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REVIEW ARTICLE

# A Review of Racial and Ethnic Disparities in Obesity Treatment

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## ABSTRACT

This paper examines disparities in obesity treatment and their implications for health equity. A comprehensive literature review was performed using Pubmed, Medline, and Google Scholar to identify studies examining obesity treatment options that reported data on African Americans, Asians, Hispanics, and Caucasians. These studies, published from 2000 to 2022, revealed disparities in behavioral/lifestyle, surgical, and pharmacological interventions for obesity. While a majority of behavioral/lifestyle and surgical treatment studies found disparities in weight loss and clinical outcomes, pharmacological studies found minimal to no evidence of disparities or favorable outcomes for racial and ethnic minorities for weight and cardiometabolic outcomes. All treatment pathways showed disparities in referral rates, access, and engagement/retention. These findings underscore the urgent need to incorporate obesity treatment as a central component in strategies addressing health inequities. By understanding and addressing these disparities, healthcare equity can be improved, ensuring a more inclusive approach to obesity management.

**Keywords:** obesity, racial disparities, obesity treatment, weight loss, bariatric surgery, obesity medications

## Introduction

The COVID-19 pandemic shed light on stark differences in morbidity and mortality amongst those struggling with obesity. People with obesity have been found to have three times the risk of hospitalization due to COVID-19 and a significant association with worse outcomes.<sup>1-2</sup> Obesity has also been shown to be a large mediator of ethnic and racial disparities. Well-established data shows that minorities are more likely to have obesity than their Caucasian counterparts with African Americans and Hispanics having a 15-30% higher prevalence of obesity in adult populations.<sup>3</sup> These trends are amplified when stratifying by sex – 54.8% of African American women and 50.6% of Hispanic women are categorized as having obesity compared to 38.0% for Caucasian women.<sup>4</sup>

Despite a significant amount of research showing the association of obesity with racial and ethnic disparities, there have been less efforts to understand disparities and inequalities when it comes to obesity treatment as documented in 2018 by Byrd et al.<sup>5</sup> In their review, they found that ethnic and racial minorities had reduced treatment response to lifestyle, behavior, pharmacologic, and surgical interventions but the studies on pharmacologic treatment was sparse and sporadic.

It is imperative that we develop a comprehensive obesity action plan, and in order to do so effectively, we must thoroughly examine the evidence surrounding equity and disparities in obesity treatment. Given the evolution of obesity treatment since 2018, we decided to conduct a review of studies examining disparities in obesity treatment. Obesity treatment was categorized into behavioral/lifestyle, surgical,

and pharmacological interventions. We searched Pubmed, Medline, and Google Scholar for relevant articles using the following steps. We first searched for articles examining obesity treatment options that reported data on African Americans, Asians, Hispanics, and Caucasians, published from January of 2000 to July 2022. We excluded articles that did not present empirical evidence (i.e review, theoretical, and opinion papers). We then excluded any papers that did not compare the same intervention between ethnic or racial groups (i.e mixed meta analysis or non-intervention retrospective papers). This yielded 44 papers. We then reviewed each article, noting disparities where the results for racial and ethnic groups were reported.

By recognizing and addressing these disparities, we can move towards a more inclusive and equitable approach in obesity management, thereby enhancing healthcare equity across diverse populations.

## Findings and Discussion

### Behavioral/Lifestyle

In our search for behavioral and lifestyle treatments of obesity, we found 17 articles that met our criteria. See Table 1. Two key disparities – weight loss and engagement – emerged in the studies we examined.

In lifestyle interventions that primarily focused on physical activity and dietary changes, an overwhelming majority found that African Americans,<sup>6-12</sup> and in particular African American women,<sup>13-19</sup> lost significantly less weight than Caucasian or Non-African Americans. Additionally, African American women were found to be more likely to regain weight compared to non-African Americans.<sup>20</sup>

Only Kinsey et al found race was not associated with initial weight loss or weight regain in a 16-month group-based weight management program, as both African American and Caucasian women both successfully lost weight and there was no significant difference in the weight lost by each group.<sup>21</sup> In the ENACT trial, African Americans lost significantly less weight in a traditional behavioral treatment (BT) approach. However, when combining traditional behavioral treatment with both environmental and acceptance-based skill workshops, there were no disparities found between African Americans and other races.<sup>12</sup> This study serves as an example that traditional treatment approaches can be modified to help address racial and/or ethnic disparities.

There were only two studies that met inclusion criteria that studied differences in outcomes for lifestyle programs in Hispanics vs non-Hispanics. In a subanalysis of Diabetes Prevention Program trial, Hispanic men and women had similar weight loss as other race-gender groups.<sup>14</sup> A subanalysis of the Look Ahead Trial, found that Hispanic participants were less likely than White participants to achieve 7 % weight loss.<sup>9</sup>

While three studies found no significant disparities in engagement and retention,<sup>21-22,15</sup> a majority of studies found evidence of either decreased retention or engagement amongst racial and ethnic minorities. In the Diabetes Prevention Program (DPP) trial, a lower proportion of African Americans and Hispanics (61% and 53%, respectively) completed the study than Caucasians (71%).<sup>14</sup> O'Neal et al observed that African American participants self-monitored their caloric intake and steps and met their calorie and step goals on fewer days than Caucasian participants.<sup>6</sup> In a mindfulness based

weight loss program, African Americans attended fewer intervention sessions.<sup>11</sup> Blackman Carr et al observed that African Americans had significantly fewer website log-ins in the group behavioral weight loss intervention.<sup>18</sup> Saju et al found that African American and Hispanic experienced greater barriers to engagement in a community Diabetes Prevention Program: lack of convenience in location, transportation difficulties, and work/life flexibility was an issue in DPP engagement.<sup>23</sup>

In summary, in behavioral/lifestyle treatments, we found a pervasive trend of African Americans, particularly African American women, losing less weight and regaining more weight compared to Caucasians. Furthermore, African Americans, along with Hispanics, demonstrated lower engagement and retention in these interventions. This might be due to socio-economic barriers such as affordability, transportation issues, inflexible work schedules, and inconvenient program locations. These findings highlight the need for culturally tailored and accessible lifestyle interventions that effectively cater to the needs of minority populations. It's also pivotal to amplify research efforts investigating disparities in behavioral and lifestyle treatments within Hispanic and Asian communities. Although there is a significant number of studies focused on interventions within these populations, there is a dearth of research exploring how their responses compare to other groups. This further exploration could provide valuable insights to tailor interventions more effectively. Clinical trial representation in larger weight loss trials remains a significant hurdle for all racial and ethnic minorities and should be addressed as we seek broader solutions for the obesity epidemic.<sup>24</sup>

Table 1: Behavioral & Lifestyle Obesity Treatment Studies

Paper	Racial/Ethnic Group	Observed Treatment Disparities	Notable Exception to Disparities
Butryn et al, 2017 <sup>12</sup>	African Americans	Less Weight Loss	Exception: Weight loss comparable for cohort receiving acceptance therapy.
Katzmarzyk et al. 2020 <sup>10</sup>	African Americans	Less Weight Loss	
Saju et al. 2022 <sup>23</sup>	Hispanic and Non Hispanic Blacks	Less Weight Loss	
Daubenmier et al. 2021 <sup>11</sup>	African Americans	Less Weight Loss	Weight regain comparable during the maintenance period in the mindfulness intervention group but not in other groups.
Ostendorf et al. 2021 <sup>20</sup>	African Americans	More Weight Regain	.
Kinsey et al., 2018 <sup>21</sup>	African American women	None	Race was not associated with initial weight loss, the likelihood of achieving $\geq 5\%$ weight reduction, nor weight regain.
O'Neal et al. 2022 <sup>6</sup>	African Americans	More Weight regain	
Coffino et al. 2022 <sup>19</sup>	Non-White	Less Weight Loss Less Utilization of Weight Loss Treatment	
Svetkey et. al 2005 <sup>13</sup>	African American women	Less Reduction in Blood Pressure	Blood pressure reduction comparable for African American men.
Hollis et al. 2008 <sup>8</sup>	African Americans	Less Weight Loss	
West et al. 2008 <sup>14</sup>	African American women	Less Weight Loss	Exception: Weight loss comparable for cohort also receiving metformin.
Brandon and Elliott-Lloyd 2006 <sup>15</sup>	African Americans	Less Reduction in Body Weight, Body Fat, Blood Pressure	
Annesi et al. 2007 <sup>7</sup>	Non-White	Less Weight loss, Less Body Satisfaction	
Cromer et al. 2022 <sup>9</sup>	Black and Hispanic	Less Weight Loss	
Glass et al. 2002 <sup>16</sup>	African American women	None	African American and Caucasian women respond the same physiologically to weight loss interventions.
Nicklas et al. 2003 <sup>17</sup>	African American women	Reduction in Body Fat, Cholesterol Levels, & Glucose Levels	
Blackman Carr et al., 2018 <sup>18</sup>	African American women	Less Weight Loss	

## Surgical

We found 14 studies that met our criteria relating to disparities observed during surgical treatment of obesity. See Table 2. Thirteen of these articles found racial and ethnic minority disparities, but five of them noted instances of equivalent outcomes among racial/ethnic groups. Disparities noted include referral rates and access, perioperative care, operative outcomes, and postoperative outcomes.

In terms of access to care, one study noted that Caucasian patients are more likely to undergo bariatric surgery when compared to African American patients.<sup>25</sup> African Americans and men were less likely to have considered bariatric surgery and were less likely to have been recommended surgery by their doctors.<sup>26</sup> However, another found that when adjusted for socioeconomic factors, such as income and insurance, there was no difference in the likelihood of pursuing bariatric surgery for minority groups.<sup>27</sup> Ibrahim et al, found no difference among referral rates for African American and Hispanic patients.<sup>28</sup>

Pre-surgery observations note that African American patients undergoing bariatric surgery are younger and heavier than non-African American patients and present with different comorbidity profiles. They often have higher BMIs at the time of surgery but fewer comorbidities compared to Caucasians. However, they show significantly higher rates of hypertension, renal disease, and cardiovascular disease.<sup>29</sup> However, one study found that there were minor differences in illness burden for minority groups.<sup>27</sup> Ibrahim et al found that African Americans' perioperative care included decreased rate of cardiac testing compared to their Caucasian counterparts.<sup>28</sup> Caucasian patients also had

shorter wait times for bariatric surgery compared to African American and Hispanic patients.<sup>28</sup>

Examining operative metrics, African American patients tend to have longer operative times and experience complications such as dehydration, renal insufficiency, and pulmonary embolism more frequently.<sup>29</sup> Robotic-assisted procedures lead to longer operation periods and postoperative lengths of stay for African American patients than Caucasian patients.<sup>30</sup> In addition, readmission, reintervention, and reoperation are more frequently observed among the non-Hispanic Black population.<sup>29</sup>

Examining post surgical outcomes, studies have demonstrated that race is a strong predictor of total weight loss and excess weight loss (EWL) following bariatric surgery. African American patients tend to achieve significantly less weight loss compared to Caucasian patients post-bariatric surgery.<sup>25,31,32-34</sup> But one study found that despite the difference in weight loss, there was no racial disparity in patient post-surgery satisfaction.<sup>31</sup> Further, African American patients tend to have lower weight loss percentages compared to Caucasians, even after adjusting for factors like eating behaviors, physical activity, and clinical factors.<sup>25,35</sup> Lastly, one study found that African Americans and Hispanics had higher rates of mortality due to venous thromboembolism in comparison to Caucasian patients post bariatric surgery.<sup>36</sup>

While the preponderance of the studies report disparities in weight loss outcomes, some studies found no disparities for a subset of the study population or for a specific time measurement or consideration. Weight loss outcomes for racial/ethnic groups were the same as for their Caucasian counterparts for study participants who underwent sleeve gastrectomy (vs Roux-

n-Y gastric bypass),<sup>28, 37</sup> amongst women,<sup>34,38</sup>) for Hispanics at the 6 months post-surgery mark,<sup>34</sup> and when adjusted for socio-economic factors such as income and insurance.<sup>27</sup>

In summary, our review revealed disparities in referral rates and access, perioperative care, operative outcomes, and postoperative outcomes. These disparities may be driven by multiple complex factors including socio-economic status, cultural beliefs, and systemic healthcare biases. It is essential to ensure equitable access to surgical interventions, and research should continue to investigate how to improve surgical outcomes for minority populations. Smith et al recommend practical

solutions to help address bariatric surgery disparities in their review and recommend that there is a need to develop and promote educational and informational tools for providers to encourage culturally sensitive communications about bariatric surgery in addition to broader translational research<sup>39</sup>. The recommendations they advocate would equally help in addressing lifestyle, behavioral, and surgical disparities.

It's important to note that the presence or absence of disparities can vary across different studies and populations, and further research is needed to better understand and address these disparities.

Table 2: Surgical Obesity Treatment Studies

Paper	Racial/Ethnic Group	Observed Treatment Disparities	Notable Exception to Disparities
Acevedo et al, 2021 <sup>30</sup>	African Americans	Greater Operative lengths, Lengths of stay, Rate of pulmonary embolism, Morbidity, Rate of readmission, Presence of operative drain	
Ibrahim et al. 2022 <sup>28</sup>	Non-White	Less Preoperative referral patterns, Less rates of cardiovascular testing, More surgical wait times, and Less early postoperative weight loss.	Comparable weight loss between groups observed at 12 months.
Hecht et al. 2020 <sup>25</sup>	Non-White	Less Weight Loss	.
Hui et al. 2020 <sup>29</sup>	African Americans	More preoperative comorbidities, Longer operative times, More complications, Increased readmission rates, Greater re-intervention, Higher mortality	
Edwards et al. 2022 <sup>36</sup>	Non Hispanic Black	Increased mortality rates	
Elli et al. 2016 <sup>34</sup>	African Americans	Less Weight Loss	No weight loss difference for Hispanics was observed.
Cheung et al. 2013 <sup>33</sup>	African-American and Hispanic	Less Weight Loss	.

Paper	Racial/Ethnic Group	Observed Treatment Disparities	Notable Exception to Disparities
Anderson et al. 2007 <sup>32</sup>	African Americans	Less Weight Loss	
Wee et al. 2017 <sup>35</sup>	African Americans	Less Weight Loss	
Coleman et al., 2014 <sup>37</sup>	Non-Hispanic Black and Hispanic	Less Weight Loss for RYGB (Roux-en-Y gastric bypass)	No weight loss differences between racial/ethnic groups for SG (Sleeve Gastrectomy) noted.
Coleman and Brookey, 2014 <sup>38</sup>	Non-Hispanic white men	Less Weight Loss	No differences between racial/ethnic groups of women in weight outcomes.
Wee et al. 2014 <sup>26</sup>	African Americans; across all races, men	Lower likelihood of proceeding with bariatric surgery; Lower likelihood of receiving bariatric surgery recommendation	
Stanford et al., 2015 <sup>27</sup>	Non-White	None	After adjustment for socioeconomic factors, there were no racial differences in who proceeded with bariatric surgery.
Samaan et al. 2022 <sup>31</sup>	African Americans	Less Weight Loss	No difference in postoperative satisfaction was found, despite the disparity in weight loss.

## Pharmacological

Pharmacologic treatment options for obesity have advanced over the last 5 years. We found 13 studies that examined disparities in pharmacologic treatment with a focus on weight loss and cardiometabolic response, adverse events, and access to obesity medications across racial and ethnic groups. See Table 3.

Four papers found statistically significant decreased weight loss in racial and ethnic groups. In the Lorcaserin trial, Caucasians lost 6.7 kg vs. 3.9 kg in Black and 3.4 kg in Hispanic subjects. However, the weight loss in the placebo arm was 3.2 kg in Caucasians, 2.7 kg in African Americans, and 1.4 kg in Hispanics. Hence, when placebo-adjusted, the difference between African Americans and Caucasians fell to 0.5 kg and was non-significant. Similarly, the Caucasian-Hispanic difference fell to 1.8 kg

with placebo-adjustment but remained significant.<sup>40</sup> African American adolescents had significantly lower weight loss and waist circumference response to orlistat.<sup>41</sup> While not examining for statistical significance, Tirzepatide produced a reduction in body weight of 6.9-10.5kg in Hispanics vs 9.9-17.1kg for non-Hispanics. Semaglutide 1.0 mg produced a reduction of 5.6 kg for Hispanics vs 7.5kg for non - Hispanics.<sup>42</sup> DeSouza et al additionally found that Semaglutide 1.0mg produced significantly less weight loss(-4.1kg vs -6.1kg) in Hispanics vs non Hispanics.<sup>43</sup>

Four papers found no significant difference in weight loss between Caucasians, African Americans, and Hispanics, while one paper found greater weight loss in African Americans. In a subanalysis of LEAD trials, Davidson et al and O'Neil et al both found that non-Hispanics

and Hispanics responded similarly to liraglutide with no significant differences in weight loss.<sup>44,45</sup> However, we would like to point out that within the study were differences between Hispanics and non-Hispanics in placebo groups. In the placebo arm, 24.3%, 8.6%, and 2.9% of non-Hispanics achieved 5%, 10%, and 15% weight loss, respectively, compared to 15.5%, 4.6%, and 2% of Hispanics.<sup>44</sup> This implies that liraglutide could have greater weight loss for Hispanics than non-Hispanics when placebo-adjusted, albeit this angle was not assessed in the study. Shomali et al found that liraglutide produced significantly more weight loss from placebo in African Americans (-2.1kg) compared to non-African Americans (-1.5).<sup>46</sup> In post hoc analysis of SUSTAIN trials, DeSouza et al concluded that semaglutide produced consistent changes in body weight across Caucasians, Asians, and African Americans when factoring in differences in baseline BMI.<sup>43</sup> In their subgroup analysis of the Pioneer programme, Aroda et al found no significant differences in weight change amongst racial and ethnic subgroups for oral Semaglutide.<sup>47</sup>

Eight studies examined disparities on cardiometabolic outcomes. The studies largely showed similar outcomes across racial and ethnic groups with some studies showing better outcomes in African Americans and Asians. When treated with Metformin, African Americans experienced lowered HbA1c levels more than European Americans<sup>48,49</sup> and Hispanics.<sup>49</sup> In a separate trial which explored liraglutide as a diabetes medication, both African American and non-African American patients showed similar success in reaching the American Diabetes Association's recommended target of HbA1c levels (53 mmol/mol) on dosages of 1.2 and 1.8 mg liraglutide. After 26 weeks of liraglutide treatment, there was no significant difference

in the mean reduction of HbA1c levels in both groups.<sup>46</sup> Furthermore, researchers found that liraglutide produced similar A1c reductions in Hispanic vs Non-Hispanic patients.<sup>45</sup> Aroda et al found that oral semaglutide produced greater HbA1c reductions with oral semaglutide 14 mg/flex in Asians (-1.5% to -1.8%) than other racial groups (-0.6% to -1.6%)<sup>47</sup> and no differences between African Americans and Caucasians. In a subanalysis of SUSTAIN trials for Semaglutide 0.5mg and 1.0mg, DeSouza et al did not find differences in A1c reduction between African Americans, Asians, and Caucasian. Asian Americans did trend towards a greater A1c reduction (-2.0% vs 1.7%) that was not statistically significant for Semaglutide 1.0mg. Hispanics did have a statistically different A1c response to Semaglutide 1.0mg vs non-Hispanics (-1.8% vs -1.9%) but the difference is not clinically relevant.<sup>43</sup> In a separate analysis, DeSouza et al found no significant differences in reduction of MACE across race and ethnicity in a post ad hoc analysis of Sustain 6 that was statistically significant. While not statistically significant, Asians had greater MACE reduction, CV death reduction, and Non-Fatal Stroke reduction. Systolic blood pressure response was statistically different in African Americans (+4.47) compared to Asians (-4.98) and Caucasians (-1.92).<sup>50</sup> While they did not examine for statistical significance between subgroups, Bennyworth et al reported that Tirzepatide produced an similar A1c changes for Hispanics (of 2.11-2.47% ) vs for non-Hispanics (2.03%-2.43% ) and Semaglutide demonstrated slightly improved A1c reduction in Hispanics(-1.93%) vs Non-Hispanics (1.69%).<sup>42</sup> Only two studies examined disparities in adverse outcomes across racial and ethnic subgroups. DeSouza et al found that significantly higher percent of Asian Asian versus other race subgroups



discontinued treatment of Semaglutide 1.0mg prematurely due to adverse events.<sup>43</sup> Aroda et al reported no differences in adverse events for Oral Semaglutide in a subanalysis of the PIONEER trials.<sup>47</sup>

Only two studies examined disparities in eligibility, access, and prescribing patterns for new obesity medications. Lu et al examined disparities around eligibility for Semaglutide based on the 2015-2020 National Health and Nutrition Examination Survey. They found that the percentage of adults eligible for semaglutide was highest for African American (56.6%), followed by Hispanics (55.0%), Caucasians (50.5%), and Asian (19.8%). The racial and ethnic differences were statistically significant across all subgroups ( $p < 0.001$ ). Additionally, they found that compared to Caucasians, significantly larger proportions of African Americans and Hispanics had lower family income, were uninsured, and less likely to have established care ( $P < 0.001$  for all).<sup>51</sup> In a subanalysis of the Look AHEAD (Action for Health in Diabetes) study, researchers found that people of racial/ethnic minority groups are beginning newer anti-obesity medications at a much later time than Caucasian patients and that the initiation of anti-obesity medications is significantly lower for African American (HR 0.81, 95% CI 0.70–0.94) and American Indians (HR 0.51, 95% CI 0.26–0.99). Medication initiation was inversely associated with yearly family income (HR 0.78, 95% CI 0.62–0.98).<sup>52</sup>

Interestingly, our results suggest that disparities are less persistent in pharmacological treatments. Despite some differences in weight loss and cardiometabolic response, the majority of studies did not find statistically significant differences between racial groups. This may be attributable to the nature of pharmacological

interventions, which, unlike lifestyle or surgical interventions, are less influenced by socio-cultural factors or healthcare access issues. It also may indicate that pharmacological treatments can potentially offer a uniform, accessible treatment modality across diverse populations.

While pharmacological treatment may reduce disparities in treatment results, our review also found that disparities are prevalent in the administration of these anti-obesity (AOM) medications. As Wright et al point out, while pharmacologic advancements in obesity hold promise for an equitable solution for the obesity epidemic, uneven access to these medications would only exacerbate obesity disparities.<sup>53</sup>

While the findings suggest that pharmacological interventions may be less susceptible to disparities, they are not a standalone solution and should be used as part of a comprehensive treatment strategy. The education and programming around the prescribing of these medications will be key to addressing disparities. Unfortunately, the reimbursement levels of obesity counseling is not financially viable for many practices.<sup>54</sup> It is unlikely that providers will expend more energy if reimbursement for obesity counseling if it is not paid on parity with traditional evaluation and management codes. In this effort, the issue arises when payers, including the Centers for Medicare & Medicaid Services, additionally do not financially support healthcare providers who invest extra time in crafting or implementing community-specific solutions. To tackle the obesity epidemic equitably, it will be crucial for insurance companies to contemplate implementing payment modifiers, as it could incentivize the creation of lifestyle, behavioral, surgical, and pharmacologic interventions that are tailored to suit specific community and cultural needs.

Table 3: Pharmacological Obesity Treatment Studies

Paper	Racial/Ethnic Group	Observed Treatment Disparities	Notable Exception to Disparities
Heisler et al, 2007 <sup>49</sup>	Black & Hispanic	Poorer HbA1c rates with medication usage	
Williams et al. 2014 <sup>48</sup>	African Americans	None	African Americans appear to have a better glycemic response to metformin when compared with European Americans.
Elhussein et al. 2022 <sup>52</sup>	Black, American Indian, Alaskan Native	Lower Initiation of newer diabetes medications	
Shomali et al. 2017 <sup>46</sup>	African Americans	None	Efficacy of treatment for African-American patients was shown not to differ from that observed in non-African-American patients over 26 weeks.
Fidler et al. 2011 <sup>40</sup>	African Americans & Hispanics	Lower Weight Loss	
McDuffie et al. 2004 <sup>41</sup>	African Americans	Lower Weight loss, Less reduction in waist circumference, Lower improvement in insulin sensitivity	
Benneyworth et al. 2022 <sup>42</sup>	Hispanic & Latino	Lower Weight loss	.
DeSouza et al. 2020 <sup>43</sup>	Asian	Lower Weight loss	
O'Neil et al. 2016 <sup>44</sup>	Hispanics	None	Non-hispanics and hispanics responded similarly to liraglutide with no significant differences in weight loss.
Davidson et al. 2016 <sup>45</sup>	Hispanic & Latino	None	Treatment results are comparable for Latino/Hispanic patients and non-Latino/Hispanic patients.
Aroda et. al 2022 <sup>47</sup>	Black/African American, and Asian; Hispanics	None	Reductions in body weight and HbA1c comparable among racial groups and ethnicities. In some trials, Asian patients experienced greater HbA1c reductions with oral semaglutide 14mg/flex than other racial groups
DeSouza et al. 2019 <sup>43</sup>	Black/African American, and Asian; Hispanics	None	No evidence of a differential effect of semaglutide on risk reduction in Major adverse cardiovascular events (MACE) And Blood pressure across race and ethnicity subgroups.
Lu et al. 2022 <sup>51</sup>	Black, Hispanics	More financial barriers to weight loss medication	

## Conclusion

In conclusion, our analysis offers a comprehensive overview of current disparities in obesity treatment modalities, with a focus on behavioral/lifestyle, surgical, and pharmacological interventions. This review elucidates the complex interplay of socioeconomic and cultural factors in determining the efficacy and accessibility of these treatments across different racial and ethnic groups.

Notably, pharmacological interventions demonstrate fewer disparities compared to behavioral and surgical treatments. This could be attributed to the standardized nature of pharmacological treatment and controlled trials, which are less influenced by the socio-cultural variables that significantly impact lifestyle and surgical interventions. Such interventions often require substantial lifestyle adjustments, consistent follow-ups, and intricate pre-and post-treatment protocols, presenting significant challenges for individuals facing socioeconomic constraints. These may include limited access to nutritional foods, safe exercise environments, or inability to take time off for medical appointments, disproportionately affecting minority groups.

On the other hand, the apparent accessibility of pharmacological treatments is contingent upon equitable insurance coverage and affordable pricing. Without adequate insurance coverage or reasonable pricing, these medications remain out of reach for lower-income individuals, thereby perpetuating disparities.

Furthermore, the success of lifestyle and behavioral interventions is intricately linked to the cultural competence of healthcare providers.

A deep understanding of diverse cultural eating habits, physical activity preferences, and health beliefs is essential for engaging patients from various backgrounds effectively. Surgical treatments, too, are not just influenced by patient-specific factors but are also subject to systemic healthcare disparities such as referral biases and unequal access to specialized care.

Our findings suggest that the emergence of new pharmacological treatments may offer a promising avenue in reducing disparities. The education and programming around the prescribing of these medications will be key to addressing disparities. Effective obesity management typically requires a multifaceted approach, combining medication with lifestyle alterations and, in some cases, surgical interventions. Merely covering obesity medications without concurrently investing in and improving payment for obesity counseling and programming would significantly undermine the ability for providers to effectively tackle obesity disparities. This approach mirrors a recurring shortcoming in healthcare management of other chronic diseases, where reliance on expensive drugs is prioritized, yet there is a notable lack of support for comprehensive programming that addresses the socio-environmental factors of these diseases.

Thus, it is imperative that healthcare policies and practices evolve to provide equitable support across all treatment modalities. Insurance companies and governments must ensure equal coverage and investment in these services, including innovations in service delivery. This is crucial not only for making pharmacological treatments accessible

but also for addressing the socioeconomic and cultural barriers that currently hinder the efficacy of all treatment modalities.

In the pursuit of equitable treatment for obesity, we must advocate for a holistic approach that encompasses both the medical and socio-cultural dimensions of this complex health issue. Only then can we hope to bridge the existing disparities and provide effective, inclusive care for all individuals struggling with obesity. This is a call to action for all stakeholders in the healthcare system, from policymakers and insurers to healthcare providers and researchers, to work collaboratively towards a more equitable and comprehensive approach to obesity management.

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None

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