

Association of Body Mass Index with Death, Mechanical Ventilation, and Cardiovascular Outcomes in COVID-19: Findings from the AHA COVID-19 CVD Registry

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Disclosures

- James A. de Lemos has received fees for participating in Data Monitoring Committees from Eli Lilly and Novo Nordisk, and consulting income from Jannssen.
- Ian J. Neeland has received honoraria, consulting, speaker's bureau fees, and travel support from Boehringer-Ingelheim/Lilly Alliance (significant), a research grant from Novo Nordisk (significant), and has been a member of a scientific advisory board regarding obesity for AMRA Medical (modest) and Merck (modest).
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- All remaining authors (NSH, CA, SRD, A. Rao, SC, AR, JW, WO, RK, AAH and MHD) report no relevant conflicts of interest or disclosures.



Introduction

- ❖ Young adults are perceived to be at low risk for severe COVID-19
- ❖ Obesity may increase the risk for morbidity and mortality in patients with COVID-19
- ❖ The association of obesity with increased risk has been seen with other respiratory viruses, such as influenza



Hypothesis & Aims

- ❖ We hypothesized that obesity would be associated with worse outcomes in COVID-19, particularly among younger individuals
- ❖ Evaluated the relationship between BMI and **in-hospital death, mechanical ventilation, adverse cardiovascular, renal, and venous thromboembolic** outcomes in patients admitted with COVID-19 in the American Heart Association's (AHA) COVID-19 Cardiovascular disease (CVD) registry powered by *Get With The Guidelines*



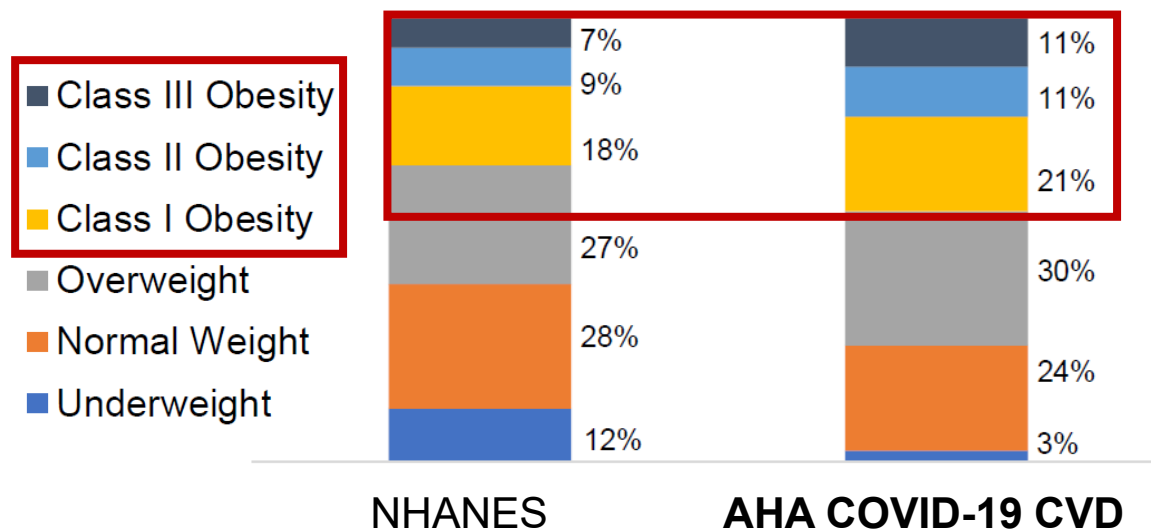
Methods

- ❖ **Cohort:** All adults with available BMI data and completed field entries for age, sex, admission date, discharge date, discharge disposition, and a prior medical history (n = 7606)
- ❖ **Primary exposure:** BMI stratified by World Health Organization (WHO) obesity class
 - Underweight (<18.5 kg/m²)
 - Normal weight (18.5–24.9 kg/m²) - Pre-specified reference group for all outcomes analyses
 - Overweight (25.0–29.9 kg/m²)
 - Class I obesity (30.0–34.9 kg/m²)
 - Class II obesity (35.0–39.9 kg/m²)
 - Class III obesity (≥ 40.0 kg/m²)
- ❖ **Primary outcomes:** Composite of in-hospital death or mechanical ventilation, in-hospital death, and mechanical ventilation
- ❖ **Secondary outcomes:**
 - Major adverse cardiovascular events (MACE, a composite of in-hospital stroke, heart failure, myocardial infarction, or all-cause death)
 - A composite of deep vein thrombosis (DVT) or pulmonary embolism (PE)
 - Renal replacement therapy (RRT, in-hospital initiation of hemodialysis or continuous renal replacement)

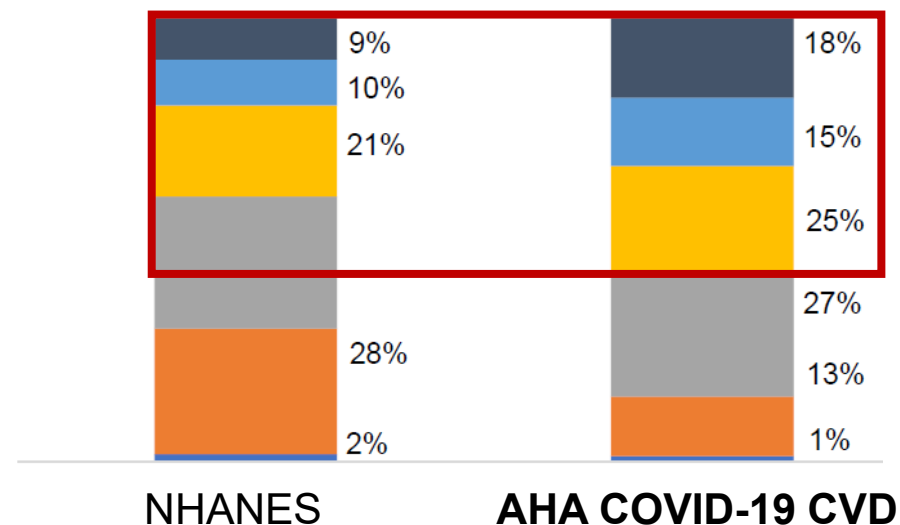


NHANES vs AHA COVID-19 BMI Distribution

Overall



Age ≤50





Baseline Characteristics by WHO Obesity Class

	Underweight (n = 194)	Normal (n = 1793)	Overweight (n = 2308)	Class I Obesity (n = 1623)	Class II Obesity (n = 846)	Class III Obesity (n = 842)
Age, years	77 (62-86)	71 (59-82)	63 (51-75)	59 (47-71)	56 (45-66)	53 (41-63)
Male	104 (54)	1021 (57)	1472 (64)	865 (53)	394 (47)	351 (42)
Race						
White	81 (42)	655 (37)	747 (32)	477 (29)	269 (32)	260 (31)
Black	43 (22)	364 (20)	453 (20)	400 (25)	263 (31)	328 (40)
Hispanic	34 (18)	462 (26)	772 (34)	547 (34)	243 (29)	189 (23)
Asian	22 (11)	177 (10)	152 (7)	48 (3)	11 (1)	11 (1)
Baseline values are presented as median (25th-75th percentile) for continuous variables and number (%) for categorical variables. WHO BMI Classes: Underweight <18.5 kg/m ² ; Normal Weight 18.5-24.9 kg/m ² ; Overweight 25.0-29.9 kg/m ² ; Class I Obesity 30.0-34.9 kg/m ² ; Class II Obesity 35.0-39.9 kg/m ² ; Class III Obesity ≥40.0 kg/m ²						

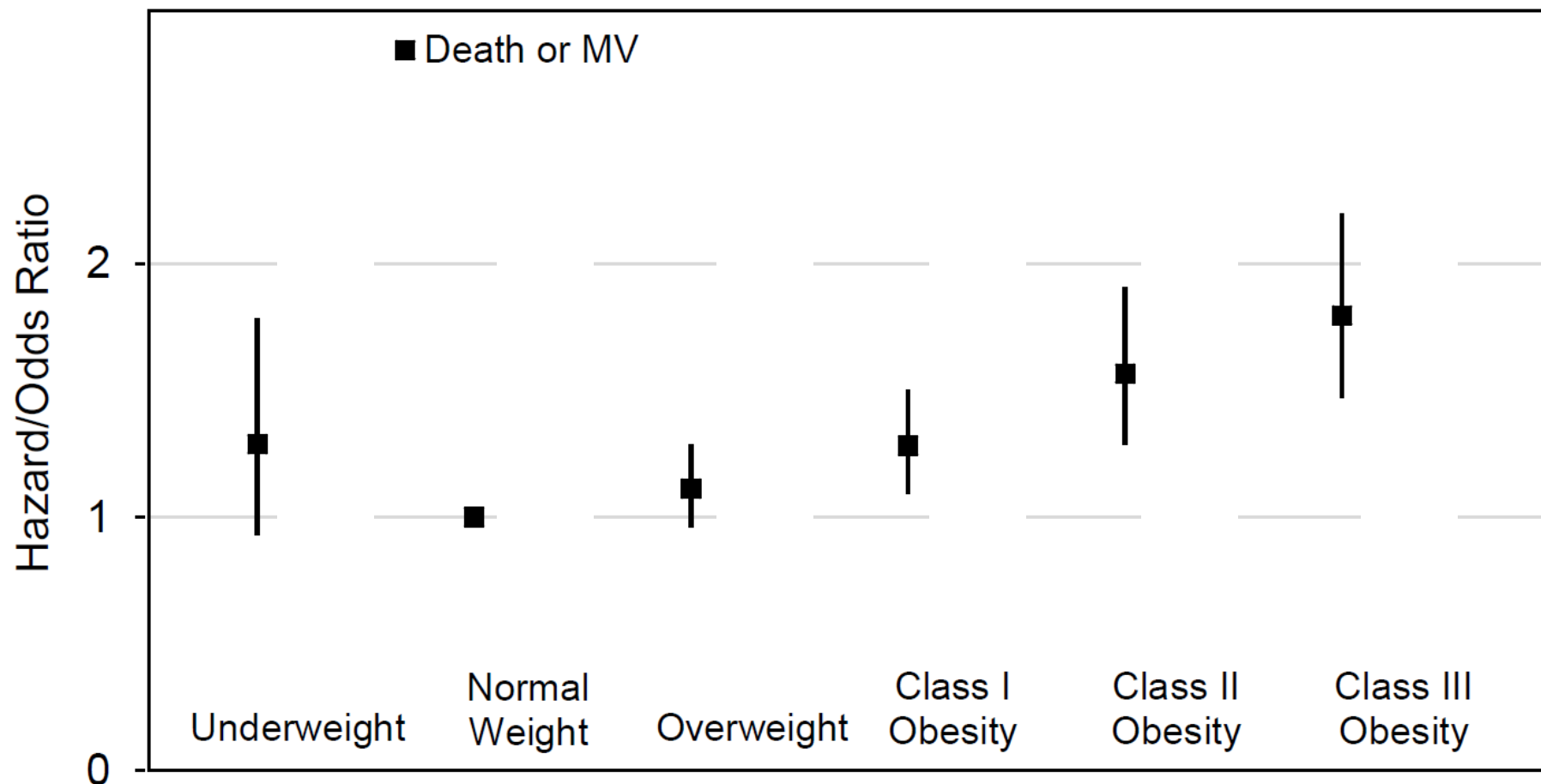


Baseline Characteristics by WHO Obesity Class

	Underweight (n = 194)	Normal (n = 1793)	Overweight (n = 2308)	Class I Obesity (n = 1623)	Class II Obesity (n = 846)	Class III Obesity (n = 842)
Comorbidities						
Hypertension	116 (60)	1084 (61)	1316 (57)	961 (59)	527 (62)	521 (63)
Diabetes	53 (27)	609 (34)	770 (33)	656 (40)	357 (42)	354 (42)
Smoking	18 (9)	140 (8)	153 (7)	105 (7)	45 (5)	49 (6)
Prior CVD	63 (33)	459 (26)	440 (19)	285 (18)	158 (19)	160 (19)
Prior DVT	9 (5)	73 (4)	58 (3)	44 (3)	23 (3)	33 (4)
Prior PE	3 (2)	37 (2)	38 (2)	27 (2)	13 (2)	25 (3)
Dialysis	11 (6)	126 (7)	88 (4)	44 (3)	18 (2)	18 (2)
CKD	25 (13)	316 (18)	281 (12)	178 (11)	94 (11)	78 (9)
Baseline values are presented as number (%) for categorical variables. WHO BMI Classes: Underweight <18.5 kg/m ² ; Normal Weight 18.5-24.9 kg/m ² ; Overweight 25.0-29.9 kg/m ² ; Class I Obesity 30.0-34.9 kg/m ² ; Class II Obesity 35.0-39.9 kg/m ² ; Class III Obesity ≥40.0 kg/m ²						



Adjusted Risk of Primary Outcomes

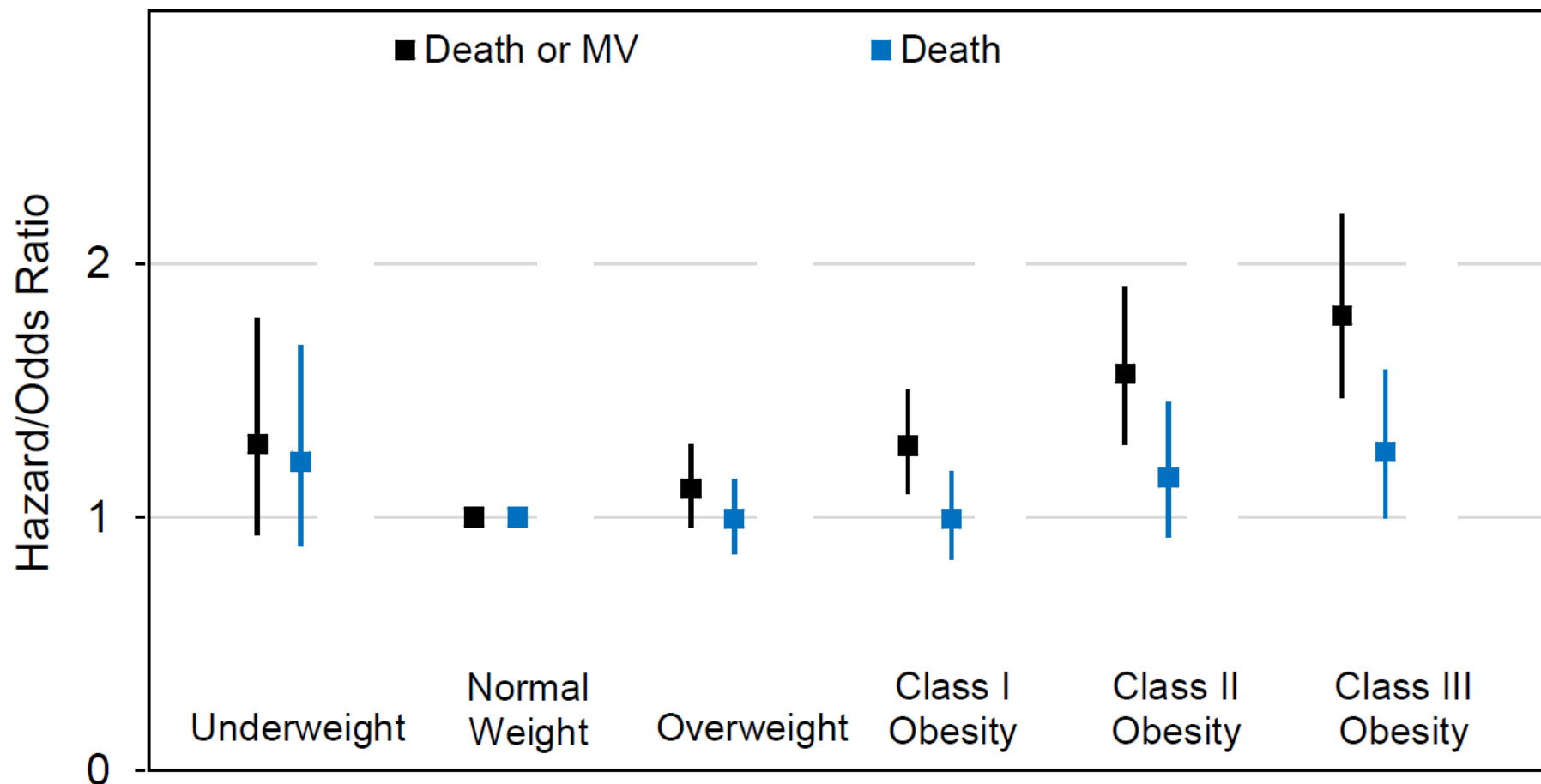


MV = Mechanical Ventilation

Adjusted for age, sex, race, hypertension, diabetes, prior cardiovascular disease and chronic kidney disease.



Adjusted Risk of Primary Outcomes

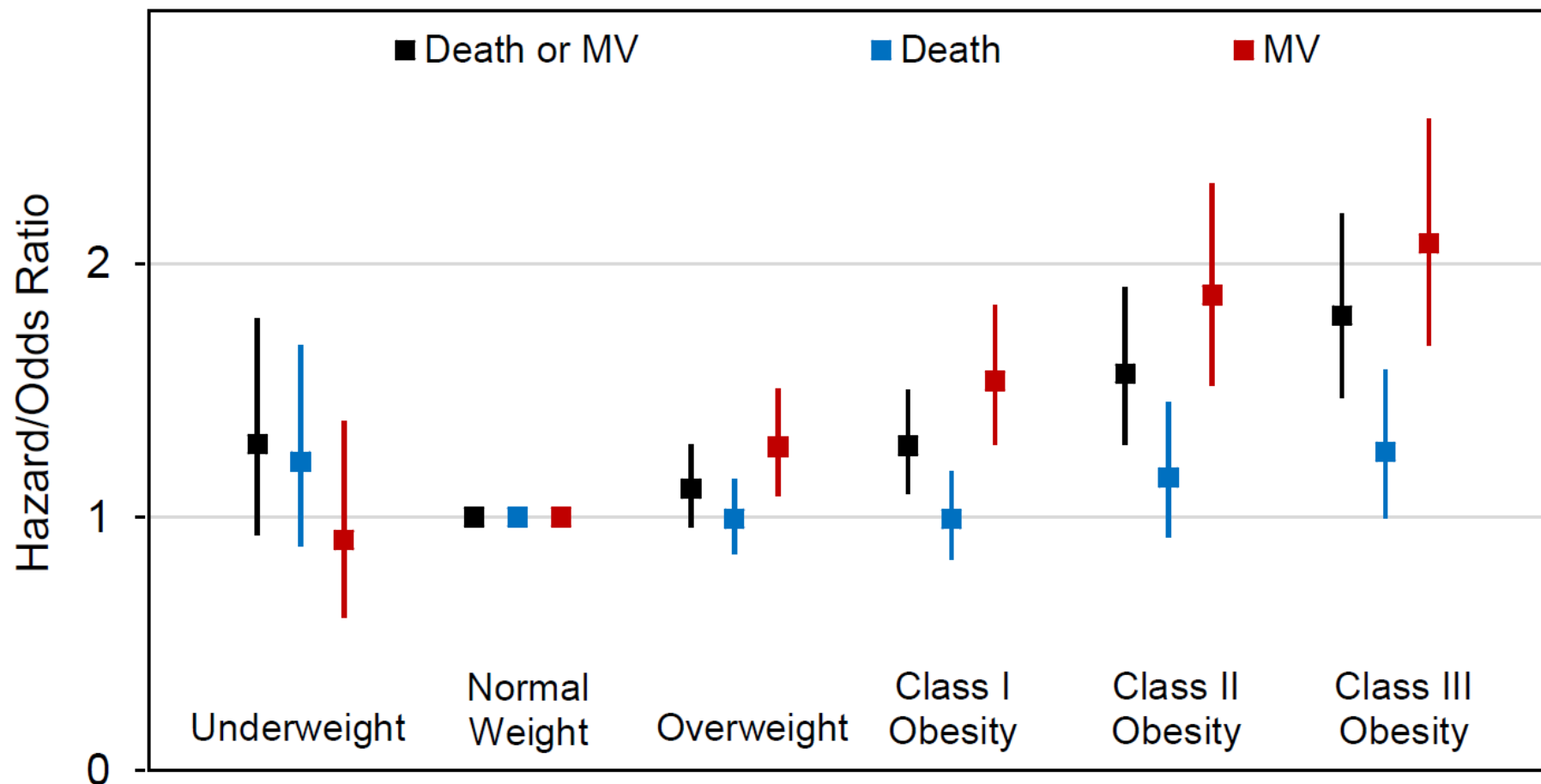


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Adjusted Risk of Primary Outcomes

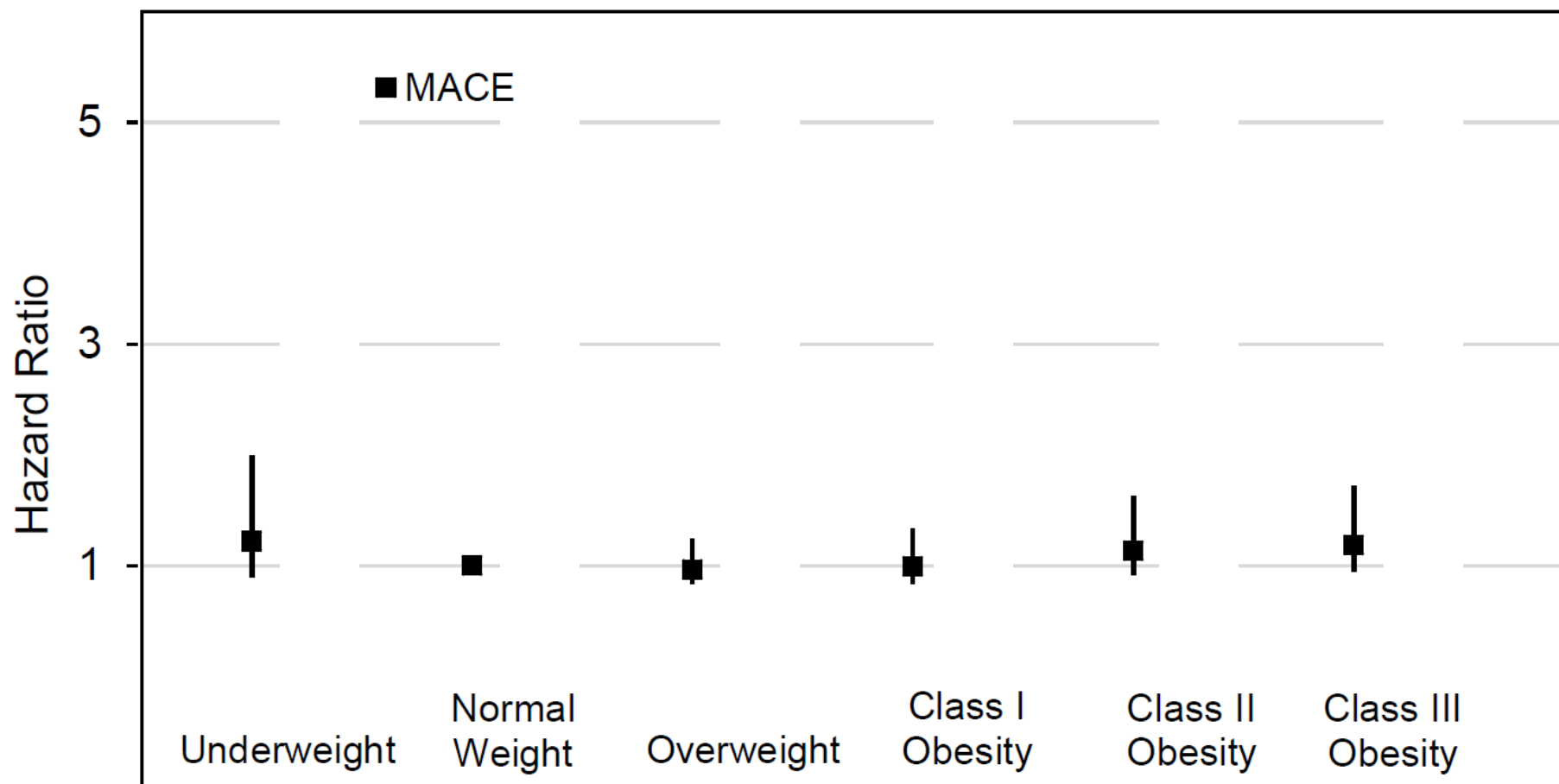


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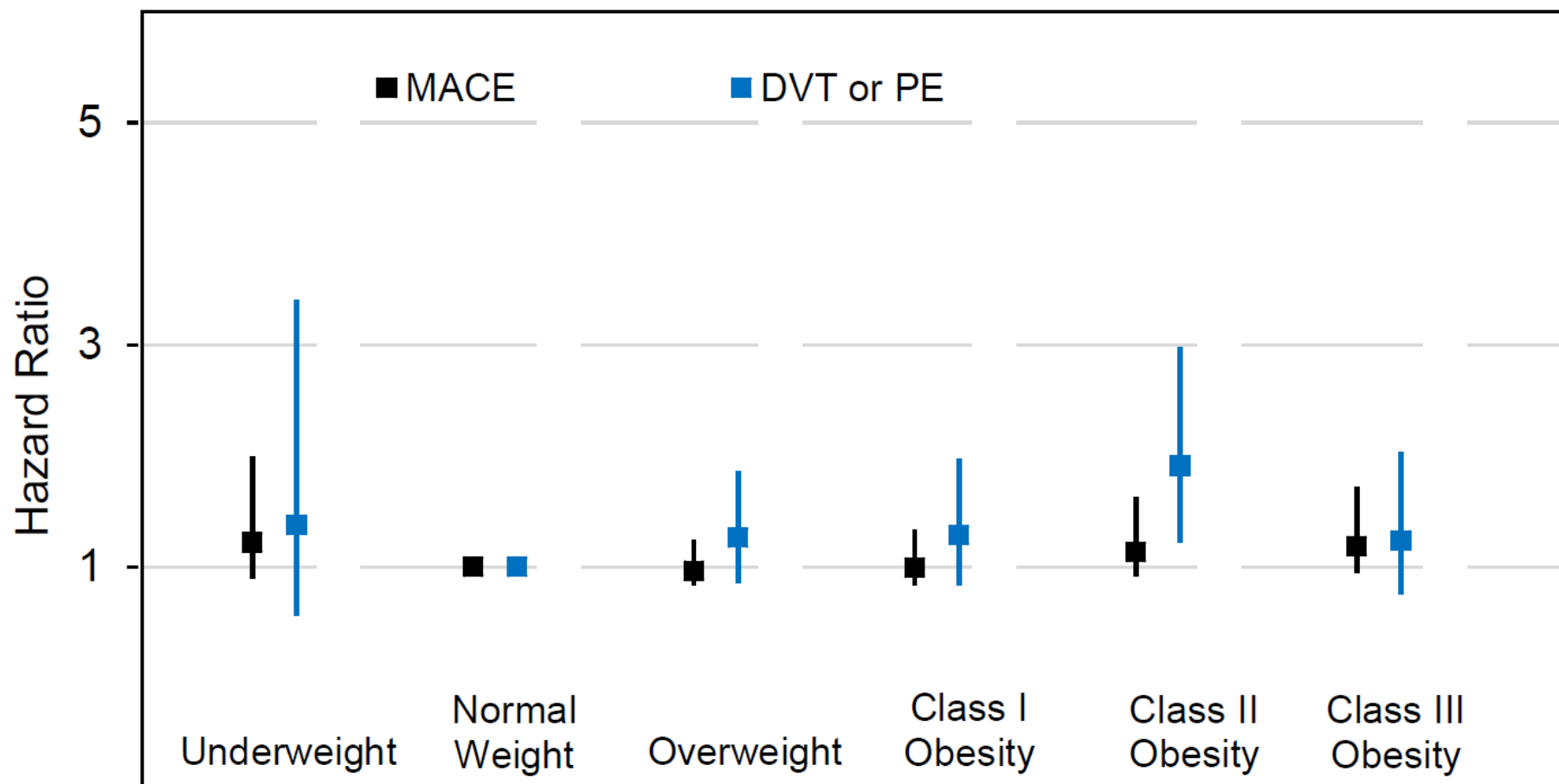
Adjusted Risk of Secondary Outcomes



Adjusted for age, sex, race, hypertension, diabetes, prior cardiovascular disease and chronic kidney disease.



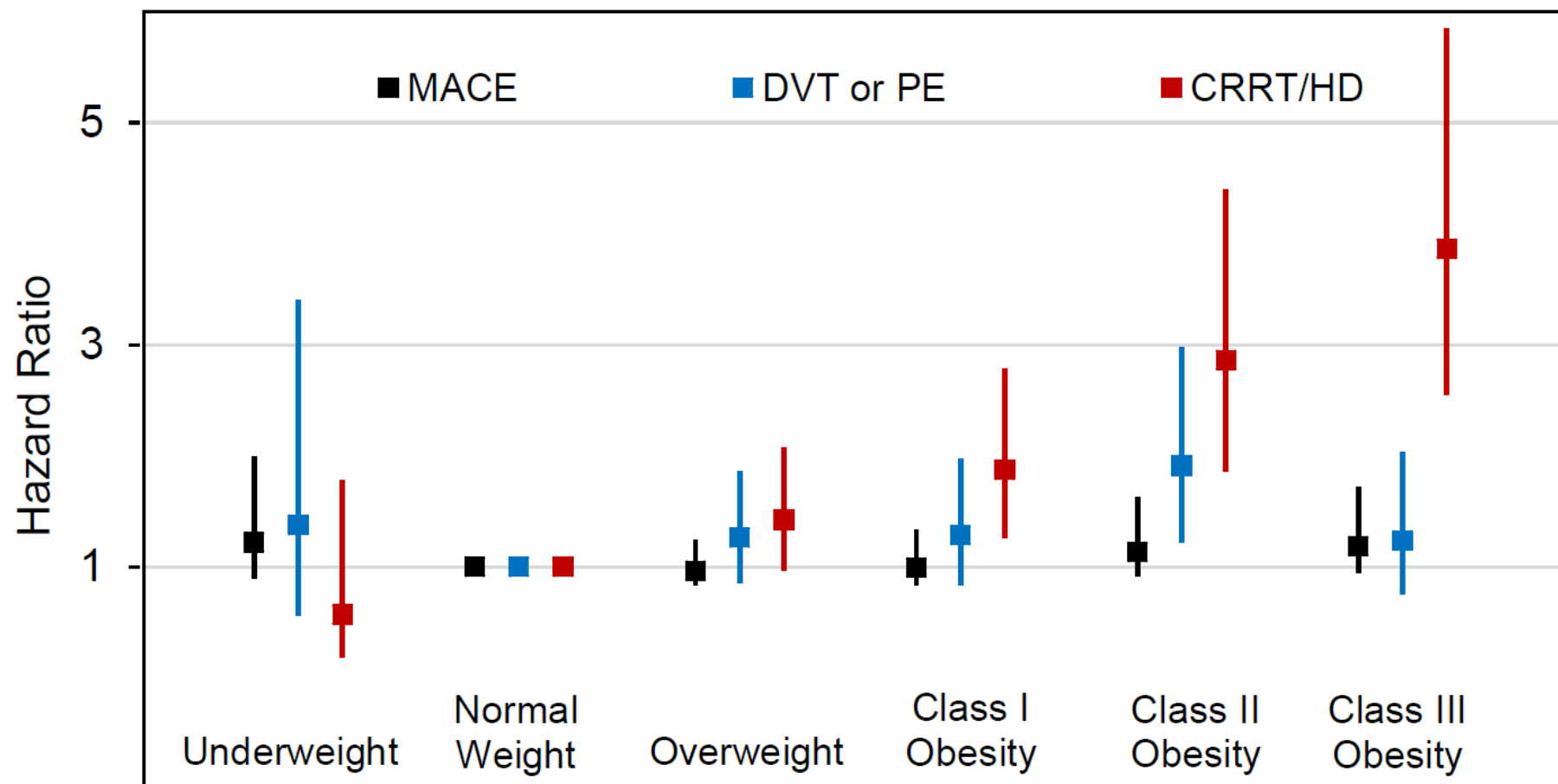
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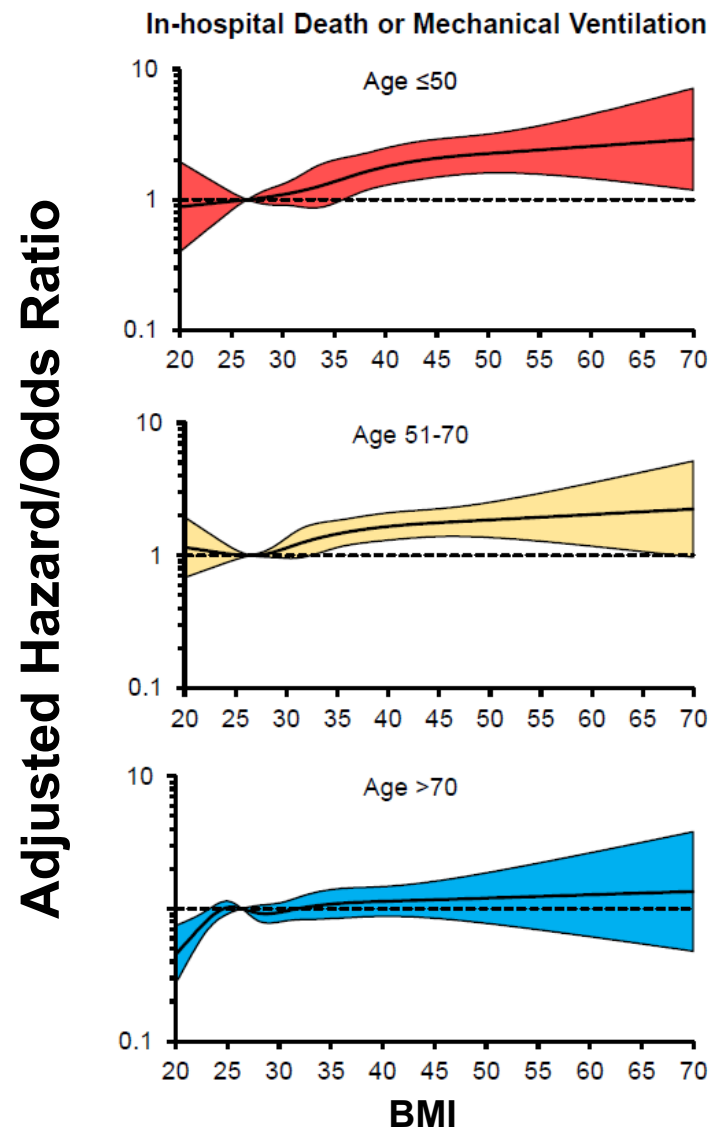


American Heart Association

Scientific Sessions

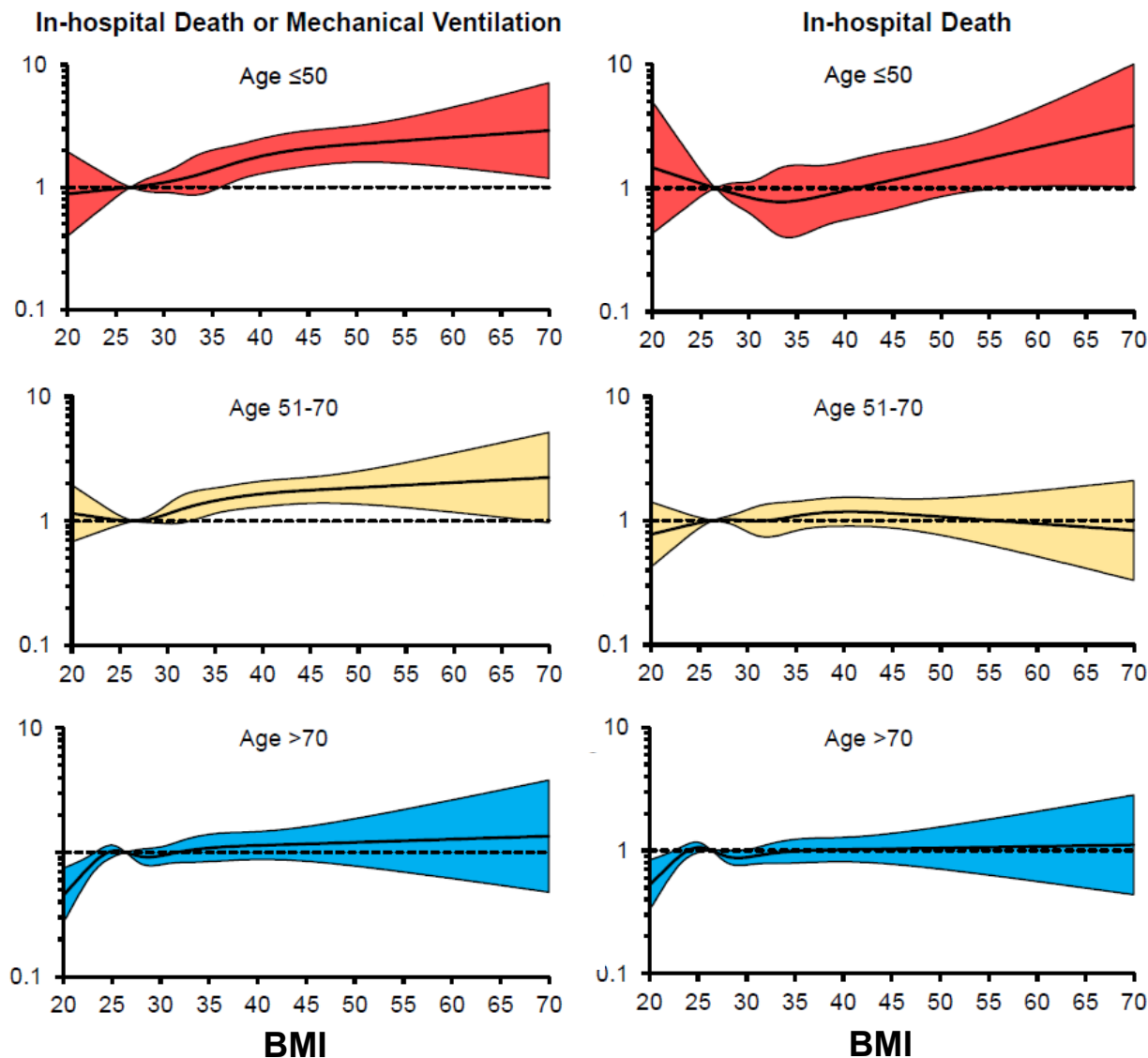
Primary Outcomes BMI by Age Strata

UT Southwestern
Medical Center





Adjusted Hazard/Odds Ratio





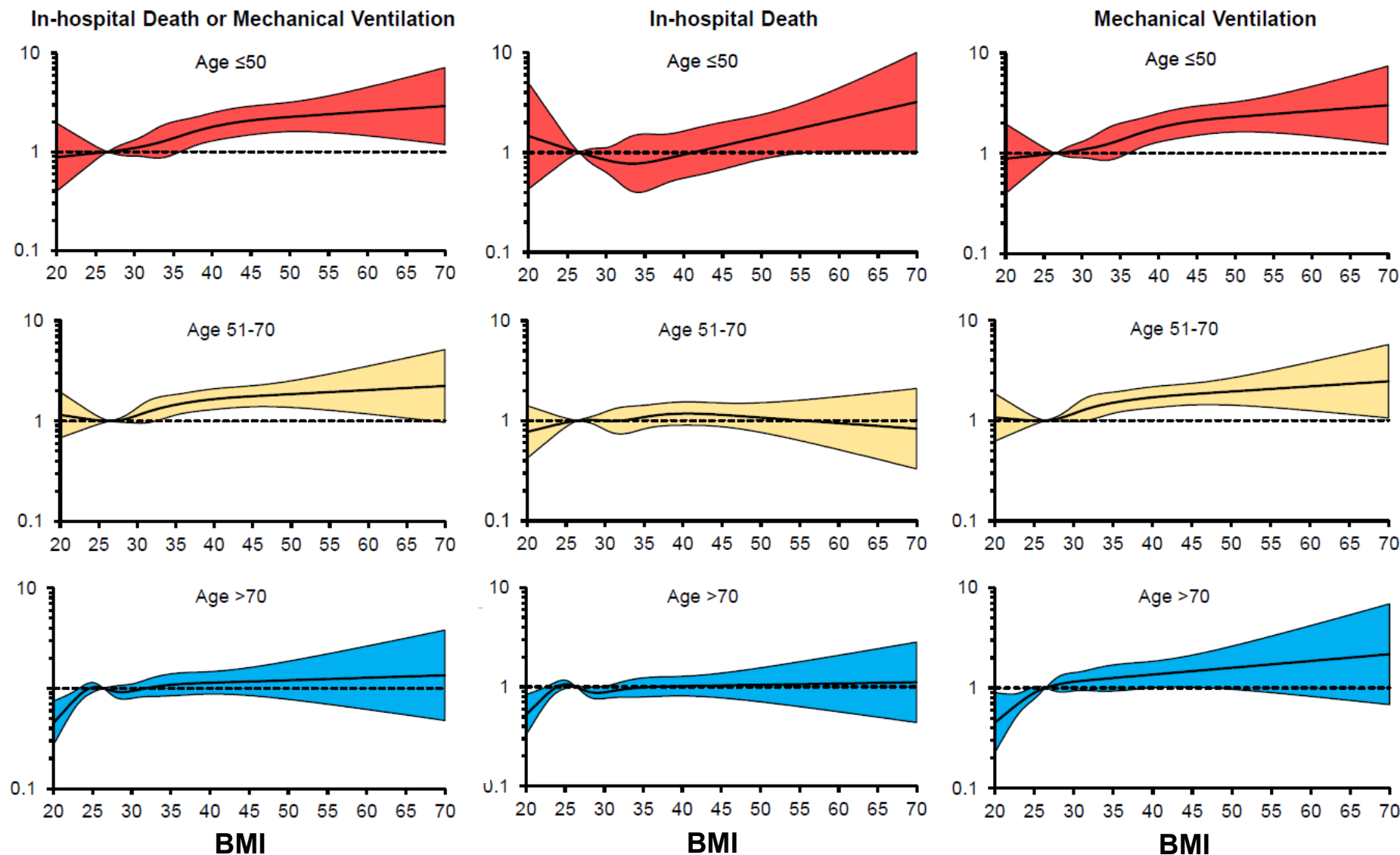
Scientific Sessions



Parkland

Primary Outcomes BMI by Age Strata

Adjusted Hazard/Odds Ratio





Conclusions

- ❖ After adjustment, class I-III obesity was associated with higher risk of mechanical ventilation regardless of age
- ❖ BMI ≥ 40 kg/m² was associated with a higher risk of in-hospital death in those age ≤ 50
- ❖ Clear public health messaging is needed for younger obese individuals who may underestimate their risk of severe COVID-19
- ❖ Severely obese individuals (BMI ≥ 40 kg/m²) should be considered high risk for severe COVID-19 infection and may warrant prioritization for a COVID-19 vaccine