


# Obesity and COVID-19 in Latin America: A tragedy of two pandemics—Official document of the Latin American Federation of Obesity Societies

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## Summary

In May 2020, Latin America became the epicenter of the COVID-19 pandemic, a region already afflicted by social disparities, poor healthcare access, inadequate nutrition and a large prevalence of noncommunicable chronic diseases. Obesity and its comorbidities are increasingly prevalent in Latin America, with a more rapid growth in individuals with lower income, and currently a disease associated with COVID-19 severity, complications and death. In this document, the Latin American Association of Obesity Societies and collaborators present a review of the burden of two pandemics in Latin America, discuss possible mechanisms that explain their relationship with each other and provide public health and individual recommendations, as well as questions for future studies.

## KEYWORDS

COVID-19, Latin America, obesity, pandemic

## 1 | INTRODUCTION

The COVID-19 pandemic struck the world in 2020, leading to an unprecedented health, political and economic crisis with long-lasting consequences that will likely influence our ways of living for decades.<sup>1</sup> While the epidemic started in Asia, the epicenter of the pandemic moved gradually to Europe and North America. During June and July, it expanded into Latin America (LA).<sup>2</sup> In August, Brazil, Mexico, Peru, Colombia and Chile were among the 10 countries with the most confirmed cases in the world, with still growing numbers. The harsh socioeconomic conditions and disparities of LA countries will have profound effects on the overall consequences of the epidemic, including the fatality rates of the virus as well as a likely increase in indirect deaths.<sup>3,4</sup> A still underappreciated issue affecting COVID-19 in LA is obesity and metabolic diseases. There is evidence of an increased risk of severity of COVID-19 in those with a body mass index (BMI) over 30 kg/m<sup>2</sup>, as well as those with diabetes and other chronic diseases.<sup>5-7</sup> According to current evidence, individuals with obesity have an increased risk of hospitalization, increased need for intensive care and increased risk of death.<sup>5-10</sup> LA has some of the highest rates of obesity and diabetes in the world, and although it probably still affects more people with higher sociodemographic positions, the rate of increase is higher in those with lower income, which are already at increased risk of complications due to poor healthcare access. This could potentiate the fatal consequences of the virus in the region, intensified even more so by socioeconomic inequalities.<sup>11,12</sup> This document produced by the Latin American Federation of Obesity Societies (FLASO) and collaborators aims to highlight the potential risks of this clash of pandemics, highlighting the need to increase surveillance and prevention among vulnerable individuals.

## 2 | OBESITY IN LA

In a consensus statement in 2016, FLASO compiled the most recent data on obesity prevalence from all countries in LA.<sup>13</sup> Three countries (Bolivia, Mexico and Guatemala) were at the higher end, each with a prevalence above 30%.<sup>13</sup> Ecuador had the lowest prevalence of obesity (14.2%), although recent reports indicate higher levels in this country, similar to those in neighbouring countries.<sup>14</sup> Obesity and specifically increased waist circumference (WC) is a risk factor for several diseases and is postulated to mediate COVID-19 severity.<sup>15,16</sup> In recent decades, the mean global increase in WC surpassed the global increase in obesity rates.<sup>17</sup> Recently, researchers from Mexico, El Salvador, Venezuela, Colombia and Paraguay have proposed WC cutoffs of 94 cm for men and 90 cm for women in LA.<sup>18</sup>

The prevalence of obesity in LA is increasing at a faster rate than in the rest of the world and even more so in individuals with lower incomes.<sup>11,12</sup> Data presented by the Non-Communicable Disease (NCD) Risk Factor Collaboration also demonstrates a more rapid increase in obesity in children and adolescents than in adults; nevertheless, the increase in prevalence in the last decades has affected all

age groups.<sup>11</sup> The most dramatic rise was observed in girls in Central America (over 1 kg/m<sup>2</sup> of BMI increase per decade).

The transition from a predominantly underweight population to an overweight and obese one has been particularly rapid in LA; this is probably associated with changes in food systems and living environments characterized by increased availability, accessibility and affordability of ultraprocessed foods, which deteriorates overall nutritional dietary quality and promotes excessive energy intake.<sup>13,19-21</sup> The concept of ultraprocessed foods was proposed within the NOVA classification system one decade ago, which assigns a classification to food according to the extent and purpose of the industrial processing.<sup>20</sup> The relevance of the NOVA classification is increasingly recognized and, in recent years, has been addressed in the recommendations and guidelines of several international entities, such as the United Nations Food and Agriculture Organization and the Pan American Public Health Organization. A recent controlled study suggested that, even when controlling for total caloric and macronutrient content, ultraprocessing favours overconsumption of calories and weight gain.<sup>21</sup> Obesity is a major risk factor for several chronic diseases, such as type 2 diabetes (T2D), cardiovascular disease (CVD), stroke and cancer.<sup>22,23</sup> Infectious diseases (some of them endemic to LA) can be aggravated by these conditions.<sup>24</sup>

During the pandemic, disruptions in food supply chains and panic buying (due to lockdown fears) may have limited access to fresh foods, tilting the balance towards a greater consumption of ultraprocessed foods and other foods with long shelf lives, which are usually high in salt, sugar and saturated fat. Two Brazilian studies found this to be more evident in less economically developed regions and in those with less education<sup>25,26</sup> A web survey found that the increase in ultraprocessed food consumption during the pandemic was more pronounced in LA (Brazil, Argentina, Colombia and Chile) than in Europe.<sup>27</sup> In a Chilean survey, the increase in fried food consumption was positively associated with weight gain during confinement.<sup>28</sup>

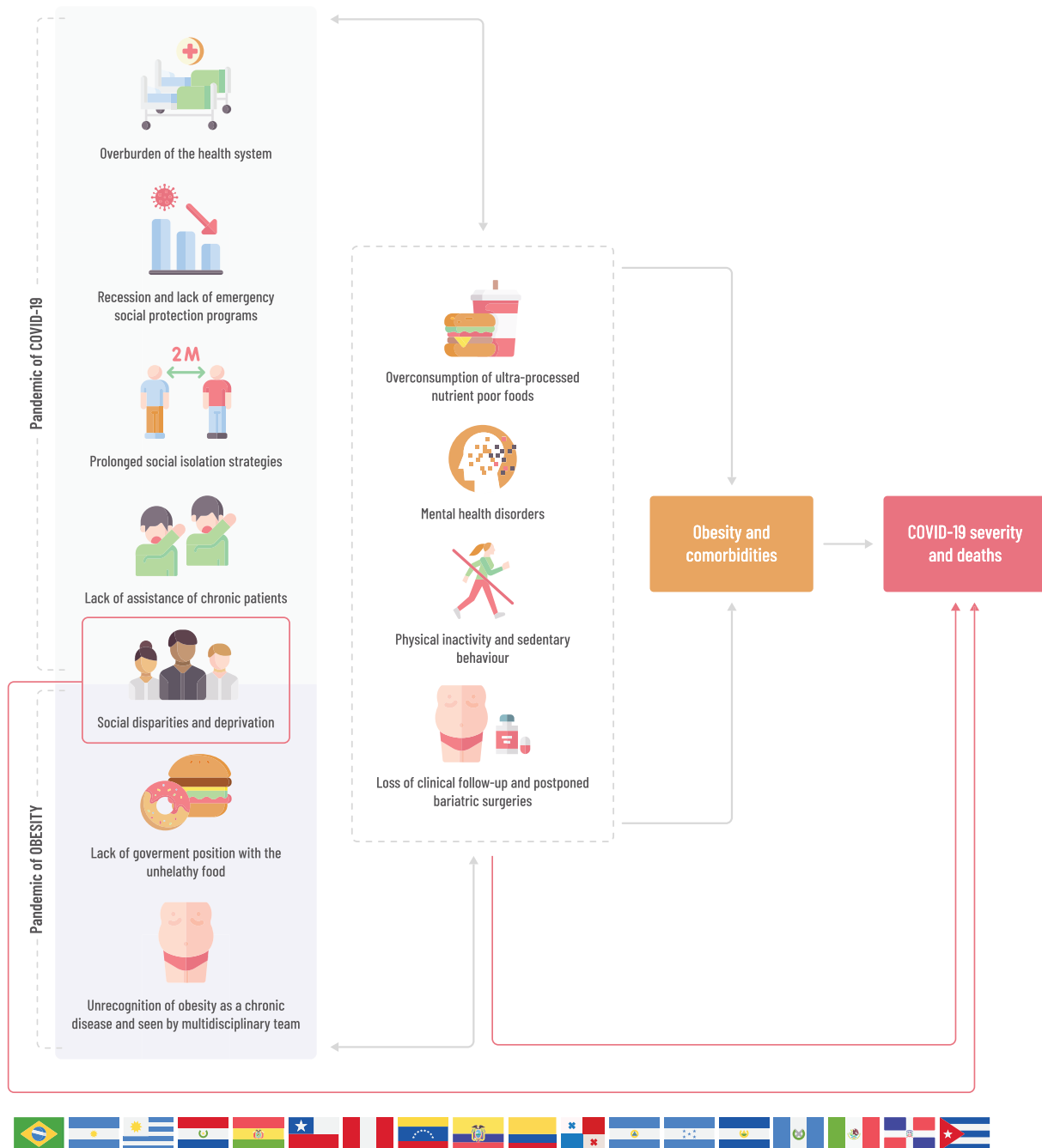
## 3 | COVID-19 IN LA

COVID-19 has greatly impacted LA, after first affecting China and other Asian countries and then Europe and North America. Upon reaching LA, the epidemic started its growth in a region where socioeconomic disparities are markedly evident.<sup>3,4,29-31</sup> The first case was detected in Brazil on February 26, 2020. Increases in the region continued slowly during March but increased steadily thereafter, with the further collapse of health and funeral systems in some regions, such as Guayas province in Ecuador. Brazil rapidly became the country with the second highest absolute number of confirmed cases and deaths.<sup>31</sup> Mexico also saw a steep rise in cases and assumed the third place in terms of number of deaths in early August. Chile, Peru and Colombia were, in August 2020, also within the top 10 countries with the most cases. In May 2020, the World Health Organization (WHO) declared LA as the new epicenter of the disease. Some countries, however, due to a hard policy of social distancing and closed borders, had a much milder burden in the first months, as Costa Rica, Paraguay and Uruguay, but it has not

lasted. The region has also been affected by mixed responses due to heterogeneous political stances, policies, testing deployment and sustained voluntary and involuntary errors in reporting and recording of cases.<sup>30</sup> This led to a spreading underdiagnosis of cases and deaths in the region, due to poor testing rates, poor-quality death certificates, low system integration and political reasons.<sup>3</sup> The fatality rate varies tremendously among countries and is related to different criteria for testing and as a consequence of different levels of underdiagnosis.<sup>2,5,30</sup> In this context, excess deaths could be a useful tool for the overall burden of the pandemics. Using this measurement, Peru was the most

affected country, with 149% excess deaths in the period, followed by Ecuador (117%).<sup>31</sup> Demographic characteristics certainly play a direct role, including age distribution, access to healthcare, economic insecurity, habitational density and percentage of comorbidities.<sup>5,30,32</sup> In this context, the burden of obesity and metabolic diseases can indeed be very high and associated with poor nutritional status, but it is difficult to isolate and adjust for these causes, especially as the pandemic spreads and numbers change daily.<sup>31,33,34</sup>

Ethnic and regional factors have been identified as strong prognostic factors.<sup>34</sup> In a Brazilian study, Pardo and Black



\*those flags represents FLASO members and not Latin America as a whole

**FIGURE 1** The complex relationship of social disparities, social distancing, obesity and COVID-19

populations, as well as inhabitants of North Brazil were found to have higher mortality rates. The authors speculate that despite differential access to public healthcare, comorbidities can play a role, and those who died had higher rates of obesity compared with survivors (77.6% vs. 22.4%). Alarmingly, in the United States (US), those of Hispanic origin have a fourfold higher risk of hospitalization.<sup>32</sup> Socioeconomic disparities and food insecurity, rather than race, contribute more to this imbalance.<sup>35</sup> Nonetheless, a large proportion of individuals in LA have a similar or worse socioeconomic condition, access to healthcare and nutrition compared with the US Hispanic population.<sup>32</sup> In this context, social determinants of health contribute to obesity and to COVID-19 severity, and obesity contributes to COVID-19 severity in turn (Figure 1). Ethnic minorities facing deprivation, like indigenous communities may face the same problem during epidemics and poor nutritional status and obesity often coexist.<sup>36</sup>

#### 4 | OBESITY AND COVID-19: EPIDEMIOLOGICAL DATA

Obesity has consistently been associated with increased COVID-19 severity, hospitalization rates and mortality, although the magnitude of the relationship is still unclear as data are heterogeneous due to different study protocols and populations.<sup>5-7</sup>

A study of 16,000 patients in the United Kingdom (UK) reported a hazard ratio (HR) of 1.33 for death in individuals with obesity.<sup>37</sup> However, it used a dichotomous variable (yes/no), without evaluating the degree of obesity, and it relied on clinical diagnosis and not direct measures of weight and height.

The much larger OpenSAFELY study examined more than 10,000 deaths in the UK and compared them with over 17 million people from the UK Biobank. Obesity was divided according to BMI: a BMI of 30–35, 35–40 and over 40 kg/m<sup>2</sup> was associated with a 1.23-, 1.81- and 2.66-fold increased risk of death,<sup>5</sup> respectively, confirming a gradient response. Among the diseases associated with metabolic syndrome, hypertension was not associated with an increased risk of death (in contrast to early reports), but diabetes was (HbA1c < 7.5%, HR 1.58; >7.5%, HR 2.61). Chronic heart disease was also associated with increased risk (HR 1.57) but was notably inferior to the risk associated with severe obesity.

The Kaiser Permanente health system analysed data from over 6,000 patients with COVID-19 in California and found that obesity had a profound effect on mortality.<sup>35</sup> There was a J-shaped curve of BMI and mortality (adjusted for comorbidities), with the most significant risks being found in those with BMI over 40 kg/m<sup>2</sup> (HR 2.68) and 45 kg/m<sup>2</sup> (HR 4.18). The importance of this study was in the subgroup analysis: The impact of obesity was significant in men, but not in women. This sex effect has already been described in a Chinese study (a fivefold increase in risk for those with BMI over 28 kg/m<sup>2</sup> in men and no increase in women) and is probably related to an increased risk of central adiposity and inflammation in males compared with females.<sup>38,39</sup>

Obesity also increases the risk of hospitalization. In 5,000 patients in a New York City hospital, BMIs over 30 and 40 kg/m<sup>2</sup> were associated with a 1.8- and 2.45-fold increased risk, respectively, after adjusting for comorbidities, including pulmonary disease and CVD.<sup>40</sup>

A recent review and meta-analysis by Popkin et al. summarized all the evidence in regard to this relationship.<sup>41</sup> Interestingly, obesity was associated with a 1.46 higher rate of testing positive for COVID-19. Whether obesity leads to a higher susceptibility or there is selection bias is a matter of debate. Obesity was also associated with a higher rate of hospitalizations (2.13), being placed on ICU (1.74), need for mechanical ventilation (1.66) and mortality (1.48).

The data from LA come from smaller and less-controlled studies, and overall, the evidence is similar to what has been observed in the rest of the world.<sup>42-44</sup>

The impact of obesity can be even higher in patients under 60 years of age, a population that poses an overall reduced risk of complications compared with older individuals.<sup>45,46</sup>

A study from New York City found that in those >60 years of age, obesity was not associated with increased admission to ICUs, but in those <60 years of age, a BMI over 30 doubled the risk.<sup>43</sup> A letter published in *Lancet* observed a similar pattern and proposed that 'obesity shifts severe COVID-19 to younger ages.'<sup>45</sup> A more than fivefold increase in mortality in those younger than 50 years was observed in those with severe obesity (>40 kg/m<sup>2</sup>).<sup>47</sup> In the recently published analysis by Kaiser Permanente, a similar pattern was observed: in individuals younger than 60 years, a BMI over 40 kg/m<sup>2</sup> was associated with a 17-fold risk of death, whereas in those over 60 years, the effect size was modest (HR 1.25 over 40 kg/m<sup>2</sup> or HR 3.03 over 45 kg/m<sup>2</sup>).<sup>35</sup>

In LA, several countries (such as Paraguay, Brazil, Argentina, Guatemala and Panama) presented a significant proportion of COVID-19 cases in those under 20 years of age.<sup>48</sup> Although children and adolescents pose a reduced risk of complications due to COVID-19, some studies have shown that obesity was a major factor associated with poor prognosis in these individuals.<sup>48-50</sup> In the US, 61% of hospitalized children presented other comorbidities; obesity, asthma and neurologic diseases were the most frequent.<sup>48</sup> In a report from NYC, 22% of hospitalized children had obesity, and obesity was diagnosed in 67% of children that required mechanical ventilation.<sup>49</sup> In another report including 14 US states, obesity was present in 37% of hospitalized children.<sup>50</sup> This is an important alert because childhood and adolescence obesity rates are high in LA, particularly among those with lower income and socioeconomic status is associated with poor prognosis as well, as already mentioned.<sup>11,32,41,48</sup> It also remains to be determined if interactions with other infectious diseases, like tuberculosis, dengue and malaria—common in LA—can impact COVID-19 severity in younger ages.<sup>24,48</sup>

There are several reasons for the differential response in younger and older individuals: Age is the most important risk factor for COVID-19 severity, and the number of individuals with obesity decreases gradually as age increases, due to survival bias, as obesity is associated with a reduction in life expectancy.<sup>22,23,51</sup> Furthermore, many observational data rely on medical records and not on direct anthropometric measures (direct weight and height measures are

rarely performed in a hospital setting).<sup>7</sup> In individuals with higher comorbidity rates, obesity is commonly omitted in the medical record and is reported only in individuals with very high BMIs or in those without comorbidities.<sup>52</sup> In this context, the overall burden of obesity is likely underestimated if whole population data are considered, and it would be useful to analyse obesity as a risk factor adjusted for age and probably for sex.

In addition to obesity per se, ectopic fat distribution is associated with increased risks.<sup>7</sup> Ectopic fat deposition, including abdominal obesity, and nonalcoholic fatty liver disease (NAFLD) are components of metabolic syndrome and associated to insulin resistance (IR).<sup>17,53,54</sup> A proof-of-concept study used low-dose chest computed tomography in hospitalized patients and observed that every 10-cm<sup>2</sup> increase in visceral fat was associated with a 1.37-fold higher likelihood of ICU treatment and a 1.32-fold higher likelihood of mechanical ventilation, and for each additional centimetre of upper abdominal circumference, there was a 1.13- and 1.25-fold increased risk of ICU treatment and mechanical ventilation, respectively.<sup>16</sup> One Italian study found an even higher (2.474-fold) increased need for increased intensive care in those with larger visceral fat areas.<sup>15</sup> The triglyceride and glucose index (TyG), a marker of metabolic syndrome, was also significantly associated with an almost threefold increased risk of severe disease.<sup>55</sup>

A retrospective study reported that increased alanine aminotransferase (ALT) and aspartate aminotransferase (AST) were also associated with poor outcomes in younger individuals (less than 40 years) regardless of BMI, suggesting a role of liver fat deposition.<sup>56</sup> As such, the large proportion of individuals with increased WC and nonalcoholic hepatic liver disease (NAFLD) in LA is concerning,<sup>17,18,57,58</sup> as well as the overall pattern of food consumption, which can directly influence IR.<sup>57</sup>

Another point of concern is a poor vaccinal response in individuals with obesity.<sup>41,59</sup> As the impact of the pandemics is enormous, there has been a rush for the development of efficacious vaccines that could halt the spread of the virus and end the crisis. As such, efforts have been made to decrease the time from vaccine development to its utilization in a widespread population. Rushing this process can lead to several gaps as different immune responses to vaccination could impact its clinical utility. There have been several studies with different viral vaccines, including hepatitis A, hepatitis B, rabies and most importantly, influenza, which shows an impaired immune response in individuals with obesity.<sup>59</sup>

## 5 | OBESITY AND COVID-19: PROPOSED MECHANISMS

The relationship between obesity and COVID-19 severity is not unexpected, because obesity is related to the severity of several other respiratory infectious diseases and poor vaccinal response.<sup>59,60</sup> Obesity is associated with several comorbidities (T2D, CVD, heart failure, hypertension and obstructive sleep apnoea)<sup>22,51</sup> that are also associated with the severity of COVID-19 and other respiratory diseases.<sup>5,24,61</sup> However, obesity seems to be a risk factor even after adjustment.<sup>5,62</sup> In the CORONADO study, which investigated risk

factors for COVID-19 in individuals with T2D,<sup>62</sup> only BMI was associated with the primary outcome (death or tracheal intubation within 7 days of admission; odds ratio 1.28) after multivariate analysis. In this regard, obesity not only increases the risk of T2D, but also, in individuals with T2D, those with higher BMIs have higher complication rates.

Proposed mechanisms linking obesity with COVID-19 severity have been discussed in different reviews.<sup>7-9,53,63</sup> Increased inflammation with abnormal cytokine production is one of the most cited mechanisms, as well as abnormal complement production and a possible reduction in the activity of processes that inhibit acute inflammation.<sup>7,63</sup> An increased risk of thrombosis likely plays a role as well.<sup>7,8</sup> Several reviews proposed that IR due to ectopic fat deposition is more relevant than weight per se, as individually, people can have IR with very different BMIs, and this hypothesis is strengthened by epidemiological data.<sup>7,53-56</sup>

Ventilatory dysfunction can be a consequence of obesity as well, and there are practical difficulties (e.g., prone position and orotracheal intubation) in ICUs when managing patients with severe obesity that can also affect prognosis.<sup>9</sup>

Nutritional factors can directly influence infection severity.<sup>64,65</sup> Micronutrient deficiencies are common in individuals with obesity, particularly in those with lower incomes and those living in food-insecure environments.<sup>66,67</sup> Excessive consumption of trans-fatty acids and saturated fats could also increase low-grade inflammation, as well as excessive consumption of simple carbohydrates.<sup>68,69</sup>

## 6 | PUBLIC HEALTH POLICIES FOR OBESITY DURING AND AFTER THE PANDEMICS: IS IT FEASIBLE?

During the past decades, researchers have proposed a range of interventions to reduce obesity.<sup>66,70</sup> Nevertheless, no successes in major populations have been shown.<sup>71</sup> With the appearance of COVID-19, the world is witnessing a 'clash of two pandemics'.<sup>7,66</sup> Recognizing obesity as a risk factor for COVID-19 is important to inform public policies and poses a challenge in implementing sanitary measures to stop viral spread. Considering the enormous social inequalities in LA countries and the evidence that both the severity of COVID-19 and the health consequences of obesity are disproportionately worse in marginalized groups, such as poor, Black and indigenous populations, comprehensive interventions with increased focus on health inequalities that address the social determinants of health and structural racism are imperative. At the same time, at the individual level, obesity is highly stigmatized, underdiagnosed and undertreated.<sup>72,73</sup>

Because governments and institutions have been trying to reduce the burden of obesity for decades with little progress, accomplishing this clearly will not be possible on a short-term basis. It is likely that only dramatic changes in terms of food availability, recommendations, subsidies and overall improvements in lifestyle could have meaningful impacts in the short, mid and especially long term.<sup>22,66,74</sup>

However, recognizing obesity as a risk factor for COVID-19 is important for government advice regarding social isolation and work

conditions for those with increased risks.<sup>75,76</sup> The US Centers for Disease Control (CDC) first considered only those with a BMI over 40 as a risk factor but later changed to over 30 kg/m<sup>2</sup>. In this context, 20%–30% of the population would be considered at increased risk only due to their BMIs, and it is nearly impossible to impose differential restrictive measures for those with or without obesity.<sup>11</sup> Because epidemics evolve heterogeneously among regions, it is not our aim to provide specific recommendations regarding social distancing or work and travel restrictions for those with obesity, but to urge the importance of recognizing this significant segment of society that can be at increased risk, for both policymakers and the population in general.

Another point of concern is the risk of increased weight gain during social isolation and quarantine.<sup>28,77</sup> It is of particular importance that each country provides specific guidance on public-space exercises and facilitates guided home exercise. The failure to do so can lead to dubious public messages, in which physical activity (PA) is recommended to reduce risks, but at the same time, should be avoided due to increased risks of infections. In LA, public spaces for PA without close physical contact are less frequent, especially in poorer areas.<sup>78</sup> This can lead to a decrease in PA, a predisposition to weight gain and worsening of related conditions.

However, a French commentary suggested that COVID-19 may be an opportunity to increase awareness of the importance of recognizing obesity as a disease beyond the duration of the pandemics.<sup>75</sup> The authors describe a series of health policies focused on individuals with obesity in France. The UK also launched a campaign to tackle obesity; however, there are several critiques as it focuses on the individual rather than on public policies.<sup>74,76</sup>

In Asia, the regional directors of four important agencies, Food and Agriculture Organization (FAO), World Food Programme (WFP), WHO and United Nations Children's Fund (UNICEF), launched a Joint Statement on Nutrition in the context of the COVID-19 pandemic, focusing not only on overweight and obesity but also on undernutrition as well. This could be a guide for future documents much beyond the pandemic itself.<sup>79</sup>

Increasing evidence, endorsed by international organizations, indicates that intersectoral and continuous actions are the best interventions to prevent obesity.<sup>66,70</sup> These include fiscal and regulatory measures, as well as educational interventions.

Consistent evidence indicates that taxation of ultraprocessed foods can improve diet quality and decrease the risk of obesity.<sup>80</sup> Some LA countries (Chile, Mexico and Peru) have implemented taxes on ultraprocessed foods, mostly on sugar-sweetened beverages. In 2014, the Mexican government started a 10% tax on sugary drinks and 8% on high energy-dense nonessential foods. Two years later, purchases of taxed beverages decreased by 7.6% and that of high energy-dense foods by 6%.<sup>81</sup> During the pandemic, tax revenues could be reverted to food insecurity programmes.

A combination of these strategies with subsidies to healthy foods seems viable. There is strong evidence that subsidies for fruits and vegetables (10%–30% price reduction) are effective in increasing their consumption.<sup>82</sup> During the COVID-19 pandemic, subsidies to local agriculture and encouragement of short food

supply chains are even more necessary to avoid a possible shortage of healthy foods.

Food advertising to children should also be restricted. A ban on television advertisements for foods high in fat, sugar and/or sodium could reduce childhood obesity by 18%.<sup>83</sup> Since the start of the pandemic, the food industry has stepped up some marketing strategies and launched campaigns and corporate social responsibility initiatives, often with thinly veiled tactics using the outbreak as a marketing opportunity (for example, by offering 'donut smiles' to US healthcare workers or promoting hashtags and social media campaigns, as seen in Mexico).<sup>84,85</sup>

Labels of ultraprocessed foods should favour the ability to choose healthier options and include prominent warnings. In LA, however, labelling is inadequate: They are based on lists of nutrients and are difficult to interpret. Chile was innovative in implementing a food-labelling regulation and other countries, as Mexico, will hopefully follow its example.<sup>86</sup> Messages like 'high in sugar' appear on the front labels which has influenced the population's purchasing profile.<sup>86,87</sup>

School-based policies are likely to have prominent long-term effects on obesity prevention. The Brazilian National School Feeding Program is often presented as an example, as its guidelines encourage the consumption of fruits and vegetables, prohibit the purchase of sugary drinks, limit the purchase of ultraprocessed food and require that 30% of purchases are made from family farmers.<sup>88</sup> The closing of schools amidst the pandemic has led to the interruption of the distribution of school meals, and this should be assessed. In Chile, more vulnerable families receive a weekly menu for their children; in Argentina, the government distributes coupons to families; in Brazil, food kits for the socially vulnerable are distributed in some municipalities.

Dietary guidelines are important instruments of communication and education. Official dietary guidelines from LA countries such as Brazil, Uruguay, Ecuador and Peru were extremely innovative as all of which recommend freshly prepared meals and avoidance of ultraprocessed foods. The WHO has published a document with guidelines for healthy eating during quarantine, which also recommends the consumption of fresh foods and the avoidance of ultraprocessed foods, with useful tips for planning and preparing food.<sup>89</sup>

**TABLE 1** Recommendations regarding recognition of obesity as a disease by health authorities and the inclusion of obesity as a mandatory discipline for health professionals

Promote recognition of obesity as a chronic disease in both official body in each country, as well as private medical insurance services

Invoking regional governments to consider obesity and cardiometabolic disease (diabetes, hypertension, coronary artery disease) a priority public health problem and to establish national strategies for prevention and treatment

Encourage medical schools to include obesity as mandatory in their regular curriculum

Conduct courses and training for health professionals who work with people with obesity

Encourage the implementation of training courses for doctors to prescribe exercise as a fundamental part of medical treatment

**TABLE 2** Public health-related and clinical recommendations to address obesity during the pandemic of COVID-19

Public health-related recommendations		Clinical recommendations	
Recommendation	Strength of recommendation (based on author's opinion)	Recommendation	Strength of recommendation (based on author's opinion)
Taxes on sugar-sweetened beverages (potentially also on other ultraprocessed foods). During the pandemic of COVID-19, the tax revenues could be used in food security programs	Strong	Avoidance of weight gain by all means	Strong
Tax subsidies for fruits and vegetables (potentially also for other healthy foods). During the pandemic of the COVID-19, subsidies to local agriculture may be necessary to avoid a possible shortage of healthy food for the population	Strong if combined with taxes on ultraprocessed foods	Achievement of at least a modest weight loss (3%–5%) in those individuals with obesity	Strong
Restriction of ultraprocessed food marketing to children (potentially a broader restriction of ultraprocessed food marketing)	Strong	Individualized dietary counselling in order to achieve modest weight loss. It should be based on personal, social and cultural differences	Strong
Mandatory front-of-pack nutrition warning labelling (potentially also for food delivery options)	Strong	Continuous dietary and/or pharmacological treatments for individuals with obesity in order to maintain the metabolic benefits of treatment	Strong
Healthy school meals should be guaranteed despite classes interruption due to pandemic of COVID-19	Weak	Maximized efforts to reach and maintain good metabolic control in individuals with comorbidities associated to obesity such as diabetes and hypertension in order to reduce the complications of COVID-19	Strong
Multidisciplinary, evidence-based treatment of obesity should be offered by the public health authorities. It should include antiobesity medications and bariatric surgery	Strong	Telemedicine to keep the patient's contact with health professionals	Strong
Mass media health promotion campaigns	Strong	Physical activity, independent of their effects on weight, to maintain or improve cardiorespiratory fitness and reduce inflammation. However, local restrictions of social isolation should be respected. Exercise can be done at home guided by apps or social media such as dancing, workouts, yoga, resistance training	Strong
		Reduced sitting-time while at-home by encouraging short bouts of walking or standing	Strong

## 7 | IS IT POSSIBLE TO INDIVIDUALLY REDUCE THE BURDEN OF OBESITY ON COVID-19 SEVERITY?

In a scenario where a large part of the population already has obesity and where public health policies, even if fully implemented, are not able to quickly reduce the prevalence of obesity, interventions with the objective of reducing the burden of chronic diseases are equally important. Strengthening health services, particularly primary care, is important to provide adequate health counselling and access to healthcare.<sup>90</sup> The pandemic, however, has caused an overburden and consequent reorganization of flow in health services and has imposed the need to rethink treatment options, using strategies such as telemedicine.<sup>91–93</sup>

In the past, FLASO has issued several documents regarding the importance of offering evidence-based obesity treatments in primary care. One of them was the 'Recife Declaration', which received the seal of the World Obesity Federation.<sup>94</sup> Among the recommendations, several aimed to increase obesity education for general health professionals. Some of these recommendations that should be highlighted during the pandemic are described in Table 1.

It is particularly important for governments to provide access for evidence-based, multidisciplinary obesity treatments and follow-up in primary care settings. Overall, nonspecific dietary recommendations without proper guidance are not associated with clinically relevant weight loss and can lead to even more stigma.<sup>22,72</sup> To train medical doctors in the correct prescription of antiobesity medications, which are still highly stigmatized, as well as to correctly indicate and provide access to bariatric surgery, an evidence-based strategy associated with reduced morbidity and mortality is crucial.<sup>22,23,73,95</sup> Recently, there has been discussion of the importance of stratifying possible candidates for bariatric surgery during and after the pandemic in order to offer expedited or standard access to patients depending on their baseline comorbidities.<sup>95</sup> We recognize the importance of this statement and also believe that the same should be done with regard to clinical treatment. BMI may not be the best way to stratify those who should receive priority of care and focus should be given to those with higher health burdens.<sup>23</sup> We believe that, as the pandemic comes under control or comes to an end, expedited access for obesity treatment should be provided for those with more severe comorbidities and disabilities.

In Table 2, we summarize several additional recommendations by FLASO, represented by this group of authors.

As the current pandemic is a humanitarian crisis of recent commencement and continuous development, the evidence available is still scarce, though growing at a rapid pace. Many of the recommendations and statements provided in this document are therefore based on the limited evidence available, deriving from previous literature in fields that expand beyond the current pandemic and the knowledge of the experts gathered in the preparation of this manuscript, while considering strictly the biological plausibility and clinical value of the recommendations. They are simple and clear messages that can be communicated, supported and widely spread.

As a chronic disease, obesity cannot be reversed in the short term and many have pointed out that awareness of the relationship between obesity and COVID-19 severity can lead to fear and panic.<sup>74–76</sup> However, there is evidence that modest weight loss can lead to several health benefits.<sup>96,97</sup> This evidence regarding reduced severity of infection is almost nonexistent, but biological plausibility exists. In a recent review, Lockhart and O'Rahilly suggest that IR is a major driver of increased risk, and if true, modest weight loss can improve it within days.<sup>7</sup> The concept of 'controlled obesity' could be a simple message as well amidst the pandemic and beyond.<sup>97</sup> We are aware, however, that even modest weight losses can be difficult to achieve, and the main focus is to inform that the absolute increase in risk posed by obesity can be at least partially modifiable.

Greater weight losses (11%–16%) can reduce inflammation and would probably have further clinical benefits,<sup>96,97</sup> but this is hard to achieve without proper treatment, and the implementation of a multidisciplinary approach and telemedicine access should be provided to those who seek clinical advice. On the other hand, those patients who have already achieved significant weight loss in the past and are successful maintainers (including those who underwent bariatric surgery) could be reassured that their risk is likely lower at their reduced body weight and that they should continue their efforts in weight maintenance.<sup>90</sup> Otherwise, weight regain can cancel the overall benefit of treatment.

PA should also be encouraged as it can reduce inflammation due to a shift in cytokine production.<sup>98</sup> Furthermore, PA can improve cardiometabolic fitness, which is associated with reduced overall health risks, including hospitalization due to pulmonary infections.<sup>98,99</sup> The overall benefits of PA are partially weight-independent and PA levels are associated with overall survival in individuals with obesity.<sup>100</sup> Sedentary time is also an independent marker of increased health risk (even in those physically active), and due to the high risk of sedentary behaviour during social isolation, recommendations for interrupting sitting time throughout the day can be useful.<sup>101</sup>

**TABLE 3** Unanswered question that we propose to be assessed in clinical trials

1. Is there a role of a weight loss diet for the prevention and treatment for COVID-19?
2. Since obesity can be associated with micronutrient and vitamin deficiencies, diagnosis and treatment of them would impact the severity of infection?
3. Since a high intake of saturated and trans fatty acids (SFA, TSA) induces lipotoxicity, inflammation and the activation of the innate immune system, would replace SFA and TFA for polyunsaturated/monounsaturated fatty acids may protect against the infection?
4. How psychological support may help subjects with obesity, a population more vulnerable to the psychological consequences of the distress and isolation?
5. Is it possible to intervene in sleep time and sleep problems during home confinement due to the COVID-19 outbreak?
6. Is there any intervention (e.g., promoting of exercise videos and/or apps) that can help to reduce sedentary time and promote physical activity during the pandemic?



Several other questions emerge regarding food quality, psychological health and effective ways to encourage PA<sup>64,65,97,102-104</sup>, some of them are listed in Table 3.

## 8 | CONCLUSION

COVID-19 has had a tremendous impact on healthcare systems around the world, and it will likely have a social impact for decades. Low-income countries, such as those in LA, tend to suffer more due to difficulties in implementing social distancing measures, difficulties in providing high quality healthcare facilities and economic burdens. Obesity is a common disease in LA. It is particularly associated with poor-quality diets in those with the lowest incomes and is associated with COVID-19 severity and risk of death, which only increases the chaotic scenario observed in our region. This document aimed to discuss the complex and interconnected relationship of social disparities, obesity and COVID-19 severity. We also proposed public health recommendations to try to reduce the burden of obesity, which is also important beyond the discussion of COVID-19. We also proposed individual recommendations that we believe can have a positive impact, as well as questions and proposals for further studies.

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