Investigating Gender and Ethnic Bias in Body Mass Index and How Body Fat Percentage Can Improve AI Diagnoses Across Age, Sex, and Ethnicity

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The Body Mass Index carries gender and ethnic bias that will endanger the future of AI diagnosis. The BMI overlooks that people can have the same BMI yet have vastly different body compositions due to differences in sex, age, and ethnicity. Females have higher Body Fat % (BF%) than males due to sex-specific fats. Different ethnicities facing historic famine, epigentically have higher BF% due to autophagy, where the body evolved to adapt to a period of famine where it will preserve fat stores, and burn lean mass to preserve energy and prolong life. The better health indicator is the body fat percentage (BF%) as higher BF% causes increased risks of heart disease, strokes, and insulin resistance. Results indicate that the different health categories for the BMI and the BF% (underweight, healthy, overweight, obese) do not intersect perfectly. Findings reveal that over 55% of males and 88.7% of females with a healthy BMI may still face misdiagnosis due to high BF%. Korea serves as a case study for the effects of colonialism and famine, while Germany represents the ideal demographic BMI was modeled after, and colonial powers. Notably, 99.9% of Korean males have a healthy BMI but exhibit extremely high BF%, compared to only 23.3% of German males, highlighting critical gaps in health assessment, especially with emerging AI diagnostic tools that often rely on biased BMI data. In the European Union, ethnicity is not collected in data, thus removing a key indicator of health. Many Asian females also present 'healthy' BMIs but have high BF%, leading to undiagnosed health risks linked to sex-related fats and historical factors. This study underscores the necessity of incorporating BF% into health assessments to improve diagnostic accuracy.

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