

# Obesity in context: Challenging BMI and embracing metabolic diversity

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## 1. INTRODUCTION & OBJECTIVES

The **International Classification of Diseases** first recorded obesity in **1948**. The misconception that **obesity** is merely a lifestyle decision that can be **reversible** through the exercise of **willpower** has persisted in public discourse and in the **medical community**. Nevertheless, obesity is recognized by the **World Health Organization (WHO)** as a **chronic disease** characterized by “**an abnormal or excessive accumulation of fat that is a health hazard**”. In the context of patient level care, there is a central and simple logical inconsistency: **the therapeutic field is still based on the Body Mass Index (BMI; weight/height<sup>2</sup>)**. This marker is calculated using a BMI chart, which attempts to quantify a level of tissue mass (**composed of bone, fat, and muscle**) in an individual (**Figure 1**). This indicator, occasionally called the **Quetelet index**, only measures weight and height, without **considering distribution of adiposity, muscle mass** or **metabolic impairments**, leading to **imprecise diagnoses**. The consideration of **obesity** as a disease based on BMI alone impedes progress in social recognition and understanding of the disease, leading to unintended iatrogenesis and hindering research.

Hence, it is indispensable to **better characterize body composition and metabolic status**, as well as to differentiate **between clinical and preclinical obesity**, as a set of complex diseases, **to target and treat more equitably**.

The purpose of this systematic review is to address **the latest progress** in the **ambiguity surrounding the diagnosis of obesity** based on BMI and, how it **impacts individuals**.

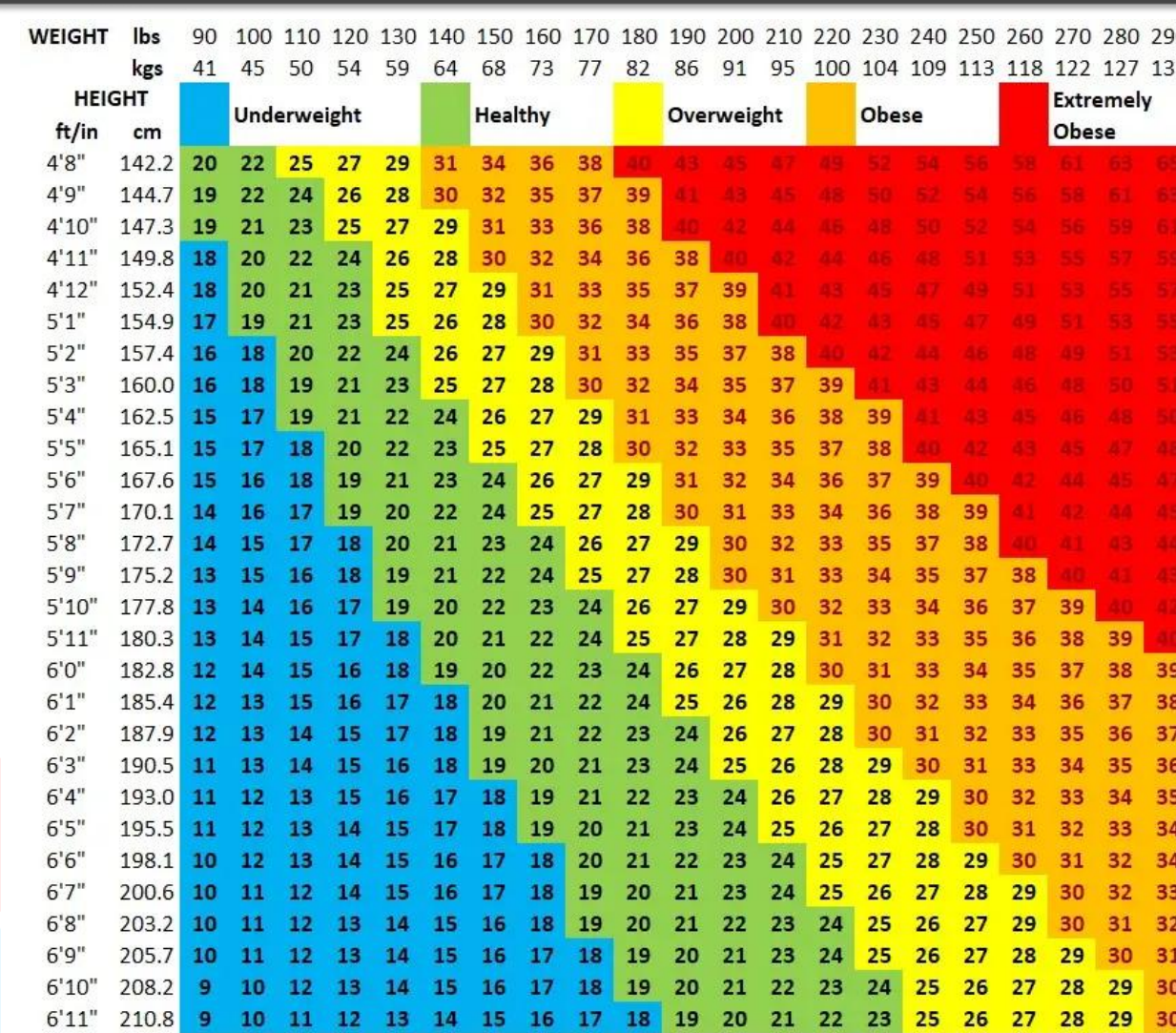


Figure 1. Body mass index chart made in Excel.

## 2. WHY BMI IS INACCURATE AND MISLEADING?

- 1) It overlooks the physiological distinctions in body fat percentage** among different genders (e.g., women have 10-13% essential body fat, while men have 2-5%).
- 2) Height biasing:** BMI scales **weight by height<sup>2</sup>**, rather than **height<sup>3</sup>**, leading to **overestimation of height in tall subjects and underestimation in shorter ones**.
- 3) Weight vs. fat:** It cannot discriminate lean mass from fat mass or bone density, resulting in **misclassifications** of metabolic health as type I (**false positives**) or type II (**false negatives**) (**Figure 2**).
- 4) Athletic populations:** large skeletal muscular mass raises BMI.

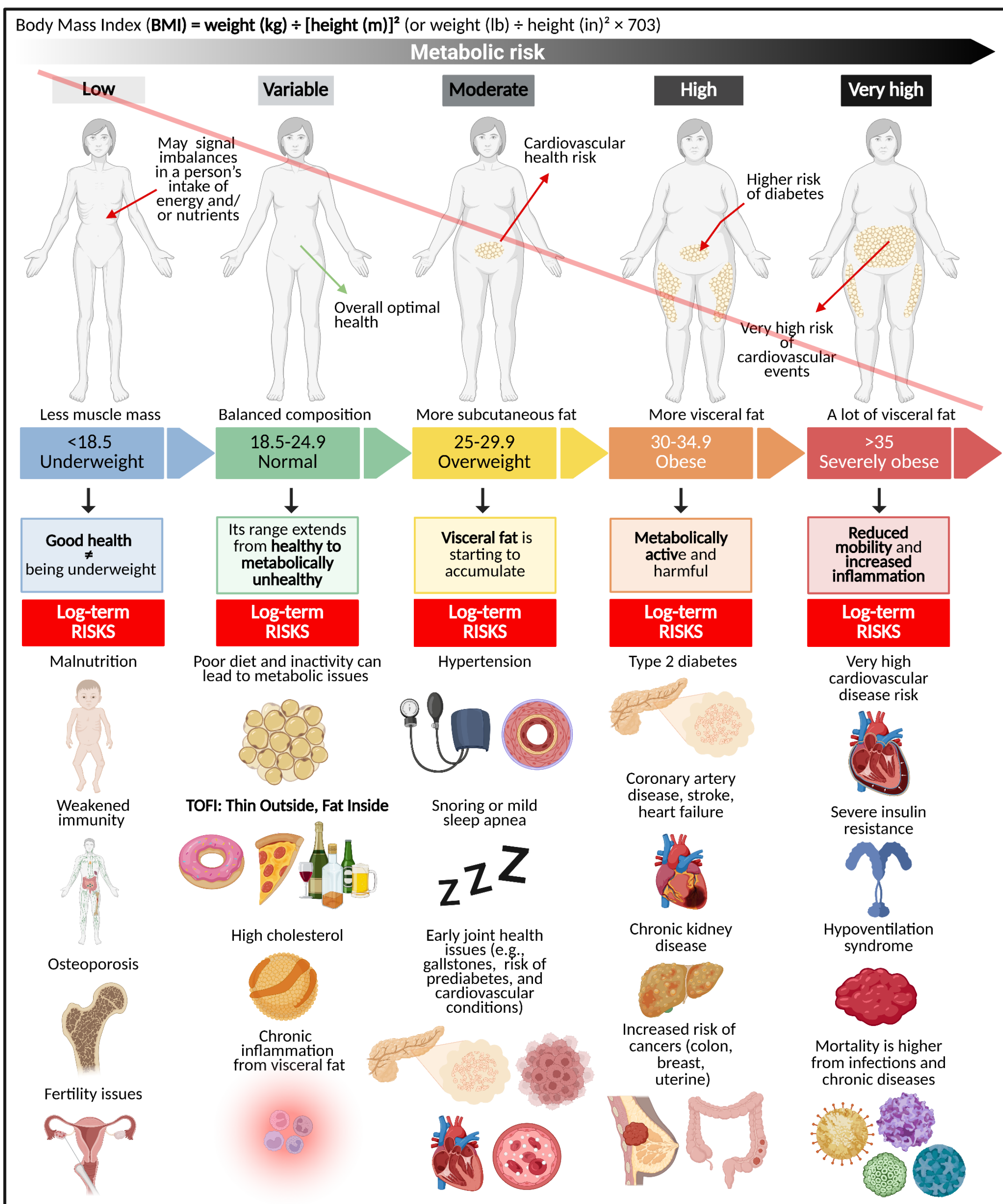


Figure 2. BMI categories, their association with body composition, and the potential health implications.

## 3. WHAT ARE ALTERNATIVE MEASURES TO BMI?

- 1) Adiposity measures:**
  - Percentage body fat (PBF):** The ratio of fat to total body weight (%).
  - Skinfold thickness:** Subcutaneous body-fat measurement using skinfold calipers.
  - Bioelectrical impedance analysis (BIA):** A method that uses electrical current and resistance to measure body composition.
  - Dual-energy X-ray absorptiometry (DXA):** Medical imaging technique for bone mineral density (BMD) measurement using spectral imaging.
- 2) Fat distribution indicators:**
  - Waist circumference (WC)
  - Waist-to-hip ratio (WHR)
  - Waist-to-height ratio (WHtr)
- 3) Functional health indicators:**
  - VO<sub>2</sub> Max (maximum oxygen consumption)**
  - Grip strength:** Overall health indicator that shows mobility, bone density, and heart health.
  - Blood pressure, fasting glucose, lipid profile (cardiometabolic health panel)**
- 4) Composite index**
  - Body adiposity index (BAI):** hip circumference and height
  - Body Shape Index (ABSI):** Height- and weight-adjusted waist circumference.

## IS BMI A FAIR PROXY FOR OBESITY?

The **conundrum of measuring BMI** in large epidemiological samples has led to extensive research. Critics claim that BMI is **insensitive to obesity and overlooks underlying metabolic disorders**. Further, high BMI **does not necessarily indicate disease**. BMI fails to distinguish between fat and muscle, nor does it account for body composition. Thus, reliance on BMI can mislead research, public health policy, and societal perception. **BMI is just one measure of obesity, and more advanced methods, like BAI, can provide a more accurate picture.**

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