The Impact of Obesity

on COVID-19 Outcomes of Hospitalizations and Mortality

The coronavirus pandemic continues to batter the United States (US), with more than 15 million cases and over 300,000 deaths attributable to the disease as of mid-December 2020.[1] Since COVID-19 was declared a global pandemic in March 2020, scientists, healthcare workers, and public health experts have learned a great deal about the pathophysiology of the coronavirus, as well as the patient populations who are most vulnerable. Understanding how to mitigate risk for these populations can have a tremendous impact on reducing hospitalizations, deaths, and associated healthcare costs.

Obesity is a complex, multifactorial, chronic disease resulting from a range of environmental, genetic, and biological factors. Obesity is linked with higher risk for several serious health conditions, such as hypertension, type 2 diabetes, hypercholesterolemia, coronary heart disease, stroke, asthma, and arthritis. Obesity has also emerged as a major risk factor for severe COVID-19 infection. During the past few months, nearly 300 articles have reported an association between obesity and increased morbidity and mortality from COVID-19.[2] Since over 40% of the US population has obesity,[3] updating policies to support the treatment and prevention of this disease should be part of a comprehensive response to COVID-19.

Xcenda's model shows that if the prevalence of obesity were reduced by even just 5% at the start of the pandemic, there would have been almost 5,000 fewer deaths in the US by late October. If the prevalence of obesity were reduced by 25%, the US would have experienced almost 24,000 fewer COVID-19 deaths.

Currently, in the US, people living with obesity may have limited access to the full spectrum of effective interventions to combat this disease. For instance, most insurers cover anti-obesity medications as an "opt-in" benefit, and rates for plan sponsors opting in are low. Currently, anti-obesity medications are excluded from Medicare prescription drug coverage (Part D).[4] The Medicare Prescription Drug, Improvement, and Modernization Act of 2003 explicitly excludes coverage of weight loss agents for Part D beneficiaries, and the Centers for Medicare & Medicaid Services (CMS) interprets this as excluding coverage for anti-obesity medications.[4]

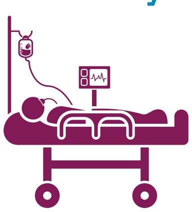
Poor access to treatment contributes to high obesity rates in the US, and patients with obesity are likelier to experience worse outcomes if infected with COVID-19 and potentially future pandemics as well. Xcenda built a model showing that decreasing the rate of obesity can lessen the risk of severe COVID-19. We found that if the prevalence of obesity were reduced by even just 5% at the start of the pandemic, there would have been almost 5,000 fewer deaths in the US by late October. If the prevalence of obesity were reduced by 25%, we could have had nearly 24,000 fewer COVID-19 deaths.

Addressing obesity would also represent a step forward in addressing health disparities by race and ethnicity. High rates of underlying obesity in diverse populations are contributing to their increased vulnerability to COVID-19. Non-Hispanic Black Americans are 1.3 times more likely to have obesity as compared to non-Hispanic White Americans,[5] and Hispanic Americans are 1.2 times more likely to have obesity than non-Hispanic White Americans.[6] Obesity is even more prevalent in women: 4 out of 5 Black or Hispanic American women have obesity or overweight.[5]

Due partly to the association between severe obesity and increased morbidity and mortality from COVID-19, Black and Hispanic Americans represent a disproportionate share of COVID-19 hospitalizations and deaths. Black Americans have a 287% greater rate of COVID-19–associated hospitalization compared to White Americans, and Hispanic Americans have a 271% greater rate of COVID-19–associated hospitalization compared to White Americans.[7]

25% reduction in obesity could have led to

7.0% fewer hospitalizations



10.8% fewer ICU admissions

11.5% fewer deaths

Modeling the Impact of the Reduction of Obesity Prevalence

Xcenda developed a US-based model to compare the current scenario (pandemic with current levels of obesity) and 3 new hypothetical scenarios (pandemic with relative reductions in obesity), with the goal of determining how lowering the prevalence of obesity can reduce severe COVID-19 outcomes. The various scenarios assess the impact of lowering the relative reduction of the current obesity prevalence nationwide of 40%, as shown in **Table 1**.

Table 1. Scenarios for Relative Reduction in Obesity, Assuming Current Obesity Prevalence of 40%

Scenario	Relative reduction in obesity …	… leads to following absolute reduction of obesity prevalence…	…resulting in absolute obesity prevalence of
Conservative	5%	2%	38%
Moderate	10%	4%	36%
Aggressive	25%	10%	30%

The model incorporated data from the most current literature available on the correlation of obesity status (measured using body mass index [BMI]) and COVID-19 outcomes (eg, hospitalization, intensive care unit [ICU] admission, and death). The inputs for the model were identified from a literature review conducted by Xcenda. The review included 11 systematic reviews with or without meta-analyses and 13 individual studies on the impact of obesity in patients with COVID-19 on key outcomes of interest—hospitalization, ICU admission, and death. The model extrapolates these associations to the COVID-19 pandemic population and outcomes observed to date, and stratifies the results using publicly available data on obesity prevalence and rates of COVID-19 infection and hospitalization by racial and ethnic groups.

To determine the impact of COVID-19 on different racial and ethnic groups, the model used the COVID-NET surveillance system.[a] COVID-NET uses the following to characterize race/ethnicity: White, Black, Hispanic/Latino, Asian/Pacific Islander (PI), American Indian/Alaska Native (AI/AN), and other. Together, these sum to 100% for the hospitalized patients in the COVID-NET data.

In the model, following standard practice, Xcenda separated race and ethnicity. The model used the following categories for race: White, Black, Asian/PI, AI/AN, and other. Hispanic/Latino is a separate ethnic category, making up 18.5% of the US population.

Due to the race/ethnic difference, Xcenda adjusted the racial categories for the COVID-NET data to 100% and removed the 23.1% of the patients in COVID-NET who were Hispanic. To adjust the racial categories to 100%, Xcenda assumed that people of Hispanic ethnicity were equally likely to be of any race.

Reductions in Hospitalizations, ICU Admissions, and Deaths

Table 2 shows the total reductions in hospitalizations, ICU admissions, and deaths through late October if the number of people with obesity was reduced by 5% (conservative scenario), 10% (moderate scenario), or 25% (aggressive scenario) at the beginning of the pandemic.

Table 2. Reductions in Hospitalizations, ICU Admissions, and Deaths, if Obesity Prevalence Were Reduced at the Beginning of the Pandemic, by Number and Percent

Number and percent of reductions						
	Hospitalizations		ICU admissions		Deaths	
Conservative	5,833	1.4%	3,022	2.2%	4,873	2.3%
Moderate	11,665	2.7%	6,013	4.4%	9,690	4.7%
Aggressive	29,918	7.0%	14,905	10.8%	23,951	11.5%

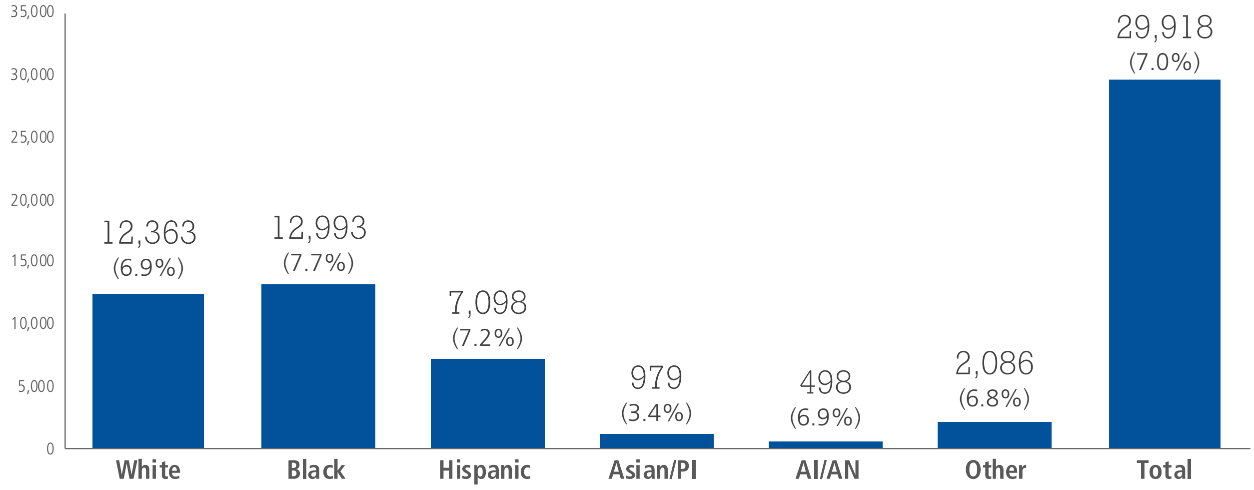
Key: ICU – intensive care unit.

[a] COVID-19-Associated Hospitalization Surveillance Network (COVID-NET) is a population-based surveillance system that collects data on laboratory-confirmed COVID-19–associated hospitalizations among children and adults through a network of over 250 acute care hospitals in 14 states.

Reductions in Hospitalizations—25% Relative Reduction (Aggressive Scenario)

Had the prevalence of obesity been 25% lower at the start of the pandemic, the model estimates there would have been almost 30,000 (7.0%) fewer hospitalizations. **Figure 1** shows the distribution across racial and ethnic categories.

Figure 1. Reductions in Hospitalizations if Obesity Prevalence Were Reduced by 25% at the Beginning of the Pandemic, Across Race and Ethnicity, by Number and Percent[a]



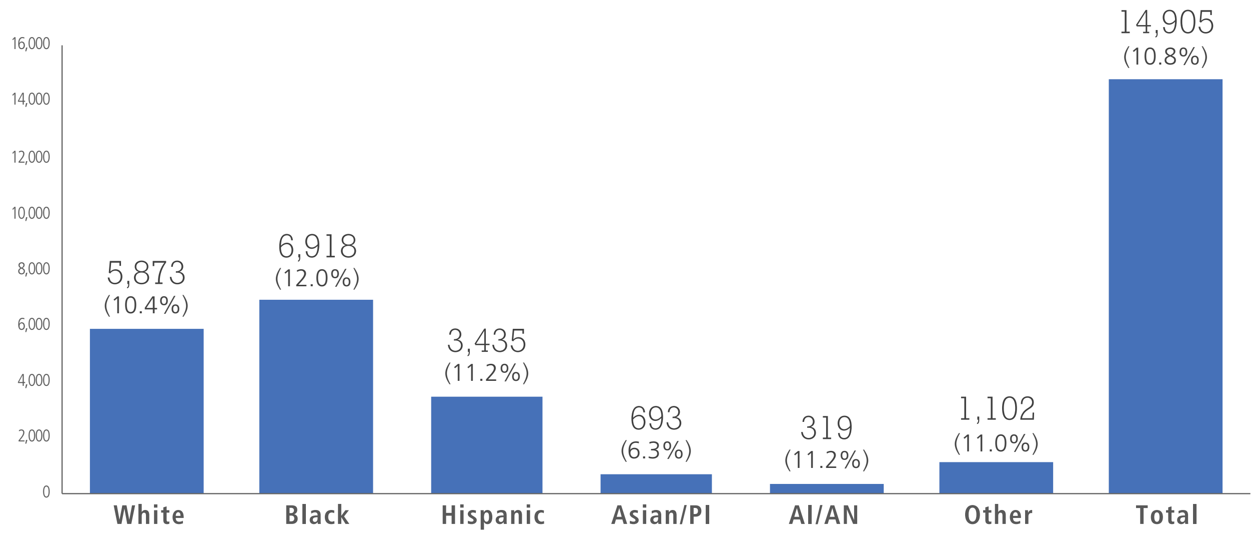
[a] There is overlap between the Hispanic category and the White and Black categories.
Key: AI – American Indian; AN – Alaska Native; PI – Pacific Islander.

Under the aggressive scenario, the White, Black, AI/AN, and Hispanic populations have a better-than-average reduction in rates of hospitalizations. Comparatively, the Asian/PI population has a lower-than-average reduction in hospitalizations relative to its share of the population.

Reductions in ICU Admissions—25% Relative Reduction (Aggressive Scenario)

Had the prevalence of obesity been 25% lower at the start of the pandemic, the model estimates there would have been almost 15,000 (10.8%) fewer ICU admissions. **Figure 2** shows the distribution across racial and ethnic categories.

Figure 2. Reductions in ICU Admissions if Obesity Prevalence Were Reduced by 25% at the Beginning of the Pandemic, Across Race and Ethnicity, by Number and Percent[a]



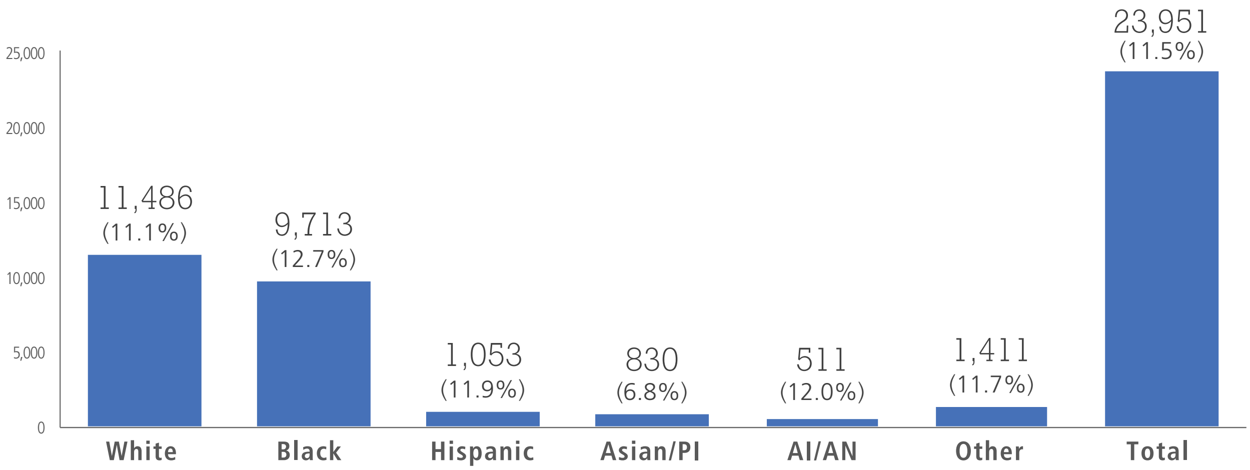
[a] There is overlap between the Hispanic category and the White and Black categories.
Key: AI – American Indian; AN – Alaska Native; ICU – intensive care unit; PI – Pacific Islander.

Under the aggressive scenario, the Black, Hispanic, and AI/AN populations have a better-than-average reduction in rates of ICU admissions. Comparatively, the White and Asian/PI populations have a lower-than-average reduction in hospitalizations relative to their share of the population.

Reductions in Deaths—25% Relative Reduction (Aggressive Scenario)

Had the prevalence of obesity been 25% lower at the start of the pandemic, the model estimates there would have been almost 24,000 (11.5%) fewer deaths. **Figure 3** shows the distribution across racial and ethnic categories.

Figure 3. Reductions in Deaths if Obesity Prevalence Were Reduced by 25% at the Beginning of the Pandemic, Across Race and Ethnicity, by Number and Percent[a]



[a] There is overlap between the Hispanic category and the White and Black categories.
Key: AI – American Indian; AN – Alaska Native; PI – Pacific Islander.

Under the aggressive scenario, the Black, AI/AN, and Hispanic populations have better-than-average reduction in deaths. Comparatively, the White and Asian/PI populations have a lower-than-average reduction in deaths relative to their share of the population.

Conclusion

Some risk factors leading to worse COVID-19 outcomes—such as advanced age—cannot be modified. As a result, maximal efforts should be deployed to reduce modifiable risk factors that lead to severe COVID-19. This is critical not only in the context of the current COVID-19 outbreak but in preparation for future outbreaks in which obesity may be a significant risk factor. For instance, about 10 years ago, against the backdrop of the H1N1 influenza epidemic, a meta-analysis of more than 3,000 individuals demonstrated that people with severe obesity had a 2-fold increased risk for ICU admission and mortality compared to counterparts without obesity.[8]

As the medical literature shows, COVID-19 patients who have obesity have dramatically increased rates of hospitalizations, ICU admissions, and death. Our model demonstrates that reducing the prevalence of obesity in the population can reduce those adverse outcomes—particularly in non-White communities.

However, losing weight through lifestyle changes, such as diet and exercise, may not work for everyone. Therefore, increasing access to a spectrum of interventions to reduce obesity, such as intensive counseling and behavioral services, anti-obesity medications, and bariatric surgery, may help individuals lose weight and, consequently, lower their risks of severe COVID-19 infection.

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The time is now for policymakers to ensure all patients have access to the full range of anti-obesity services and treatments. In addition to reducing obesity and its many associated comorbidities, those therapies will help reduce the risk of severe COVID-19 infection and potentially reduce the risk of severe adverse outcomes resulting from future pandemics.

Appendix

Obesity Leads to Higher Risk of Hospitalization for COVID-19

Multiple studies have shown that obesity is a risk factor for COVID-19 hospital admission, with varying levels of correlation. Below, we briefly summarize 3 meta-analyses and studies documenting how obesity increases severe COVID-19 reactions. While not a full literature review, Xcenda conducted a thorough scan and incorporated the highest-quality studies into the model.

Supporting Studies

Lighter et al reported that "obesity appears to be a previously unrecognized risk factor for hospital admission and need for critical care."[9] The authors analyzed the results of 3,615 individuals who tested positive for COVID-19 and were either discharged from the emergency department, admitted to the hospital in acute care, or directly admitted or transferred to the ICU during admission.

They found significant differences in admission and ICU care only in patients less than 60 years of age with varying BMIs, as shown in **Table 3**.

Table 3. Increased Likelihood of Being Admitted to Acute Hospital Care or ICU, Compared to ED Discharge

Age	BMI	Comparative risk of admission to acute care (compared to ED discharge)	Comparative risk of ICU admission (compared to ED discharge)
Less than 60	30–34	200%	180%
	35+	220%	360%

Key: BMI – body mass index; ED – emergency department; ICU – intensive care unit.

Hamera et al also found that obesity was associated with higher odds of COVID-19 with severe symptoms requiring hospitalization, as shown in **Table 4**[10]:

Table 4. Increased Hospitalization Risk of COVID-19, by Obesity Classification

	Overweight	Obese	Morbidly obese
Increased hospitalization risk	118%	140%	190%

Kim et al analyzed data from 2,491 adults hospitalized with laboratory-confirmed COVID-19 during March 1 to May 2, 2020.[11] Half of the hospitalized patients had obesity; that underlying condition increased risk for ICU admission by 131%.

Obesity Also Leads to Higher Mortality Due to COVID-19

A number of studies have shown that patients who have overweight (ie, BMI greater than 25) or obesity (BMI greater than 30) have a much higher risk of dying from COVID-19. The following are summaries of a few studies demonstrating the link between obesity and higher mortality from COVID-19.

- A meta-analysis of 14 studies comprising 403,535 patients found that a BMI greater than 25 kg/m^2 increased the risk of mortality by 368%[12]
- A meta-analysis of 12 studies comprising 34,390 patients demonstrated that obesity was associated with a 155% greater risk of mortality[13]
- A French study aimed to describe the strength of association between obesity in patients hospitalized with COVID-19 and mortality.[14] It found mortality was significantly higher in people with obesity, after considering age groups, sex, smoking history, and comorbidities. The increased risks, compared to 18.5 to 25.0 kg/m^2 as the reference class, are listed in **Table 5**

Table 5. Increased Risk of Mortality from COVID-19, Based on BMI

BMI (kg/m^2)	30–35	35–40	40+
Increased mortality risk	189%	279%	255%

Key: BMI – body mass index.

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