	1.68 (1.59-1.77)	<.001	1.40 (1.32-1.49)	<.001
In-hospital mortality	0.18% (0.11%-0.32%)	0.20% (0.15%-0.28%)	0.93 (0.48-1.81)	.83	‡	‡
Median household income quartile 2 (n = 16,852)†						
Mechanical ventilation	7.2% (6.4%-8.0%)	4.5% (4.2%-4.9%)	1.65 (1.43-1.92)	<.001	1.61 (1.36-1.91)	<.001
Noninvasive	6.1% (5.4%-6.9%)	3.0% (2.7%-3.3%)	2.19 (1.85-2.59)	<.001	1.91 (1.57-2.31)	<.001
Invasive	1.2% (0.9%-1.6%)	1.9% (1.6%-2.1%)	0.65 (0.48-0.88)	.01	0.76 (0.52-1.09)	.14
Hospital LOS ≥3 d	59.2% (57.7%-60.7%)	47.2% (46.4%-48.1%)	1.63 (1.51-1.75)	<.001	1.33 (1.23-1.44)	<.001
In-hospital mortality	0.19% (0.09%-0.38%)	0.14% (0.09%-0.23%)	1.47 (0.63-3.41)	.37	‡	‡
Median household income quartile 3 (n = 14,860)†						
Mechanical ventilation	7.7% (6.8%-8.6%)	4.8% (4.4%-5.2%)	1.75 (1.50-2.04)	<.001	1.62 (1.36-1.93)	<.001
Noninvasive	6.4% (5.6%-7.2%)	3.3% (3.0%-3.6%)	2.20 (1.84-2.62)	<.001	1.89 (1.55-2.29)	<.001
Invasive	1.5% (1.2%-2.0%)	1.8% (1.6%-2.1%)	0.85 (0.63-1.16)	.31	0.91 (0.64-1.29)	.58
Hospital LOS ≥3 d	59.7% (58.1%-61.3%)	47.7% (46.8%-48.6%)	1.64 (1.52-1.77)	<.001	1.39 (1.28-1.52)	<.001
In-hospital mortality	0.08% (0.03%-0.26%)	0.14% (0.09%-0.23%)	0.58 (0.17-1.597)	.39	‡	‡
Median household income quartile 4 (highest) (n = 10,065)†						
Mechanical ventilation	8.4% (7.3%-9.6%)	4.5% (4.1%-5.0%)	2.04 (1.69-2.46)	<.001	2.03 (1.64-2.51)	<.001
Noninvasive	7.3% (6.3%-8.5%)	2.7% (2.4%-3.1%)	3.01 (2.41-3.75)	<.001	2.73 (2.14-3.48)	<.001
Invasive	1.5% (1.0%-2.1%)	2.1% (1.8%-2.4%)	0.71 (0.48-1.05)	.083	0.76 (0.49-1.18)	.23
Hospital LOS ≥3 d	62.2% (60.1%-64.2%)	49.4% (48.3%-50.5%)	1.72 (1.56-1.90)	<.001	1.43 (1.29-1.59)	<.001
In-hospital mortality	0.09% (0.02%-0.37%)	0.11% (0.06%-0.22%)	0.80 (0.18-3.65)	.78	‡	‡
Metropolitan residents (n = 66,516)						
Mechanical ventilation	8.4% (8.0%-8.9%)	5.1% (4.9%-5.3%)	1.89 (1.76-2.03)	<.001	1.74 (1.60-1.89)	<.001
Noninvasive	7.3% (6.9%-7.7%)	3.5% (3.3%-3.6%)	2.52 (2.32-2.75)	<.001	2.12 (1.93-2.33)	<.001
Invasive	1.4% (1.3%-1.6%)	1.9% (1.8%-2.1%)	0.75 (0.65-0.87)	<.001	0.85 (0.72-1.00)	.048
Hospital LOS ≥3 d	59.6% (58.8%-60.3%)	46.4% (46.0%-46.9%)	1.67 (1.62-1.74)	<.001	1.39 (1.33-1.47)	<.001
In-hospital mortality	0.16% (0.11%-0.24%)	0.17% (0.14%-0.21%)	1.01 (0.65-1.58)	.06	‡	‡
Nonmetropolitan residents (n = 5,570)						
Mechanical ventilation	6.6% (5.4%-8.1%)	3.5% (2.9%-4.0%)	1.80 (1.34-2.40)	<.001	1.94 (1.38-2.74)	<.001
Noninvasive	5.0% (4.0%-6.3%)	2.0% (1.6%-2.4%)	2.37 (1.66-3.38)	<.001	2.36 (1.55-3.58)	<.001
Invasive	1.6% (1.1%-2.4%)	1.7% (1.3%-2.1%)	0.91 (0.54-1.53)	.73	1.16 (0.63-2.12)	.63
Hospital LOS ≥3 d	58.4% (55.8%-61.0%)	46.3% (44.8%-47.8%)	1.58 (1.39-1.80)	<.001	1.26 (1.08-1.46)	.003
In-hospital mortality	0	0.11% (0.05%-0.29%)	—	—	‡	‡

Unadjusted and adjusted logistic regression models to account for patient clustering within hospitals.

*Adjusted for age, sex, race/ethnicity, primary insurance, quartiles for household income, residential status, patient comorbidities, hospital state, and calendar year.

†Three thousand nine hundred eighty patients were excluded because the patient residence variable was missing.

‡Adjusted models were not constructed because of the relatively small number of in-hospital mortality (n = 116).

TABLE E4. Unadjusted and adjusted associations of obesity with hospital LOS among patients hospitalized with asthma exacerbation

Strata	Obesity hospital LOS (d), median (IQR)	Nonobesity hospital LOS (d), median (IQR)	Unadjusted % increase in hospital LOS compared with nonobesity (95% CI)*	P value	Adjusted % increase in hospital LOS compared with nonobesity (95% CI)*	P value
Overall	3 (2-5)	2 (1-4)	24% (22%-27%)	<.001	13% (11%-16%)	<.001
Age category						
<40 y	3 (2-4)	2 (1-3)	20% (16%-25%)	<.001	11% (7%-15%)	<.001
≥40 y	3 (2-5)	2 (2-4)	23% (20%-26%)	<.001	14% (11%-17%)	<.001
Sex						
Male	3 (2-4)	2 (1-3)	26% (21%-31%)	<.001	14% (8%-19%)	<.001
Female	3 (2-5)	2 (2-4)	22% (20%-25%)	<.001	13% (10%-16%)	<.001

IQR, Interquartile range.

Unadjusted and adjusted negative binomial regression models using generalized estimating equations to account for patient clustering within hospitals.

*Adjusted for age, sex, race/ethnicity, primary insurance, quartiles for household income, residential status, patient comorbidities, hospital state, and calendar year.

TABLE E5. Associations of obesity with acute severity markers of asthma exacerbation and in-hospital death using stabilized IPW method

Outcomes	OR (95% CI)	P value
Mechanical ventilation	1.70 (1.54-1.87)	<.001
Noninvasive	2.08 (1.85-2.32)	<.001
Invasive	0.85 (0.72-1.00)	.055
Hospital LOS ≥3 d	1.36 (1.30-1.43)	<.001
In-hospital mortality	0.95 (0.57-1.59)	.86

IPW was calculated by using age, sex, race/ethnicity, primary insurance, quartiles for household income, residential status, patient comorbidities, hospital state, and calendar year.