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commentary: COVID-19 and Obesity: Exploring Biologic Vulnerabilities, Structural Disparities, and Weight Stigma

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Obesity has emerged as a risk factor for hospitalization, intensive care, and mortality among patients with COVID-19 [1–9]. These risk signals persist after adjusting for age, sex, and major comorbidities including diabetes and chronic cardiac, pulmonary, and kidney disease [1,2]. Given this evidence, the United States Centers for Disease Control and Prevention has highlighted obesity (BMI ≥ 30 kg/m²) as a risk factor for severe COVID-19 [10]. We explore multiple causative pathways by which obesity may worsen risk. Individuals with obesity face not only unique biologic vulnerabilities and structural disparities but also weight stigma that deepens health inequities in the face of a pandemic. Current evidence suggests three areas for greater attention to assure consistent and unbiased standards for care.

Biologic mechanisms of inflammation, immune dysfunction, and altered physiology have been proposed to explain the risk of severe COVID-19 among people with obesity [11–14]. Obesity induces a chronic pro-inflammatory state with upregulation of multiple cytokines [15,16]. Massive cytokine release has been implicated in severe COVID-19 [17]; researchers have noted higher levels of inflammatory markers such as C-reactive protein and D-dimer among hospitalized COVID-19 patients who experience critical illness or death [1]. In studies of influenza viruses, obesity has been linked to blunted antiviral response, prolonged viral shed, and resistance to effective vaccination [15,18]. During the 2009 H1N1 influenza pandemic, obesity was found an

independent risk factor for severe disease [19,20]. Excess body weight also restricts diaphragm movement, reduces functional lung capacity, and can contribute to hypoventilation [21]. Other pathophysiologic mechanisms that have been proposed and may link obesity to worse COVID-19 outcomes include Vitamin D insufficiency [22–24], expression of angiotensin-converting enzyme 2 in adipose tissue [12], the potential role of adipose tissue as a viral reservoir [25], and vascular endothelial dysfunction [12]. Despite a plethora of biologically plausible hypotheses, the specific and relative contributions of these mechanisms remain poorly defined.

Recent work has also highlighted the disproportionate burden of COVID-19 cases and deaths among people of color [26–28]. Rates of obesity and many of its comorbidities, including diabetes, are higher among Hispanic and African Americans and socioeconomically disadvantaged groups [29]. The disproportionate burden of obesity, in addition to occupational exposures, crowded living environments, and other inequities, likely contributes to racial/ethnic outcome disparities in the United States [30]. Similar disparities have been observed in the United Kingdom [31,32]. As obesity emerges as an independent risk factor for severe COVID-19 and is most prevalent among communities of color, it is another concerning layer of structural disadvantage.

These biologic and structural vulnerabilities, as identified in initial reports, suggest particular risk for the 42.4% of adults with obesity in the United States [33]. As we consider individual and societal risk factors, we must also assess the role of interpersonal bias and discrimination, including in the relationship between obesity and COVID-19. There has been minimal focus on weight stigma in the current pandemic, though weight bias exerts a prevalent, powerful effect in medical and public settings and is likely to impact COVID-19 epidemiology. Weight stigma can be defined as negative, prejudicial attitudes on the basis of body size; discrimination involves unequal treatment and biased behavior [34]. The prevalence of weight discrimination is estimated at 19–42% among adults with obesity; prevalence is higher among individuals with higher BMI [34]. Of adults in the United States with overweight and obesity, 40–50% experience internalized weight bias [34]. Weight bias is widespread among physicians, nurses, medical students, and other healthcare providers [34–36]. Patients with higher BMIs are more likely to be viewed as non-adherent to prescribed treatments [37]. Increased BMI has been associated with decreased utilization of healthcare, including lower rates of routine breast and

Abbreviations: COVID-19/coronavirus disease-2019; BMI/body mass index.

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gynecologic cancer screening exams as well as delays in presentation for care [38]. Researchers have reported 32% of women with obesity and 55% of women with severe obesity endorsed cancelling or delaying medical appointment(s) due to weight concerns [39]. These patterns have been measured most frequently in primary care but likely extend to other healthcare settings. A recent expert joint consensus statement highlights the wide-reaching harms of weight bias and historical shortcomings of related public health efforts [34].

The implications of weight stigma are particularly alarming in the context of COVID-19. Observed decreases in non-COVID hospitalizations indicate a general reluctance to seek even necessary medical care during this pandemic [40]. Individuals with obesity are especially likely to delay care, or avoid it completely, because of bias and humiliation experienced in healthcare settings [38]. As government guidance [10,41,42] and news sources [43–46] highlight obesity as a risk factor for severe COVID-19, people with obesity may differentially seek care due to heightened stigma or perceived personal vulnerability. When limiting transmission is a public health priority and delays in care can be deadly, it is more important than ever to understand and address how weight status affects who is (not) presenting for care. This knowledge is vital as numerous regions in the United States and around the world continue to suffer an initial peak in infections and hospitalizations, and as others brace for an anticipated second wave.

How medical stigma translates to inpatient COVID-19 care is unclear. We appreciate the concern raised that patients with stigmatized medical conditions, such as substance use disorder, are not prioritized if scarce medical resources need to be rationed [47]. Providers may alternatively expedite intensive care and other available treatments for patients with obesity based on an expectation of more severe symptoms. Treatment patterns by weight status deserve close attention.

Weight stigma and its cumulative sequelae are a prevalent and distinct vulnerability that interacts with biologic and structural risks for worse COVID-19 outcomes. Healthcare avoidance may act synergistically with any underlying biologic susceptibilities to critical illness and mortality among people with obesity. This point has been neglected in lay media and medical journals. The deleterious effect of weight bias falls disproportionately on the minority and socioeconomically disadvantaged groups most affected by obesity, structural barriers to health, racism, and other forms of discrimination. It therefore exacerbates inequities now painfully evident in COVID-19 cases and mortality. We identify three necessary responses.

First, further research is needed to quantify the impact of healthcare avoidance for COVID- and non-COVID-related medical needs. Patients with stigmatized medical conditions like obesity are at particular risk. Time from symptoms to presentation is one important measure of delayed care which has not entered published models of obesity, comorbidities, and COVID-19. Preliminary analyses of obesity and its comorbidities as risk factors for COVID-19 would also benefit from more comprehensive research integrating data on race, ethnicity, and socioeconomic disadvantage. The United Kingdom Office for National Statistics has included local area deprivation, educational attainment, and other census data in analyses of ethnic group differences in COVID-19 deaths [31]; a similar approach could be applied to investigations of obesity and COVID-19 outcomes. Inclusion of these variables may help parse biologic, structural, and stigmatic effects of obesity on outcomes.

Second, in words and actions, we must actively affirm the dignity of our patients. This is always important but perhaps most so at a time of heightened fear and uncertainty. Evidence-based risk communication must avoid reducing individuals to their medical conditions; respectful language (“person with obesity” rather than “obese person”) humanizes our patients [48]. Stigma can be uncomfortable to acknowledge and difficult to measure and address, but these difficulties do not diminish its significance. Where possible, we must identify and call out explicit and implicit bias in clinical settings. Stereotypes such as non-adherence or impulsiveness should be questioned. Weight-related humor has no place in healthcare.

Third, we must assess opportunities to redefine care. Telehealth has soared to minimize infectious exposures [49]. Virtual visits and digital health tools may be options for patients with obesity to receive care with less perceived stigma than during traditional in-person encounters. Though complex, direct measurement of perceived stigma and other psychological burdens during the pandemic can expose shortcomings of current practice and opportunities for patient support.

People with obesity are faced with a challenging set of overlapping vulnerabilities in the COVID-19 pandemic. As we clarify the contributions from biologic mechanisms and structural disparities on the relationship between obesity and COVID-19 outcomes, we must not neglect the effect of stigma and bias on treatment decisions and individual behavior. If we address these vulnerabilities actively and compassionately, together we step toward health equity. In the words of World Health Organization Director-General Tedros, “This is the time for solidarity, not stigma” [50]. Weight stigma is one missing link between obesity and risk of severe COVID-19 that warrants closer attention in research and practice.

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