Obesity Science & Practice

WILEY | THE OBESITY SOCIETY | WORLD OBESITY

PERSPECTIVE OPEN ACCESS

The Future of the Obesity Management Landscape: Challenges, Opportunities and Solutions

Alexander Dimitri Miras[1] | Alexander Kokkinos[2] | Abd Tahrani[3,4] | Ricardo Reynoso[5] | Jörg Tomaszewski[6] | Ildiko Lingvay[7] | Domenica Rubino[8] | Jonathan Q. Purnell[9] | Muzamil Hussain[1] | Amy Hall[10] | Dimitrios Pournaras[11,12] | Philip Schauer[13] | Carel W. le Roux[14,15] | Luiza Borowska[16] | Chiedza Kaitano[16] | Ishita Doshi[6] | Dominique Gregoire[17] | Helen Haggart[18] | María Morán Gortaire[16] | Stephanie Mutchler[19] | Barbara Sleypen[20] | Elena Startseva[16] | Priya Sumithran[21,22] | Francis M. Finucane[23,24]

[1]School of Medicine, Ulster University, Derry, UK | [2]First Department of Propaedeutic Internal Medicine and Diabetes Center, Medical School, National and Kapodistrian University of Athens, Laiko General Hospital, Athens, Greece | [3]Novo Nordisk A/S, Søborg, Denmark | [4]Department of Metabolism and Systems Science, University of Birmingham, Birmingham, UK | [5]Medical and Scientific Affairs, International Operations, Novo Nordisk Health Care AG, Zurich, Switzerland | [6]Johnson & Johnson MedTech, Raritan, New Jersey, USA | [7]Department of Internal Medicine and Peter O'Donnel Jr. School of Public Health, UT Southwestern Medical Center, Dallas, Texas, USA | [8]Washington Center for Weight Management and Research, Arlington, Virginia, USA | [9]Department of Medicine, Divsions of Cardiology and Endocrinology, Oregon Health & Science University, Portland, Oregon, USA | [10]Queen Elizabeth University Hospital, Glasgow, UK | [11]Medical Research Council (MRC) Integrative Epidemiology Unit, Population Health Sciences, Bristol Medical School, University of Bristol, Bristol, UK | [12]Department of Bariatric/Metabolic Surgery, Southmead Hospital, North Bristol NHS Trust, Bristol, UK | [13]Pennington Biomedical Research Institute of Louisiana State University, Baton Rouge, Louisiana, USA | [14]St. Vincent's University Hospital, Dublin, Ireland | [15]University College Dublin School of Medicine, Dublin, Ireland | [16]Boehringer Ingelheim International GmbH, Ingelheim, Germany | [17]Surgical Innovation, Marketing Department, Medtronic, Brussels, Belgium | [18]Johnson & Johnson MedTech, Wokingham, UK | [19]Johnson & Johnson MedTech, Cincinnati, Ohio, USA | [20]Medtronic, Jette, Belgium | [21]Department of Surgery, School of Translational Medicine, Monash University, Melbourne, Victoria, Australia | [22]Department of Endocrinology and Diabetes, Bayside Health (Alfred Care Group), Melbourne, Victoria, Australia | [23]College of Medicine, Nursing and Health Sciences, University of Galway, Galway, Ireland | [24]Cúram, University of Galway, Galway, Ireland

Correspondence: Alexander Dimitri Miras (a.miras@ulster.ac.uk)

Received: 9 July 2025 | **Revised:** 24 December 2025 | **Accepted:** 21 February 2026

Keywords: bariatric surgery | biology | obesity related misperceptions | pharmacotherapy

ABSTRACT

Objective: In July 2023 a diverse group of international experts from academia, healthcare and medical technology/pharmacological companies gathered to discuss the current global landscape in the management of obesity, identify the clinical challenges healthcare systems are facing, and the gaps in scientific knowledge.

Approach: We proposed ways that the academia-industry-healthcare-interface can be strengthened to offer solutions to these challenges and fill the gaps in knowledge.

Conclusion: We identified these five priorities for action: (1) Enhancing the academia-healthcare-industry collaboration in a way that prioritizes the patient with obesity and healthcare economic value. (2) Identifying reliable biomarkers and predictors of obesity treatment response to determine as early as possible whether a specific therapy is likely to work. (3) Defining specific and individualized treatment targets that take account of heterogeneity of obesity-related complications risk, the presence of multimorbidity, and patient preference. (4) Addressing bias and discrimination against people with obesity amongst clinicians, health policy makers and the wider public. (5) Combining randomized controlled trial and cohort study data to apply next generation "machine learning" and "artificial intelligence" methods to large datasets that accelerates identification of factors associated with response heterogeneity and successful treatment response prediction.

1 | Introduction

In 2023, a diverse group of international experts from academia, healthcare and medical technology/pharmacological industries gathered to discuss the current state of the management of the disease of obesity, identifying the challenges health care systems across the globe will need to respond to in the coming years, and the gaps in scientific knowledge. The aim of this meeting was to comprehensively discuss the current state of the obesity management landscape and its challenges and shortcomings. After which, the working group proposed ways that the academia-industry-healthcare interface can be strengthened to offer solutions to these challenges. The discussions addressed "pre-competitive" questions which were not influenced by any conflicts of interest of the panel and, when answered, would not give unfair advantage to one company or institution over another.

Obesity prevalence has surged in the last half century, partly due to a shift in the environment, [1] in which food became more easily available and affordable, paired with a decrease in overall physical activity [2]. Remarkably, not all individuals respond similarly to this new obesogenic environment, and a "Gaussian" distribution of population body weights suggests that strong intrinsic biological traits interact with environmental influencers to determine where an individual lies within the population distribution at any point in time. In fact, heritability studies have suggested that much of the variance in body mass index (BMI) is determined by the genetics of the individual [3].

The panel of experts present in this meeting gave their perspective regarding the key challenges facing obesity care and these were then agreed upon by consensus. These are: (1) Understanding the biology of obesity, (2) Defining obesity as a disease, (3) Obesity related misperceptions, (4) Staging of patients with obesity, (5) Determinants of response to treatment, (6) Weight management treatment targets, (7) Access to care for the treatment of obesity, (8) Longterm approach and pathways for the treatment of obesity, and (9) Prevention versus treatment of obesity. The discussion then generated consensus on solutions for each of these problems, which are presented here in detail with the aim of informing future policies in obesity management. Each expert was given time and opportunity to redact or change any recommendations or wording they wanted, after which the text agreed by all was presented in this article. As the meeting took place in 2023, the text of the manuscript has been updated to include the recent developments in obesity care. The final text was agreed upon by all authors.

2 | Challenges and Solutions

2.1 | Understanding the Biology of Obesity

Heritability is an estimate of the contribution of genetic differences between individuals in a population to a given phenotypic trait. Studies of twins and families estimate the heritability of body mass index (BMI) to be between 45% and 75% across the spectrum of body weight, with even higher estimates among subpopulations with obesity [4].

However, genetic susceptibility does not inevitably lead to obesity. Even among middle-aged adults in the highest decile for polygenic risk score, a substantial minority (17%) had a BMI within the normal weight range [5]. Lifestyle factors, such as eating patterns and physical activity can significantly attenuate the influence of genes on obesity risk [5, 6], highlighting the important influence of environmental and behavioral factors on body weight.

The rapid rise in the population prevalence of obesity over the past four decades has undoubtedly been driven primarily by changes in the environment affecting those with genetic predisposition [1]. Among the numerous postulated contributors are changes in the food supply (increased portion sizes, cheaper food, increased consumption of highly processed food) triggering overconsumption of calories, reduced energy expenditure due to less time spent in occupational physical activity and greater sedentary time [2]. Additional individual-and societal-level factors linked with increased obesity risk are disturbed sleep, increased stress, exposure to endocrine-disrupting chemicals, and socio-economic disparities [3].

Preventatively stemming the rising prevalence of obesity can only be achieved by policy changes to address our "obesogenic" environment, but major challenges lie in understanding which of these environmental and socioeconomic factors are causally related, how they interact with physiology and behavior to elicit changes in energy balance and metabolic feedback systems to promote weight gain in genetically susceptible individuals., and then converting this knowledge into actionable and impactful policy.

3 | Defining Obesity as a Disease

One of the biggest challenges to patient care has been the identification of a consistent, scientific language of obesity that respects the individual [7]. Even though the World Health Organization recognized obesity as a chronic disease over 77 years ago, its acceptance, as such, has been slow, evident from the fact that the first recognition of obesity as a disease by the American Medical Association (AMA) only came in 2013 [8]; this is because obesity is a complex, heterogenous and dynamic state with multiple contributing or exacerbating factors resulting in medical complications.

A recent European Association for the Study of Obesity commission comprised of a group of global stakeholders reached consensus to define *obesity as a complex, chronic lifelong disease with excessive fat accumulation, that risks or impairs health*; however, the use of BMI to define obesity remains controversial [9]. The commission agreed that genetics and environment are the main *causes* of developing obesity, and that biopsychosocial, environmental, obesity related misperceptions and socioeconomic influences are the main *exacerbating* factors. They called for management that is holistic, multidisciplinary and individualized. Treatment should be focused on improving overall

health and quality of life and weight loss is a *consequence of successful treatment but not the goal*. Consensus was not reached regarding the role of energy intake and expenditure, with most of the group voicing the opinion that it was a symptom or consequence of the disease, rather than causal or exacerbating, reflecting a shift in our understanding and acceptance of obesity as a disease [9].

Although there is a consensus that excess adiposity is a valid definition of what constitutes the disease of obesity, challenges remain. For example, difficulty in deciding the type of adiposity measurement, its appropriate target patient, it's frequency, the context it is used in and its goal. For example, BMI is easily calculated by most electronic medical record systems, and has clinical utility and correlates with metabolic risk [10]; however, evidence suggests that waist circumference (WC) may be more clinically relevant as an indirect measure of visceral adiposity and its associated risk of cardiovascular disease (CVD) and is responsive to lifestyle change [11]. Decreases in WC directly relate to decreased health risk and are more easily self-monitored by patients. WC measurement takes time, is user/protocol dependent, and requires consistency. The biggest challenge is putting it to practical use, as evident from a US study which pointed out barriers to its adoption being time, non-confluence with routine practice, discomfort for provider and perceived discomfort for the patient [12] leading to its low usage. However, the National Institutes of Health (NIH) and WHO recommend the use of bony prominences as guides for consistency with technician and self-measurement corresponding well [13, 14]. Alternatively, calculating a waist to height ratio (WtHR) has also been suggested with an optimal target < 0.5 for lower CVD risk [15]. Recently, WtHR was reported to be of importance in identifying the risk of myocardial infarction in females [16].

The International Atherosclerosis Society (IAS) and International Chair on Cardiometabolic Risk (ICCR) consensus statement recommends that waist circumference should be adjusted for BMI, because within each BMI category increasing WC is associated with increased morbidity and mortality risk [17]. Furthermore, they suggest that the current single WC thresholds (88 cm women, 102 cm men) are not generalizable because they were originally derived Caucasians with a BMI of 30 kg/m^2 rather than any associated health risk. When this WC threshold was compared to WC controlled for BMI categories, future CVD risk correlated more closely to changes within BMI categories. It is also important to consider ethnic-specific thresholds, since certain ethnic groups will be more vulnerable at lower thresholds [18–20].

More recently and subsequent to our 2023 academia/industry collaboration, an international group of obesity experts known as the Lancet Commission on Obesity developed an evidence-based consensus report on the definition and diagnostic criteria of clinical obesity in part to address the inadequacies of a BMI only based definition of obesity [20]. The Commission defined obesity as a condition characterized by excess adiposity, with or without abnormal distribution or function of adipose tissue. Clinical obesity was defined as a chronic, systemic illness characterized by alterations in the function of tissues, organs, the entire individual, or a combination thereof, due to excess adiposity. Clinical obesity can lead to severe end-organ damage, causing life-altering and potentially life-threatening complications (e.g., heart attack, stroke, and renal failure). Preclinical obesity was defined as a state of excess adiposity with preserved function of other tissues and organs and a varying, but generally increased, risk of developing clinical obesity and several other non-communicable diseases (e.g., type 2 diabetes, cardiovascular disease, certain types of cancer, and mental disorders). Although the risk of mortality and obesity-associated diseases can rise as a continuum across increasing levels of fat mass, the Commission differentiated between preclinical and clinical obesity (i.e., health vs. illness) for clinical and policy-related purposes. The Commission recommended that BMI should be used only as a surrogate measure of health risk at a population level, for epidemiological studies, or for screening purposes, rather than as an individual measure of health. Excess adiposity should be confirmed by either direct *measurement of body fat, where available, or at least one anthropometric criterion (e.g., waist circumference, waist-to-hip ratio, or waist-to-height ratio) in addition to BMI, using validated methods and cutoff points appropriate to age, gender, and ethnicity.*

The process of defining and generating consensus on a unified definition of obesity is a process which is currently ongoing and evolving, as evidenced by the evolution of opinions described above from the AMA in 2013 to the European commission in 2023 and now to the Lancet commission 2025.

4 | Obesity Related Misperceptions

Perceptions define behaviors [21], which in turn affect the experience of living with the disease [22] and its outcomes at an individual and the population level. Misperceptions held by society, such as obesity, result from an individual's unhealthy choices, hedonism, lack of self-control and is a personal failure rather than a disease process [23] that affect individuals living with obesity as well as the fight against this disease. Internalization of this negative feedback from society by the individual, a form of personal bias, adversely impacts quality of life and leads to avoidance of health care, development of mood disorders, body dysmorphia and dissatisfaction, activity avoidance, and worsening of adiposity-associated metabolic or mechanical problems, further aggravating obesity [24]. These negative perceptions permeate all levels of society-within families, at work or school, in public, on social media, from health care professionals, and payers/insurers involved in the treatment decisions [7, 24]. Groups such as the National Association to Advance Fat Acceptance want to separate the terms “fat” from “obesity” and have argued that medicalizing obesity as a disease furthers societal shaming and focuses on larger individuals as a drain on health-care [25]. This highlights the unique challenges that patients living with the disease of obesity face since no other chronic disease (e.g., diabetes, hypertension, hyperlipidemia) would raise this concern.

These misconceptions about the disease of obesity lead to mistreatment of individuals living with it, as evident from the 2018 UK parliamentary group on obesity report showing that 88% of people with obesity have experienced stigma, reproval or

abuse because of their condition of obesity [26]. This in turn potentiates the psychosocial stressors, including depressive symptoms, anxiety, lower self-esteem, social isolation, perceived stress, substance use, unhealthy eating and weight-control behaviors, such as emotional overeating and binge eating [7, 27–29]. Furthermore, obesity related misperceptions are also prevalent among the healthcare community and policy makers, which negatively impact research and healthcare funding prioritization and delivery [7].

The global success of GLP1 medications in the treatment of obesity is a great opportunity for education of the population about the disease of obesity and shift focus from scales to health [30]. As awareness about the mechanism of action of these drugs is increasing, people are learning about gut hormones, and brain's role in this disease is now becoming more widely known and accepted [30]. Caution is necessary as disparity in access to these medications has created inequalities and some may consider their use as taking the "easy way out" as opposed to depending on dietary and physical activity interventions to lose weight. These negative connotations to seeking medical help for the disease of obesity also need to be reconciled by holistic educational campaigns to fully dismantle the core beliefs that are used to differentially treat individuals with obesity and are holding the fight against obesity epidemic back [30].

5 | Staging of Disease Severity

Following the formal diagnosis of obesity, there is a need to stage the severity of the disease. This practice is common for most conditions in medicine, including for example oncology. Several staging systems have been developed to incorporate associated complications and the degree of impairment to improve treatment and outcome. The King's Obesity Staging System (KOSS), developed to assess the degree of clinical impairment, assigns a score of 0–3 (normal to advanced disease) to 12 health domains related to obesity, supporting a framework for the clinician to identify individual domains impacted by obesity, including economics and mental health. KOSS supports improved health outcomes after bariatric surgery, but is limited in focusing treatment direction other than improving disease state and is not predictive of mortality [31, 32].

The Edmonton Obesity Staging System (EOSS) encompasses 5 stages of progressive metabolic, mechanical and mental impairment for the individuals with obesity, from asymptomatic to severely impaired [33]. Most importantly, EOSS is a strong predictor of mortality independent of BMI [34, 35]. Swaleh et al. applied the EOSS to create a clinical dashboard for primary care and found that significant functional impairment was not linearly dependent on BMI but was evident in subpopulations within each BMI level.

The cardiometabolic staging system (CMDS) focuses on delineating metabolic risk associated with insulin resistance and progression to diabetes and/or cardiovascular death beyond BMI [36]. Those at higher stages have a greater risk for development of T2D, all-cause mortality and CVD mortality. The CMDS expands the assessment of cardiovascular risk from EOSS, in that the EOSS stage 1 patients would be CVD risk delineated into CMDS stages 1–3, with different impact on mortality [32, 37].

Estimates of visceral adiposity and disease state predict morbidity and mortality, but difficulty remains in assessing an individual's functional status. Current staging strategies often include an estimate of an individual's function based on the presence of osteoarthritis or self-reporting of limited mobility. These are typically assessed in clinical trials using patient reported clinical outcomes, but quantitative assessment of performance is typically not performed.

These staging systems have existed for a decade or more, but despite their obvious clinical utility, they have been slow to be adopted in clinical care and pharmacotherapeutic research programs. With the global use of electronic medical records, the incorporation of a consensus staging system could enable a more efficient way to triage treatments and targets.

6 | Determinants of Response to Treatment

The drivers of developing obesity and its progression, and the impacts of obesity on health as well as responses to treatment are heterogenous and vary widely [38–41]. Hence, better phenotyping is required to identify patients with different disease drivers and trajectories and impact on health [38]. This should pave the way for better understanding of the pathogenesis, better treatments and improved individualized approaches for obesity rather than the current "one size fits all" approach. This in turn could lead to better outcomes. In addition to its scientific and clinical merits, better phenotyping and better outcomes will allow payers to prioritize those that are most in need and those in whom the treatment is likely to be more cost-effective.

Key to this is the ability to predict treatment responses and the development of models that can predict disease progression and treatment effects. This is particularly important considering the limitations in access to obesity treatments due to payer restrictions, limited clinical infrastructure, investment, high drug costs, and reimbursement and supply chain challenges. Access to large cohorts of patients with obesity who have reliably documented clinical outcomes data will be essential for better understanding and predicting tailored treatment responses. While it may not be easy to phenotype patients with complex diseases into subpopulations, recent attempts in T2D have been successful [42, 43], where "high level" stratification has impacted the recommendations for treatment options in the international standard of care guidelines [44].

The field of obesity could learn from this. Multiple efforts to improve obesity phenotyping and understand the mechanistic basis for disease progression and treatment effects are ongoing, facilitated by the presence of large cohorts such as IMI SOPHIA (Innovative Medicines Initiative – Stratification of Obesity Phenotypes to Optimize Future Therapy), availability of multiomics data, and the use of AI machine learning. As Obesity profiles based on anthropometric measurements and biomarkers can identify discordant profiles, these individuals are

disproportionately at higher risk for major cardiovascular events (MACE) then what is expected for their BMI [45]. Using these multi-variable prediction models with the help of AI can enhance the precise prevention of MACE [45]. If this system is implemented, up to 4–15 additional correct interventions would be offered and 37–135 unnecessary interventions would be prevented [45]. Examples of use of AI for obesity care include the prediction of weight loss after bariatric surgery and with semaglutide treatment [46, 47]. A machine learning-derived model in the UK Biobank cohort has been shown to predict the development of osteoarthritis using a wide spectrum of available data including -omics and imaging. In addition, this study identified many different disease phenotypes, highlighted potential new mechanisms of action and treatment targets and also managed to assess the potential effect sizes of interventions targeting the identified risk factors in a given individual, paving the way for more personalized approaches [48]. It is likely that more successes are to come, but, how this new data will be applied in routine clinical practice and payers' decision-making remains to be determined.

7 | Weight Management Treatment Targets

Unlike other chronic diseases such as diabetes and hypertension, obesity does not yet have well-defined treatment targets. Such targets could aid clinicians and patients in decision making regarding treatment intensification, clinical- and cost-effectiveness, and the development of individualized treatment approaches [49, 50]. Achieving treatment targets is associated with improved outcomes such as reduction in the risk of microvascular complications or cardiovascular diseases in patients with diabetes, hypertension, or dyslipidemia [51].

For obesity management, several treatment targets have been suggested. The 2013 AHA/ACC/TOS guideline for the management of overweight and obesity in adults recommended 5% weight loss as an initial treatment goal [52]. Similarly, the regulatory authorities (U.S. Food and Drug Administration [FDA] and European Medicine Agency [EMA]) guidance to industry focuses on a placebo-corrected weight loss of 5% as the benchmark [53, 54]. Whilst a 5% weight loss may have health benefits, making it the treatment target fails to recognize the heterogeneity in the health needs and phenotypes of people with obesity [38]. As well as residual risk in those who remain above healthy weight benchmarks. Some obesity-related complications (ORCs) are more “resistant” to weight loss than others and require > 10% weight loss (e.g., mortality, cardiovascular disease, MASH, and obstructive sleep apnea) [55]. Some ORCs have improvements proportional to the amount of weight loss that extend well beyond 5% (such as T2D, osteoarthritis and physical function). Similar to treating ORCs, the prevention of ORCs can require more than 5% weight loss, with greater loss achieving lower incidence of some complications, such as diabetes, but not others, such as chronic kidney disease [56]. Hence, as described in greater detail below, many would advocate moving beyond the simple and historic weight loss target of < 5% [49, 57] using current and future evidence from outcomes trials to better define weight thresholds identified with optimal health outcomes.

However, whether specific percentage weight loss thresholds should define treatment targets remains controversial. For example, the Canadian practice guidelines consider that success in obesity treatment should be defined based on outcomes (related health, function and quality of life) and not just weight loss [58]. While personalized treatment goals are desirable, the lack of an equivalent to the HbA1c in diabetes or the LDL-cholesterol in dyslipidemia is holding obesity therapy back.

Addressing these challenges and identifying a treatment target with weight management is increasingly important, especially as obesity treatment options are likely to expand further in the near future. Weight loss responses for current treatments (medical nutritional behavioral therapy, pharmacotherapy, endoscopic treatments and metabolic-bariatric surgery) range from 5% to 35%, with significant heterogeneity in treatment response [59]. Hence, there is an increasing need now more than ever to guide patients, clinicians and payers to what a successful obesity treatment should be defined as and an integral part of this will be the identification of a treatment target for obesity management.

One possible approach to address these challenges is to use examples of other chronic diseases that have broadly accepted treatment targets. These have developed over time and become more sophisticated with the generation of evidence from ever-more safe and efficacious treatment options, including target individualization. For example, while the recommended HbA1c treatment target is < 7%, the guidelines suggest that this should be personalized based on several factors: tighter control (such as T2D remission) will be indicated in some patients who are younger and newly diagnosed, but a higher HbA1c is also acceptable in some older patients, those with recurrent hypoglycemia, and when a complication burden is high [51, 60]. Similarly, cholesterol and blood pressure targets for cardiovascular disease treatment and prevention have also changed over time and become more personalized. For example, target LDL-cholesterol levels have steadily fallen from < 130 mg/dL to now < 40 mg (depending on the guideline issuing body) for patients with the highest cardiovascular risk [52].

Another learning from other chronic disease models is that the actual treatment target in diabetes, hyperlipidemia, or hypertension is based on the same biomarker that is used for the diagnosis of the disease (i.e., HbA1c, blood pressure, LDL) and the treatment target is based on absolute post-treatment values rather than a percentage change. In obesity, the biomarker that is widely used for diagnosis is the body mass index (BMI). However, as the relationship between BMI and health outcomes is modified by abdominal adiposity [17, 61], several guidelines recommended the inclusion of a waist based measure in the assessment of people living with obesity [62, 63].

In addition, for any given change in BMI, there is heterogeneity in changes in abdominal adiposity and the changes in abdominal adiposity modify the relationship between changes in BMI and health outcomes [64, 65]. Hence, a treatment target which combines BMI and waist circumference as an indirect measure for abdominal adiposity could be a better alternative. Having an adiposity measure as a treatment target can be perceived as stigmatizing and has the disadvantages of a weight-centric

approach to obesity management [66] compared to the "best weight" concept and the health-centric approach, such as proposed by the Canadian Obesity Clinical Practice Guidelines. In addition, linking the adiposity treatment target to long-term health benefits could also allow these targets to be personalized on individual levels based on their own risk. For example, risk from any level of BMI and WC can best be interpreted in the context of biochemical or other markers of obesity complications. In this regard, it is anticipated that persistence or resolution of measures of inflammation (hs-CRP), dyslipidemia (triglycerides, apo B, non-HDL cholesterol), HbA1c, liver enzymes, apnea index, cardiac diastolic function by ultrasound, heart rate recovery during fitness testing and other tests will also help guide individual weight target determination.

To develop an obesity treatment target, we need to define the treatment aim. In diabetes, the target was based on preventing progression of diabetes related complications [67]. Similarly, in hypertension and dyslipidemia, the target is based on preventing cardiovascular disease [52]. A similar approach could be used in obesity, where the target is based on ORC prevention. This could be individualized based on the patients' own risk of ORCs or a combination of these. With recent advances in data science and machine learning, it is possible to consider the risk of a large number of ORCs in combination or the development of a composite risk score. However, such an approach requires consensus on which ORCs to prevent. One possible definition could be based on the background population risk of these ORCs. Further steps should include defining the target based on treating (and not only preventing) ORCs and considering composite outcomes where multimorbidity is present.

There are currently an expanding number of industry-sponsored clinical trials with well-characterized study populations that will allow the validation and further development of obesity treatment targets [68]. However, efforts are needed to ensure that all ethnicities are represented adequately, considering that differences exist in body composition and the links between adiposity and ORCs across different ethnic groups. The development of such treatment targets in obesity is likely to be complimented by the development of interventions treating obesity that have specific effects on certain ORCs above their impact on weight. A good example of this is the trials on Survodutide for MASH, which has demonstrated at least 30% liver fat reduction in around 60% of participants treated by it compared to 14% treated with placebo together with improvement by at least one fibrosis stage seen in around 34% and 22% participants, respectively [69]. It is thought that a proportion of this effect is independent of weight loss and due to the direct effect of glucagon in clearing fat from the liver. Likewise, the use of SGLT2 inhibitors for the management of not just hyperglycemia, but also conditions like heart failure or CKD are a well-established precedent.

8 | Access to Obesity Care

Despite the recent expansion in the treatment options for obesity, access to treatment remains limited. Only a small fraction of eligible patients receive bariatric surgery, pharmacotherapy and intensive lifestyle behavioral interventions [70–73]. There are many reasons on multiple levels for limited access including healthcare system setting, clinical care pathways, HCPs, payers, patients and supply challenges [74–77]. Factors related to pricing, reimbursement, safety concerns, supply chain challenges, patients' own understanding for the need for treatment, societal and health care system, obesity related misperceptions, health care inequalities, lack of long term data and lack of scalable treatments for pharmacotherapy, lack of education on different treatment options, undeveloped health economic models that do not account for the total burden and benefits of weight loss, and the need for "quick return" on payers' investment are only some of the factors that contribute to this limited access [78–80]. Hence, improvement in access requires collaborative actions to address the variety of the factors involved. Improved productivity and the development of scalable treatment solutions are key to improved access as well as improved education on disease awareness and all available treatment options. It is also important to improve health economic modeling by generating the data related to disease burden as well as utilizing the data generated from RCTs addressing newly examined ORCs and the total burden of the disease. Addressing biases and obesity related misperceptions at all levels (patients, HCPs, health care system and payers) is also needed. These biases can stop patients from seeking medical care, make clinicians less willing to use effective treatments beyond "eat less and move more," and allow payers to prioritize funding for diseases and services other than obesity. Better phenotyping and identifying the patients for whom specific treatments are likely to be most cost-effective for the health care system, with potential rapid return of economic benefits, is also very important to address payers' concerns.

The principle of equitable access to evidence-based treatment cannot be overstated. While the prioritization of healthcare resources, particularly in the context of financial burden, remains a policy decision, the fundamental tenet should be the universal accessibility of effective, evidence-based interventions for all individuals, irrespective of their socioeconomic status. This approach ensures that health disparities are minimized and that every patient can benefit from the best available treatments.

9 | Long-Term Approach and Pathways for the Treatment of Obesity

Another challenge to obesity treatment is that a chronic disease model for the management of obesity is not being practiced in clinics today. Most obesity treatments are offered for a time limited period rather than as long-term treatments, which would be the case in any other chronic disease. For example, in the UK, lifestyle behavioral interventions are time limited and even pharmacotherapy was previously only recommended for 2 years as per NICE guidance [71, 81]. A welcome change has been the approval of Tirzepatide without a 2 years stopping rule [82]. Although metabolic/obesity surgery offers sustainable treatment, often the recommended follow-up is not financially compensated. This comes from the lack of understanding of obesity as a chronic disease and is complicated further with the limited resources available and the complex setting that was created around the development of care for people living with obesity.

Considering the need for improved access to obesity treatments, and the disease prevalence and health and economic burden, obesity treatment should follow the example of diabetes, where the bulk of clinical care takes place in primary care rather than in specialized centers [71]. Specialized centers will not be able to address the number of people requiring treatment. However, we should not underestimate the pressures on primary care; therefore, for obesity care to improve and be delivered in primary care, vital resources, support and education need to be provided. Also, the primary care setting may be better to support treating obesity as a chronic disease by providing lifelong treatment and postoperative follow up which is less likely to be accessible in specialized centers.

However, clearly some patients need to have input from specialized centers (as is the case for many chronic diseases), where liaising between primary and secondary and tertiary care is essential. Such patients include those requiring metabolic-bariatric surgery, or patients with multiple complex complications, severe mental health disorders and lack of effective treatment response. The setting and the delivery of obesity care need rethinking to aid long-term management, improve access to treatment and reduce disease burden. However, different health care systems will need to consider their own challenges and the best way forward to improve care pathways. Moreover, research is needed to establish whether primary care without access to a multidisciplinary team can achieve the same weight loss and health gain in patients with preclinical obesity compared with specialist hospital care with access to a multidisciplinary team.

10 | Prevention Versus Treatment of Obesity

Even though the WHO has recognized that obesity is an escalating global epidemic [83], despite substantial efforts in policy to tackle it, the rates of obesity continue to rise globally. Where governments have prioritized tackling obesity, the strategies have not succeeded. This may partly be due to strategies often being too narrowly defined or focusing predominantly on prevention but targeting those with existing obesity rather than those without it. For example, ultra-processed foods (UPFs), which are "formulations of ingredients, mostly of exclusive industrial use, typically created by a series of industrial techniques and processes" [84], now comprise over half of all food intake in America [85] and Britain [86]. They displace healthier, less processed food from the diet [87] and contain significantly higher proportions of free sugars, total and saturated fats, salt and energy density, and lower proportions of protein, fiber, vitamins and minerals [88]. They are affordable, hyper-palatable, stimulate repeat purchase, are aggressively marketed and branded, and they are highly profitable [89]. UPF consumption is a significant driver of obesity [90], CVD [91], diabetes [92] and mortality [93]. Prevention is one pillar to address the disease of obesity in those at risk of the disease; it should not be considered in isolation and should not be confused with treatment of those with established disease. A disproportionate focus on prevention may serve to further disparage people living with obesity—that is a result of an individual's choices.

Furthermore, a focus purely on the prevention of disease in people who do not have obesity reflects a failure to recognize the link between those with established obesity and economic outcomes. Not only are people with obesity more likely to develop conditions such as heart disease, diabetes and cancer which increase costs for healthcare systems, but obesity also reduces the employment rate, and increases early retirement, absenteeism and presenteeism [86] which affects the economic prosperity of a country. The OECD (Organization for Economic Co-operation and Development) estimates that through the combined effects of obesity on life expectancy, health expenditure and the labor market, GDP will be 3.3% lower on average in OECD countries [94]. As the World Obesity Federation notes, this is comparable with the impact of COVID-19 in 2020 [95] when global GDP decreased by 3.4% [96]. Therefore, it is vital that obesity is recognized as both a health and economic challenge and that obesity managementand treatment are seen as an investment rather than simply as a cost. This can be done in conjunction with disease prevention in those without obesity.

The complex interactions between political, social and economic factors and obesity were highlighted by the UK government's Foresight Report in 2007 [97], which included an intricate "systems map" of the drivers of obesity. Although the authors of the report were not asked to make specific policy recommendations, they clearly sought to shift the focus from individual to collective and societal responsibility in discussions about public-health policymaking to address the obesity crisis [98]. The report acknowledged that evidence for successful prevention strategies was limited but that the predictions for dramatic increases in population prevalence of obesity mandated urgent government action, without prevarication. While some saw the Foresight report as an exemplar of successful collaboration between biological and social scientists, health professionals, industry representatives, voluntary organizations, and policymakers that would lead to meaningful political action on obesity [99], others expressed concern at the time that the report lacked specific and meaningful policy recommendations, with the obesity system map looking "more like a spilled plate of spaghetti than anything of use to policymakers" [100] and noting that senior scientists had reported being prevented by government officials from writing more precise and meaningful policy recommendations. These fears about ineffective policies appear to have been well-founded. A recent analysis of 689 policies within 14 government strategies in England between 1990 and 2020 noted that those policies tend to be proposed in a way that does not readily lead to implementation, that there is a failure to learn from previous policy failures, and there remains a strong emphasis on individual agency rather than legislation to shape external influences on individual behavior [101].

Some countries have introduced treatment guidelines for obesity (Italy and France, e.g.,); however, uptake is often low, partly as patients must fulfill strict criteria to qualify. For example, in Italy, it was estimated that only 128 bariatric surgical procedures per million people took place in 2012 [102], which has risen steadily as 89,543 procedures were performed between 2014 and 2021 [103]. However, things are starting to change, as evident by the recent UK government announcement of a joint partnership with Eli Lilly of £85 million for innovation

TABLE 1 | Summary of the roundtable discussions.

What we know:

- Obesity remains a major public health crisis, borne by affected individuals, healthcare systems and the society.
- In addressing the obesity crisis, the provision of effective treatment for affected individuals must be accompanied by population-level strategies to address its environmental determinants.
- While changes in the environmental determinants of diet and physical activity behaviors over time have led to a shift in the population distribution of body mass index, an individual's place within that distribution at any point in time is determined by heritability and biology rather than willpower or motivation.
- Treatment of obesity requires a multidisciplinary approach encompassing dietetic, psychological, surgical, medical, nursing, exercise physiology, physiotherapy and occupational therapy expertise.
- Despite proven safety and efficacy of surgical and drug treatments for clinical obesity, access to them remains challenging for many patients because of obesity related misperceptions and bias, high costs, lack of reimbursement, poor understanding of obesity treatments and a lack of adequate infrastructure to provide clinical care

Areas of uncertainty:

- Even with medical and surgical treatments for obesity that are associated with substantial therapeutic weight loss, there is significant and reproducible heterogeneity in treatment response that, while physiologically determined, is currently difficult to predict.
- While therapeutic weight loss with structured lifestyle modification programmes is usually modest and difficult to sustain, the role of these programmes as an adjunct to obesity surgery or to drug therapy has not been adequately assessed in randomized controlled trials.
- While there is consensus that obesity is a chronic, complex, lifelong disease that is characterized by excess fat accumulation which poses a risk to health, there is less agreement on the relative contribution of excess dietary energy intake, reduced physical activity energy expenditure or other factors such as poor sleep quality to excess adiposity.
- While the current definition of obesity using the body mass index (BMI) is recognized as excessively crude and oversimplistic, the characteristics that should define a more nuanced obesity phenotype remain to be determined.
- Because population-level initiatives to address the obesity crisis will only ever have small effect sizes at an individual level, they are often deployed invoking the "precautionary principle," without a priori empirical evidence that they are effective

Future priorities:

- Enhancing collaboration between pharmaceutical and medical technology industries and healthcare systems, in a way that prioritizes the patient with obesity and is financially sustainable and equitable.
- Identifying reliable biomarkers and predictors of obesity treatment response, in order to determine as early as possible whether a specific therapy is likely to work, will help to make treatment more efficacious and cost-effective, while minimizing patient exposure to ineffective and resource-depleting strategies. This is particularly relevant to irreversible treatments that include certain bariatric surgery procedures.
- Defining specific and individualized treatment targets that take account of heterogeneity in the risk of obesity-related complications, the presence of multimorbidity and patient preference is desirable.
- Addressing bias and discrimination against people with obesity amongst clinicians, health policy makers and the wider public, in order to allow the adequate resourcing and deployment of effective prevention and treatment strategies, is important.
- Combining randomized controlled trial and cohort study data, in order to apply next generation "machine learning" and "artificial intelligence" methods to large datasets, to more readily identify factors associated with response heterogeneity and successful treatment response prediction would be helpful

in obesity management pathways, to be delivered via Innovate UK [104]. This initiative aims to develop new approaches and new care delivery mechanisms for people with obesity to get the care they need. This initiative is a good example of putting into practice some of the recommendations made in this paper, like healthcare-industry partnerships, a holistic program to adapt and innovate the obesity care delivery mechanisms focusing on the health outcomes for the patients rather than trying to fit them in a rigid existing healthcare delivery model [104]. Encouraging data are now consistently coming from the USA in a number of reports, including a recent one from Gallup, which show that there has been a decline in the rates of obesity in the United States from 39.9% in 2022 to 37.0% in 2025 [105, 106]. The reports demonstrate this drop consistently across a number of time points, making it more likely that the trend is real. Although causation cannot be inferred, this decrease is associated with the rapid increase in obesity management medications over the last few years. If indeed true, this demonstrates the substantial impact that these medications can potentially have not only on the individual level but also on the population level.

While investments in obesity treatment are welcome, they need to be part of a wider, integrated and long-term policy approach to obesity. To adequately tackle the obesity epidemic, it is important that people living with obesity have access to comprehensive obesity therapy that seeks to identify the most effective, evidence-based treatment option for them. More accurately identifying which treatment options will be effective for which patients will also ensure greater cost-effectiveness for healthcare systems.

11 | Conclusion

In this manuscript we have summarized the discussions that took place at a scientific exchange meeting in which clinicians, academics and representatives of some of the key companies that provide treatments for people living with obesity (Table 1). We identified 9 critical themes that kept coming up in the discussions, areas of uncertainty and five priorities for action to move the needle in obesity care over the next decade. These five priorities are as follows: (1) Enhancing the academia-healthcare-industry collaboration in a way that prioritizes the patient with obesity and healthcare economic value. (2) Identifying reliable biomarkers and predictors of obesity treatment response to determine as early as possible whether a specific therapy is likely to work. (3) Defining specific and individualized treatment targets that take into account the heterogeneity of obesity-related complications risk, the presence of multimorbidity, and patient preference. (4) Addressing bias and discrimination against people with obesity among clinicians, health policy makers and the wider public. (5) Combining randomized controlled trial and cohort study data to apply next generation "machine learning" and "artificial intelligence" methods to large datasets accelerates the identification of factors associated with response heterogeneity and successful treatment response prediction. Despite differences in the group's academic or business priorities and goals, we agreed that we are much more likely to achieve them by working together, rather than against each other.

Funding

The authors have nothing to report.

Conflicts of Interest

The scientific meeting was funded in part by Novo Nordisk, Boehringer Ingelheim, Medtronic and Johnson & Johnson, and representatives from the companies attended all discussions. Boehringer Ingelheim was given the opportunity to review the manuscript for medical and scientific accuracy as it relates to Boehringer Ingelheim substances, as well as intellectual property considerations. A.D.M. has received research funding from the MRC, NIHR, Jon Moulton Charitable Foundation, Anabio, Fractyl, Boehringer Ingelheim, Gila, Randox, and Novo Nordisk. A.D.M. has received honoraria for lectures and presentations from Novo Nordisk, Astra Zeneca, Currax Pharmaceuticals, Boehringer Ingelheim, Screen Health, GI Dynamics, Algorithm, Eli Lilly, Ethicon, and Medtronic. A.D.M. and C.W.l.R. are shareholders in the Beyond BMI clinic, which provides clinical obesity care. A.K. has received grant to his institution by Novo Nordisk Greece, Pharmaserve Lilly Greece and ELPEN Pharma Greece. A.K. has been a consultant for Novo Nordisk Greece, Pharmaserve Lilly Greece, Sanofi Greece and Boehringer Ingelheim. A.K. has received honoraria for lectures and presentations from Novo Nordisk Greece, Pharmaserve Lilly Greece, Astra Zeneca Greece, MSD Greece, Sanofi Greece, Bausch Health Greece, Ethicon Greece, Galenica Pharma Greece, Epsilon Health Greece, and Winmedica Greece. A.K. has received support for attending meetings from Pharmaserve Lilly Greece, Novo Nordisk Greece, Astra Zeneca Greece and Sanofi Greece. A.K. has held unpaid positions as Member of the Steering Committee of the Metabolic Surgery Study Group of the EASD, Vice-President, Hellenic Medical Association for Obesity and Member of the Executive Board, Hellenic Atherosclerosis Society. A.T. was an employee of Novo Nordisk at the time of writing this manuscript and he is currently an employee of Amgen Research Copenhagen, which has no role in this manuscript. A.T. is a stockholder of Novo Nordisk. J.T. and I.D. are employees and shareholders of Johnson & Johnson MedTech. R.R. is an employee of Novo Nordisk Health Care AG, and shareholder of Novo Nordisk A/S. I.L. received research funding (paid to institution) and/or product from NovoNordisk, Boehringer-Ingelheim, and Dexcom. I.L. received research related consulting fees (paid to institution) from NovoNordisk. I.L. received advisory/consulting fees and/or other support from: Abbvie, Altimmune, Alveus Therapeutics, Amgen, Antag Therapeutics, Astra Zeneca, Bayer, Betagenon AB, Bioio Inc., Biomea, Boehringer-Ingelheim, Carmot, Cytoki Pharma, Eli Lilly, Intercept, Janssen/J&J, Juvena, Keros Therapeutic Inc, Mediflix, Merck, Metsera, Neurocrine, Novo Nordisk, Pharmaventures, Pfizer, Regeneron, Roche, Sanofi, Shionogi, Source Bio, Structure Therapeutics, TARGET RWE, TERNS Pharma, The Comm Group, WebMD, and Zealand Pharma. I.L. has received honoraria for lectures and presentations from Astra Zeneca and Novo-Nordisk. I.L. has received support for attending meetings from NovoNordisk, AstraZeneca, and Neurocrine. D.R. is currently a clinical investigator for Amgen, Astra Zeneca, Boehringer Ingelheim, Tern and Novo Nordisk; received consultant/advisor fees from Novo Nordisk, Regeneron, Boehringer Ingelheim, Shionogi, Cytoki, Lilly, Neurocrine, Abbvie, Astra Zeneca, Tern, Pfizer, Roche, Ferring; payment or honoraria for participating as a speaker from Novo Nordisk; medical writing support from Novo Nordisk, Boehringer Ingelheim; and is a shareholder of Abbvie. J.Q.P. has served a Data Safety and Monitoring Board member on NIH metformin in Dementia tool, NIH ARMMS T2D Adjudication Committee, Regeneron Pharmaceuticals and in Novo Nordisk. J.Q.P. has received travel support for meetings from The Obesity Society and The American Diabetes Association. M.H. has received research grant to his institution by breakthrough T1D (formerly JDRF) which includes Clinical Research grant. D.P. has been a consultant for Jonhson & Johnson, Novo Nordisk, Pfizer, GSK, and Medtronic. D.P. has received honoraria for presentation and lectures from Johnson & Johnson, Medtronic, and Novo Nordisk. D.P. has been in leadership roles in the Bariatric Specialty Lead British Obesity and Metabolic Surgery Society and Royal College of Surgeons of England, Steering Committee, and Obesity Empowerment Network. D.P. is a stockholder of Keyron. P.S. has received funding from National Institutes of Health, Ethicon and Medtronic. P.S. has been a consultant for Heron and has received honoraria for lectures and presentations from Novo Nordisk and GI Dynamics. P.S. has been an advisory board member for Lilly, Regeneron and Keyron. P.S. has been a President of the Louisiana Obesity Society. P.S. is a stockholder of Mediflix, SE Healthcare LLC, and Metabolic Health International LTD. C.W.l.R. reported grants from the Irish Research Council, Health Research Board, Science Foundation Ireland and Anabio. C.W.l.R. has received honoraria for lectures and presentations from NovoNordisk, Herbalife, Johnson & Johnson, Eli Lilly, Boehringer Ingelheim, Rhythm Pharmaceuticals, and Currax Pharmaceuticals. C.W.l.R. serves on advisory boards of NovoNordisk, Eli Lilly, Johnson & Johnson, Boehringer Ingelheim, GI Dynamics, Herbalife, Altimmune, Irish Life Health, Amgen, Arrowhead, Roche, AstraZeneca, Keyron and Gila Pharmaceuticals. C.W.l.R. plays a leadership role in the Irish Society for Nutrition and Metabolism. C.W.l.R. was the chief medical officer and director of the Medical Device Division of Keyron in 2021—both of these were unremunerated positions. C.W.l.R. was a previous investor in Keyron, which developed endoscopically implantable medical devices

that mimic the surgical procedures of sleeve gastrectomy and gastric bypass. They do not have any contracts with other companies to put their products into clinical practice. C.W.l.R. continues to provide scientific advice to Keyron for no remuneration. C.W.l.R. is a co-owner obesity clinic providing clinical obesity care Beyond BMI and My best weight. L.B. is a Full-time employee of Boehringer Ingelheim. C.K. was an employee of Boehringer Ingelheim International until March 2024 and is now an employee of Regeneron. I.D. is an employee and shareholder of Johnson & Johnson MedTech. D.G. has no declaration of interest to declare. H.H. is an employee and shareholder of Johnson & Johnson MedTech. M.M.G. is a Full-time employee of Boehringer Ingelheim. S.M. is an employee and shareholder of Johnson & Johnson MedTech. B.S. is an employee of Medtronic. E.S. is an Employee of Boehringer Ingelheim International GmbH and has received support from the same for attending meetings. P.S. has received funding from National Health and Medical Research Council. P.S. has received payment (to her institution) for advisory and speaking activities for Eli Lilly and Novo Nordisk. P.S. has been in unpaid leadership roles in the ANZ Obesity Society (council member—2017–2022) and The Obesity Collective (Leadership group). P.S. has co-authored manuscripts with support for medical writing from Novo Nordisk, and Eli Lilly. F.M.F. is funded by a Clinical Research Career Development Award (Grant N/A) from the Saolta University Healthcare Group in the Health Service Executive (The Irish National Health Service) and by a Science Foundation Ireland CÚRAM project grant (Grant 13/RC/2073-P2). F.M.F. is a DSMB member for University of Michigan LEAP RCT and LEGEND RCT. F.M.F. is a board member of National Office for Clinical Audit, Irish Heart Foundation and was a council member of Royal College of Physicians of Ireland until 2024. F.M.F. is a grant reviewer for Danish Diabetes Academy and Principal Investigator for REDEFINE 2 RCT (Novo Nordisk) and REDEFINE 3 RCT (Novo Nordisk). A.H. is a graduate medical student at Queens University Belfast.

References

1. A. M. Sharma and R. Padwal, "Obesity Is a Sign–Over-Eating Is a Symptom: An Aetiological Framework for the Assessment and Management of Obesity," *Obesity Reviews* 11, no. 5 (2010): 362–370, https://doi.org/10.1111/j.1467-789x.2009.00689.x.

2. F. S. Luppino, L. M. de Wit, P. F. Bouvy, et al., "Overweight, Obesity, and Depression: A Systematic Review and Meta-Analysis of Longitudinal Studies," *Archives of General Psychiatry* 67, no. 3 (2010): 220–229, https://doi.org/10.1001/archgenpsychiatry.2010.2.

3. T. S. Church, J. L. Kuk, R. Ross, E. L. Priest, E. Biltoff, and S. N. Blair, "Association of Cardiorespiratory Fitness, Body Mass Index, and Waist Circumference to Nonalcoholic Fatty Liver Disease," *Gastroenterology* 130, no. 7 (2006): 2023–2030, https://doi.org/10.1053/j.gastro.2006.03.019.

4. C. Bouchard, "Genetics of Obesity: What We Have Learned Over Decades of Research," *Obesity* 29, no. 5 (2021): 802–820, https://doi.org/10.1002/oby.23116.

5. T. O. Kilpeläinen, L. Qi, S. Brage, et al., "Physical Activity Attenuates the Influence of FTO Variants on Obesity Risk: A Meta-Analysis of 218,166 Adults and 19,268 Children," *PLoS Medicine* 8, no. 11 (2011): e1001116, https://doi.org/10.1371/journal.pmed.1001116.

6. Q. Qi, M. K. Downer, T. O. Kilpeläinen, et al., "Dietary Intake, FTO Genetic Variants, and Adiposity: A Combined Analysis of Over 16,000 Children and Adolescents," *Diabetes* 64, no. 7 (2015): 2467–2476, https://doi.org/10.2337/db14-1629.

7. F. Rubino, R. M. Puhl, D. E. Cummings, et al., "Joint International Consensus Statement for Ending Stigma of Obesity," *Nature Medicine* 26, no. 4 (2020): 485–497, https://doi.org/10.1038/s41591-020-0803-x.

8. T. K. Kyle, E. J. Dhurandhar, and D. B. Allison, "Regarding Obesity as a Disease: Evolving Policies and Their Implications," *Endocrinology and Metabolism Clinics of North America* 45, no. 3 (2016): 511–520, https://doi.org/10.1016/j.ecl.2016.04.004.

9. C. H. Jepsen, J. Bowman-Busato, T. Allvin, et al., "Achieving Consensus on the Language of Obesity: A Modified Delphi Study," *EClinicalMedicine* 62 (2023): 102061, https://doi.org/10.1016/j.eclinm.2023.102061.

10. F. Abbasi, C. Blasey, and G. M. Reaven, "Cardiometabolic Risk Factors and Obesity: Does It Matter Whether BMI or Waist Circumference Is the Index of Obesity?," *American Journal of Clinical Nutrition* 98, no. 3 (2013): 637–640, https://doi.org/10.3945/ajcn.112.047506.

11. I. J. Neeland, R. Ross, J.-P. Després, et al., "Visceral and Ectopic Fat, Atherosclerosis, and Cardiometabolic Disease: A Position Statement," *Lancet Diabetes & Endocrinology* 7, no. 9 (2019): 715–725, https://doi.org/10.1016/s2213-8587(19)30084-1.

12. B. Gaynor, B. Habermann, and R. Wright, "Waist Circumference Measurement Diffusion in Primary Care," *Journal for Nurse Practitioners* 14, no. 9 (2018): 683–688.e1, https://doi.org/10.1016/j.nurpra.2018.06.002.

13. S. Goodwin, "The Practical Guide to the Identification, Evaluation and Treatment of Overweight and Obesity in Adults," *Clinical Nurse Specialist* 16, no. 3 (2002): 164, https://doi.org/10.1097/00002800-200205000-00016.

14. Consultation W, *Waist Circumference and Waist-Hip Ratio. Report of a WHO Expert Consultation*, Vol. 2008 (World Health Organization, 2008), 8–11.

15. R. Mallik, J. Carpenter, and A. Zalin, "Assessment of Obesity," *Clinical Medicine* 23, no. 4 (2023): 299–303, https://doi.org/10.7861/clinmed.2023-0148.

16. S. A. Peters, S. H. Bots, and M. Woodward, "Sex Differences in the Association Between Measures of General and Central Adiposity and the Risk of Myocardial Infarction: Results From the UK Biobank," *Journal of the American Heart Association* 7, no. 5 (2018): e008507, https://doi.org/10.1161/jaha.117.008507.

17. R. Ross, I. J. Neeland, S. Yamashita, et al., "Waist Circumference as a Vital Sign in Clinical Practice: A Consensus Statement From the IAS and ICCR Working Group on Visceral Obesity," *Nature Reviews Endocrinology* 16, no. 3 (2020): 177–189, https://doi.org/10.1038/s41574-019-0310-7.

18. P. T. Katzmarzyk, G. A. Bray, F. L. Greenway, et al., "Ethnic-Specific BMI and Waist Circumference Thresholds," *Obesity* 19, no. 6 (2011): 1272–1278, https://doi.org/10.1038/oby.2010.319.

19. G. Rao, T. M. Powell-Wiley, I. Ancheta, et al., "Identification of Obesity and Cardiovascular Risk in Ethnically and Racially Diverse Populations: A Scientific Statement From the American Heart Association," *Circulation* 132, no. 5 (2015): 457–472, https://doi.org/10.1161/cir.0000000000000223.

20. F. Rubino, D. E. Cummings, R. H. Eckel, et al., "Definition and Diagnostic Criteria of Clinical Obesity," *Lancet Diabetes & Endocrinology* (2025).

21. W. Schoenfeld, W. Cumming, "Behavior and Perception," (1962).

22. A. Grannell, C. W. le Roux, and D. McGillicuddy, "'You Are Always at War With Yourself' the Perceptions and Beliefs of People With Obesity Regarding Obesity as a Disease," *Qualitative Health Research* 31, no. 13 (2021): 2470–2485, https://doi.org/10.1177/10497323211040767.

23. S. Nutter, L. A. Eggerichs, T. S. Nagpal, et al., "Changing the Global Obesity Narrative to Recognize and Reduce Weight Stigma: A Position Statement From the World Obesity Federation," *Obesity Reviews* 25, no. 1 (2024): e13642, https://doi.org/10.1111/obr.13642.

24. R. M. Puhl, "Weight Stigma and Barriers to Effective Obesity Care," *Gastroenterology Clinics* 52, no. 2 (2023): 417–428, https://doi.org/10.1016/j.gtc.2023.02.002.

25. D. McPhail and M. Orsini, "Fat Acceptance as Social Justice," *Canadian Medical Association Journal* 193, no. 35 (2021): E1398–E1399, https://doi.org/10.1503/cmaj.210772.

26. A. Selous, I. Finlay, A. Jenkin, E. Smith, and N. Warner, *The Current Landscape of Obesity Services: A Report From the All-Party Parliamentary Group on Obesity* (APPG, 2018).

27. A. Steptoe and P. Frank, "Obesity and Psychological Distress," *Philosophical Transactions of the Royal Society B* 378, no. 1888 (2023): 20220225, https://doi.org/10.1098/rstb.2022.0225.

28. S. Dandgey and E. Patten, "Psychological Considerations for the Holistic Management of Obesity," *Clinical Medicine* 23, no. 4 (2023): 318–322, https://doi.org/10.7861/clinmed.2023-0146.

29. V. Timkova, P. Mikula, and I. Nagyova, "Psychosocial Distress in People With Overweight and Obesity: The Role of Weight Stigma and Social Support," *Frontiers in Psychology* 15 (2025): 1474844, https://doi.org/10.3389/fpsyg.2024.1474844.

30. B. L. Heitmann, "The Impact of Novel Medications for Obesity on Weight Stigma and Societal Attitudes: A Narrative Review," *Current Obesity Reports* 14, no. 1 (2025): 18, https://doi.org/10.1007/s13679-025-00611-5.

31. E. Aasheim, S. Aylwin, S. Radhakrishnan, et al., "Assessment of Obesity Beyond Body Mass Index to Determine Benefit of Treatment," *Clinical Obesity* 1, no. 2–3 (2011): 77–84, https://doi.org/10.1111/j.1758-8111.2011.00017.x.

32. M. Abdelaal, C. W. le Roux, and N. G. Docherty, "Morbidity and Mortality Associated With Obesity," *Annals of Translational Medicine* 5, no. 7 (2017): 161, https://doi.org/10.21037/atm.2017.03.107.

33. A. M. Sharma and D. L. Campbell-Scherer, "Redefining Obesity: Beyond the Numbers," *Obesity* 25, no. 4 (2017): 660–661, https://doi.org/10.1002/oby.21801.

34. R. S. Padwal, N. M. Pajewski, D. B. Allison, and A. M. Sharma, "Using the Edmonton Obesity Staging System to Predict Mortality in a Population-Representative Cohort of People With Overweight and Obesity," *Canadian Medical Association Journal* 183, no. 14 (2011): E1059–E1066, https://doi.org/10.1503/cmaj.110387.

35. R. Swaleh, T. McGuckin, T. W. Myroniuk, et al., "Using the Edmonton Obesity Staging System in the Real World: A Feasibility Study Based on Cross-Sectional Data," *Canadian Medical Association Open Access Journal* 9, no. 4 (2021): E1141–E1148, https://doi.org/10.9778/cmajo.20200231.

36. F. Guo and W. T. Garvey, "Cardiometabolic Disease Staging Predicts Effectiveness of Weight-Loss Therapy to Prevent Type 2 Diabetes: Pooled Results From Phase III Clinical Trials Assessing Phentermine/Topiramate Extended Release," *Diabetes Care* 40, no. 7 (2017): 856–862, https://doi.org/10.2337/dc17-0088.

37. F. Guo, D. R. Moellering, and W. T. Garvey, "The Progression of Cardiometabolic Disease: Validation of a New Cardiometabolic Disease Staging System Applicable to Obesity," *Obesity* 22, no. 1 (2014): 110–118, https://doi.org/10.1002/oby.20585.

38. A. A. Tahrani, M. Panova-Noeva, N. C. Schloot, et al., "Stratification of Obesity Phenotypes to Optimize Future Therapy (SOPHIA)," *Expert Review of Gastroenterology & Hepatology* 17, no. 10 (2023): 1031–1039, https://doi.org/10.1080/17474124.2023.2264783.

39. I. J. Neeland, P. Poirier, and J.-P. Després, "Cardiovascular and Metabolic Heterogeneity of Obesity: Clinical Challenges and Implications for Management," *Circulation* 137, no. 13 (2018): 1391–1406, https://doi.org/10.1161/circulationaha.117.029617.

40. J. P. Wilding, R. L. Batterham, S. Calanna, et al., "Once-Weekly Semaglutide in Adults With Overweight or Obesity," *New England Journal of Medicine* 384, no. 11 (2021): 989–1002, https://doi.org/10.1056/nejmoa2032183.

41. M. Katsoulis, A. G. Lai, K. Diaz-Ordaz, et al., "Identifying Adults at High-Risk for Change in Weight and BMI in England: A Longitudinal, Large-Scale, Population-Based Cohort Study Using Electronic Health Records," *Lancet Diabetes & Endocrinology* 9, no. 10 (2021): 681–694, https://doi.org/10.1016/s2213-8587(21)00207-2.

42. A. T. N. Nair, A. Wesolowska-Andersen, C. Brorsson, et al., "Heterogeneity in Phenotype, Disease Progression and Drug Response in Type 2 Diabetes," *Nature Medicine* 28, no. 5 (2022): 982–988, https://doi.org/10.1038/s41591-022-01790-7.

43. E. Ahlqvist, P. Storm, A. Käräjämäki, et al., "Novel Subgroups of Adult-Onset Diabetes and Their Association With Outcomes: A Data-Driven Cluster Analysis of Six Variables," *Lancet Diabetes & Endocrinology* 6, no. 5 (2018): 361–369, https://doi.org/10.1016/s2213-8587(18)30051-2.

44. N. A. ElSayed, G. Aleppo, R. R. Bannuru, et al., "9. Pharmacologic Approaches to Glycemic Treatment: Standards of Care in Diabetes—2024," supplement, *Diabetes Care* 47, no. Supplement_1 (2024): S158–S178, https://doi.org/10.2337/dc24-s009.

45. D. E. Coral, F. Smit, A. Farzaneh, et al., "Subclassification of Obesity for Precision Prediction of Cardiometabolic Diseases," *Nature Medicine* 31, no. 2 (2025): 534–543, https://doi.org/10.1038/s41591-024-03299-7.

46. P. Saux, P. Bauvin, V. Raverdy, et al., "Development and Validation of an Interpretable Machine Learning-Based Calculator for Predicting 5-Year Weight Trajectories After Bariatric Surgery: A Multinational Retrospective Cohort SOPHIA Study," *Lancet Digital Health* 5, no. 10 (2023): e692–e702, https://doi.org/10.1016/s2589-7500(23)00135-8.

47. A. Strathe, D. B. Horn, M. S. Larsen, et al., "A Model-Based Approach to Predict Individual Weight Loss With Semaglutide in People With Overweight or Obesity," *Diabetes, Obesity and Metabolism* 25, no. 11 (2023): 3171–3180, https://doi.org/10.1111/dom.15211.

48. R. Gupta, R. L. Nielsen, T. Monfeuga, et al. "Data-Driven Identification of Predictive Risk Biomarkers for Subgroups of Osteoarthritis Using an Interpretable Machine Learning Framework: A UK Biobank Study," (2023).

49. W. T. Garvey, "New Horizons. A New Paradigm for Treating to Target With Second-Generation Obesity Medications," *Journal of Clinical Endocrinology & Metabolism* 107, no. 4 (2022): e1339–e1347, https://doi.org/10.1210/clinem/dgab848.

50. H. Shao, M. Laxy, E. W. Gregg, A. Albright, and P. Zhang, "Cost-Effectiveness of the New 2018 American College of Physicians Glycemic Control Guidance Statements Among US Adults With Type 2 Diabetes," *Value in Health* 24, no. 2 (2021): 227–235, https://doi.org/10.1016/j.jval.2020.09.010.

51. American Diabetes Association Professional Practice Committee, "6. Glycemic Goals and Hypoglycemia: Standards of Care in Diabetes—2024," supplement, *Diabetes Care* 47, no. Supplement_1 (2024): S111–S125, https://doi.org/10.2337/dc24-S006.

52. M. D. Jensen, D. H. Ryan, C. M. Apovian, et al., "2013 AHA/ACC/TOS Guideline for the Management of Overweight and Obesity in Adults: A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines and the Obesity Society," supplement, *Circulation* 129, no. 25 Suppl 2 (2014): S102–S138, Epub 20131112, PubMed PMID: 24222017; PubMed Central PMCID: PMC5819889, https://doi.org/10.1161/01.cir.0000437739.71477.ee.

53. J. Golden, *FDA 2007 Draft Guidance for Industry. Developing Products for Weight Management*. (US Department of Health and Human Services, Food and Drug Administration, 2007).

54. European Medicines Agency, *Guideline on Clinical Evaluation of Medicinal Products Used in Weight Management* (EMA, 2016).

55. D. H. Ryan and S. R. Yockey, "Weight Loss and Improvement in Comorbidity: Differences at 5%, 10%, 15%, and Over," *Current Obesity Reports* 6, no. 2 (2017): 187–194, https://doi.org/10.1007/s13679-017-0262-y.

56. K. K. F. MedSci, V. Schnecke, C. L. Haase, et al., "Weight Change and Risk of Obesity-Related Complications: A Retrospective Population-

Based Cohort Study of a UK Primary Care Database," *Diabetes, Obesity and Metabolism* 25, no. 9 (2023): 2669–2679, https://doi.org/10.1111/dom.15154.

57. A. A. Tahrani and J. Morton, "Benefits of Weight Loss of 10% or More in Patients With Overweight or Obesity: A Review," *Obesity* 30, no. 4 (2022): 802–840, https://doi.org/10.1002/oby.23371.

58. S. Wharton, D. C. Lau, M. Vallis, et al., "Obesity in Adults: A Clinical Practice Guideline," *Canadian Medical Association Journal* 192, no. 31 (2020): E875–E891, https://doi.org/10.1503/cmaj.191707.

59. C. M. Perdomo, R. V. Cohen, P. Sumithran, K. Clément, and G. Frühbeck, "Contemporary Medical, Device, and Surgical Therapies for Obesity in Adults," *Lancet* 401, no. 10382 (2023): 1116–1130, https://doi.org/10.1016/s0140-6736(22)02403-5.

60. F. L. Visseren, F. Mach, Y. M. Smulders, et al., "2021 ESC Guidelines on Cardiovascular Disease Prevention in Clinical Practice: Developed by the Task Force for Cardiovascular Disease Prevention in Clinical Practice With Representatives of the European Society of Cardiology and 12 Medical Societies With the Special Contribution of the European Association of Preventive Cardiology (EAPC)," *European Heart Journal* 42, no. 34 (2021): 3227–3337, https://doi.org/10.1093/eurheartj/ehab484.

61. S. Zhang, X. Fu, Z. Du, et al., "Is Waist-to-Height Ratio the Best Predictive Indicator of Cardiovascular Disease Incidence in Hypertensive Adults? A Cohort Study," *BMC Cardiovascular Disorders* 22, no. 1 (2022): 214, https://doi.org/10.1186/s12872-022-02646-1.

62. C. Rueda-Clausen, M. Poddar, S. Lear, P. Poirier, and A. Sharma, *Canadian Adult Obesity Clinical Practice Guidelines: Assessment of People Living With Obesity* (Canadian Adult Obesity Clinical Practice Guidelines, Li Ka Shing Centre for Health Research Innovation, University of Alberta Edmonton, 2020).

63. National Institute for Health and Care Excellence, *Obesity: Identification, Assessment and Management* (National Institute for Health and Care Excellence, 2014).

64. K. L. Olson, R. H. Neiberg, M. A. Espeland, et al., "Waist Circumference Change During Intensive Lifestyle Intervention and Cardiovascular Morbidity and Mortality in the Look AHEAD Trial," *Obesity* 28, no. 10 (2020): 1902–1911, https://doi.org/10.1002/oby.22942.

65. Y. Yuan, K. Liu, M. Zheng, et al., "Analysis of Changes in Weight, Waist Circumference, or Both, and All-Cause Mortality in Chinese Adults," *JAMA Network Open* 5, no. 8 (2022): e2225876, https://doi.org/10.1001/jamanetworkopen.2022.25876.

66. K. Mauldin, M. May, and D. Clifford, "The Consequences of a Weight-Centric Approach to Healthcare: A Case for a Paradigm Shift in How Clinicians Address Body Weight," *Nutrition in Clinical Practice* 37, no. 6 (2022): 1291–1306, https://doi.org/10.1002/ncp.10885.

67. Group UPDS, "Intensive Blood-Glucose Control With Sulphonylureas or Insulin Compared With Conventional Treatment and Risk of Complications in Patients With Type 2 Diabetes (UKPDS 33)," *Lancet* 352, no. 9131 (1998): 837–853, https://doi.org/10.1016/S0140-6736(98)07019-6.

68. U.S. Food and Drug Administration, "Obesity and Overweight: Developing Drugs and Biological Products for Weight Reduction: Guidance for Industry," in *Draft Guidance*, ed. Administration USFaD (FDA, Center for Drug Evaluation and Research, 2025), https://www.fda.gov/media/71252/download.

69. A. J. Sanyal, P. Bedossa, M. Fraessdorf, et al., "A Phase 2 Randomized Trial of Survodutide in MASH and Fibrosis," *New England Journal of Medicine* 391, no. 4 (2024): 311–319, https://doi.org/10.1056/nejmoa2401755.

70. J. Ard, C. O. Andersen, K. Sommer Matthiessen, et al., "Disease Burden and Health Status Among People With Severe Obesity Who Do Not Receive Bariatric Surgery: A Retrospective Study," *Obesity Facts* 16, no. 4 (2023): 326–334, https://doi.org/10.1159/000531032.

71. J. M. Hazlehurst, J. Logue, H. M. Parretti, et al., "Developing Integrated Clinical Pathways for the Management of Clinically Severe Adult Obesity: A Critique of NHS England Policy," *Current Obesity Reports* 9, no. 4 (2020): 530–543, https://doi.org/10.1007/s13679-020-00416-8.

72. D. R. Saxon, S. J. Iwamoto, C. J. Mettenbrink, et al., "Antiobesity Medication Use in 2.2 Million Adults Across Eight Large Health Care Organizations: 2009–2015," *Obesity* 27, no. 12 (2019): 1975–1981, https://doi.org/10.1002/oby.22581.

73. B. Clapp, J. Ponce, J. Corbett, et al., "American Society for Metabolic and Bariatric Surgery 2022 Estimate of Metabolic and Bariatric Procedures Performed in the United States," *Surgery for Obesity and Related Diseases* 20, no. 5 (2024): 425–431, https://doi.org/10.1016/j.soard.2024.01.012.

74. T. N. Kim, "Barriers to Obesity Management: Patient and Physician Factors," *Journal of Obesity & Metabolic Syndrome* 29, no. 4 (2020): 244–247, https://doi.org/10.7570/jomes20124.

75. H. Gasoyan, G. Tajeu, M. T. Halpern, and D. B. Sarwer, "Reasons for Underutilization of Bariatric Surgery: The Role of Insurance Benefit Design," *Surgery for Obesity and Related Diseases* 15, no. 1 (2019): 146–151, https://doi.org/10.1016/j.soard.2018.10.005.

76. L. M. Kaplan, A. Golden, K. Jinnett, et al., "Perceptions of Barriers to Effective Obesity Care: Results From the National ACTION Study," *Obesity* 26, no. 1 (2018): 61–69, https://doi.org/10.1002/oby.22054.

77. A. Diallo, F. Andreelli, F. Pattou, et al., "Perceptions of Bariatric Surgery in Patients With Type 2 Diabetes: Data From a Self-Administered Questionnaire," *Surgery for Obesity and Related Diseases* 19, no. 12 (2023): 1346–1354, https://doi.org/10.1016/j.soard.2023.06.012.

78. OECD, *The Heavy Burden of Obesity: The Economics of Prevention* (OECD Health Policy Studies, OECD Publishing, 2019), https://www.oecd.org/content/dam/oecd/en/publications/reports/2019/10/the-heavy-burden-of-obesity_0beeff1b/67450d67-en.pdf?utm_source=chatgpt.com.

79. L. Roux and C. Donaldson, "Economics and Obesity: Costing the Problem or Evaluating Solutions?," *Obesity Research* 12, no. 2 (2004): 173–179, https://doi.org/10.1038/oby.2004.23.

80. S. Harrison, P. Dixon, H. E. Jones, A. R. Davies, L. D. Howe, and N. M. Davies, "Long-Term Cost-Effectiveness of Interventions for Obesity: A Mendelian Randomisation Study," *PLoS Medicine* 18, no. 8 (2021): e1003725, https://doi.org/10.1371/journal.pmed.1003725.

81. National Institute for Health and Care Excellence, *Semaglutide for Managing Overweight and Obesity* (National Institute for Health and Care Excellence, 2023).

82. (NICE) NIfHaCE, Tirzepatide for Managing Overweight and Obesity [Guideline] (2024) [updated 03/09/2025], https://www.nice.org.uk/guidance/ta1026/resources/a-practical-guide-to-using-medicines-to-manage-overweight-and-obesity-15299628589/chapter/prescribing-reviewing-and-stopping-tirzepatide#:~:text=If%20the%20person%20is%20tolerating,diet%20and%20increasing%20physical%20activity.

83. World Health Organization, *Controlling the Global Obesity Epidemic* [Internet] (WHO, 2025), https://www.who.int/activities/controlling-the-global-obesity-epidemic.

84. C. A. Monteiro, J.-C. Moubarac, R. B. Levy, D. S. Canella, M. L. da Costa Louzada, and G. Cannon, "Household Availability of Ultra-Processed Foods and Obesity in Nineteen European Countries," *Public Health Nutrition* 21, no. 1 (2018): 18–26, https://doi.org/10.1017/s1368980017001379.

85. L. G. Baraldi, E. M. Steele, D. S. Canella, and C. A. Monteiro, "Consumption of Ultra-Processed Foods and Associated Sociodemographic Factors in the USA Between 2007 and 2012: Evidence From a Nationally Representative Cross-Sectional Study," *BMJ Open* 8, no. 3 (2018): e020574, https://doi.org/10.1136/bmjopen-2017-020574.

86. F. Rauber, M. L. da Costa Louzada, E. M. Steele, et al., "Ultra-Processed Foods and Excessive Free Sugar Intake in the UK: A

Nationally Representative Cross-Sectional Study," *BMJ Open* 9, no. 10 (2019): e027546, https://doi.org/10.1136/bmjopen-2018-027546.

87. D. Martini, J. Godos, M. Bonaccio, P. Vitaglione, and G. Grosso, "Ultra-Processed Foods and Nutritional Dietary Profile: A Meta-Analysis of Nationally Representative Samples," *Nutrients* 13, no. 10 (2021): 3390, https://doi.org/10.3390/nu13103390.

88. C. A. Monteiro, J. C. Moubarac, G. Cannon, S. W. Ng, and B. Popkin, "Ultra-Processed Products Are Becoming Dominant in the Global Food System," supplement, *Obesity Reviews* 14, no. S2 (2013): 21–28, https://doi.org/10.1111/obr.12107.

89. C. A. Monteiro, G. Cannon, J.-C. Moubarac, R. B. Levy, M. L. C. Louzada, and P. C. Jaime, "The UN Decade of Nutrition, the NOVA Food Classification and the Trouble With Ultra-Processing," *Public Health Nutrition* 21, no. 1 (2018): 5–17, https://doi.org/10.1017/s1368980017000234.

90. F. Juul, E. Martinez-Steele, N. Parekh, C. A. Monteiro, and V. W. Chang, "Ultra-Processed Food Consumption and Excess Weight Among US Adults," *British Journal of Nutrition* 120, no. 1 (2018): 90–100, https://doi.org/10.1017/s0007114518001046.

91. K. Mendoza, S. A. Smith-Warner, S. L. Rossato, et al., "Ultra-Processed Foods and Cardiovascular Disease: Analysis of Three Large US Prospective Cohorts and a Systematic Review and Meta-Analysis of Prospective Cohort Studies," *Lancet Regional Health–Americas* 37 (2024): 100859, https://doi.org/10.1016/j.lana.2024.100859.

92. F. Imamura, L. O'Connor, Z. Ye, et al., "Consumption of Sugar Sweetened Beverages, Artificially Sweetened Beverages, and Fruit Juice and Incidence of Type 2 Diabetes: Systematic Review, Meta-Analysis, and Estimation of Population Attributable Fraction," *BMJ* 351 (2015): h3576, https://doi.org/10.1136/bmj.h3576.

93. A. Rico-Campà, M. A. Martínez-González, I. Alvarez-Alvarez, et al., "Association Between Consumption of Ultra-Processed Foods and All Cause Mortality: SUN Prospective Cohort Study," *BMJ* 365 (2019): l1949, https://doi.org/10.1136/bmj.l1949.

94. M. Cecchini and S. Vuik, *The Heavy Burden of Obesity* (OECD Publishing, 2019).

95. E. Mahase, *Global Cost of Overweight and Obesity Will Hit $4.32 tn a Year by 2035, Report Warns* (British Medical Journal Publishing Group, 2023).

96. Statista, "Global Real Gross Domestic Product (GDP) Growth After the Coronavirus (COVID-19) From 2019 With a Forecast Until 2024," [Internet] (2023), https://www.statista.com/statistics/1102889/covid-19-forecasted-global-real-gdp-growth/.

97. B. Butland, S. Jebb, P. Kopelman, et al., "Foresight. Tackling Obesities: Future Choices," Project Report (2007).

98. K. McPherson, T. Marsh, and M. Brown, "Foresight Report on Obesity," *Lancet* 370, no. 9601 (2007): 1755, https://doi.org/10.1016/s0140-6736(07)61740-1.

99. D. King, "Foresight Report on Obesity," *Lancet* 370, no. 9601 (2007): 1754, https://doi.org/10.1016/s0140-6736(07)61739-5.

100. A. Jack, "Foresight Report on Obesity–Author's Reply," *Lancet* 370, no. 9601 (2007): 1755, https://doi.org/10.1016/s0140-6736(07)61741-3.

101. D. R. Theis and M. White, "Is Obesity Policy in England Fit for Purpose? Analysis of Government Strategies and Policies, 1992–2020," *Milbank Quarterly* 99, no. 1 (2021): 126–170, https://doi.org/10.1111/1468-0009.12498.

102. O. Borisenko, Z. Colpan, B. Dillemans, P. Funch-Jensen, J. Hedenbro, and A. R. Ahmed, "Clinical Indications, Utilization, and Funding of Bariatric Surgery in Europe," *Obesity Surgery* 25, no. 8 (2015): 1408–1416, https://doi.org/10.1007/s11695-014-1537-y.

103. V. Manno, V. Minardi, M. Masocco, F. Cobellis, G. Minelli, and D. Greco, "First National Analysis of Severe Obesity Hospitalizations in Italy: Insights From Discharge Card Database," *Frontiers in Public Health* 12 (2024): 1332076, https://doi.org/10.3389/fpubh.2024.1332076.

104. *Enhancing Weight Management Support in the UK* (Innovate UK, 2025), https://iuk-business-connect.org.uk/news/enhancing-weight-management-support-in-the-uk/.

105. B. Rader, R. Hazan, and J. S. Brownstein, eds., *Changes in Adult Obesity Trends in the US. JAMA Health Forum* (American Medical Association, 2024).

106. D. Witters, M. P. James, *Obesity Rate Declining in U.S.* (Gallup, 2025), https://news.gallup.com/poll/696599/obesity-rate-declining.aspx.