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Future Healthcare Trend for 2024: Cellular Health

# 2024 **InBody Report**

SEE WHAT YOU'RE MADE OF

# InBody Report

## Introduction

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InBody is pleased to announce the release of our second annual report. Since our establishment in 1996, InBody has remained firm in our commitment to enhancing people's health over the course of 28 years. Throughout our extensive journey, we have meticulously gathered body composition data from diverse regions across the globe. The 2024 InBody Report presents comprehensive insights into people's health and lifestyles, drawing upon the wealth of worldwide body composition data accumulated over the years.

Since the publication of the 2023 InBody Report last year, InBody's body composition data has obtained global attention. Fitness trainers have broadened their coaching perspectives through InBody's body composition data, while academics have utilized it as a valuable tool for evidence in medical research and development. InBody's expansive data collection reflects the varied climates, environments, and cultures of the regions we live in, providing guidance on how and in what direction we should move towards creating a healthier future.

As of August 2023, InBody's worldwide body composition data has reached 100 million records. The 2024 InBody Report presents detailed insights into body compositions from an even more diverse array of countries and individuals residing in distinct cultures and lifestyles. InBody's body composition data has now become more diversified and in-depth.

We now find ourselves in an era where a focus on change is important. The InBody Report will persist in its role as a provider of global body composition trends, empowering individuals to make informed decisions for a healthier future.

\* The data used in this report were used solely for statistical purposes, providing only personal information that was agreed upon. Information that can identify individuals was not included in the content.

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**InBody**

ID  
120651320

**Body Composition Analysis**

Intracellular Water (%)	61.1
Extracellular Water (%)	37.9
Dry Lean Mass (%)	85.1
Body Fat Mass (%)	14.9

**Body Fat Analysis**

**...so My Results Tell Me**  
Explanation of the changes your results will fall under and

**Body Composition Analysis**  
... understand your body composition. Compare the length of a  
Mass) for a snapshot of your current body composition.

... solely on your height and weight. BMI is unad  
Percent Body Fat (PBF) is much more spe  
amount of body fat to total weight  
developing different disea



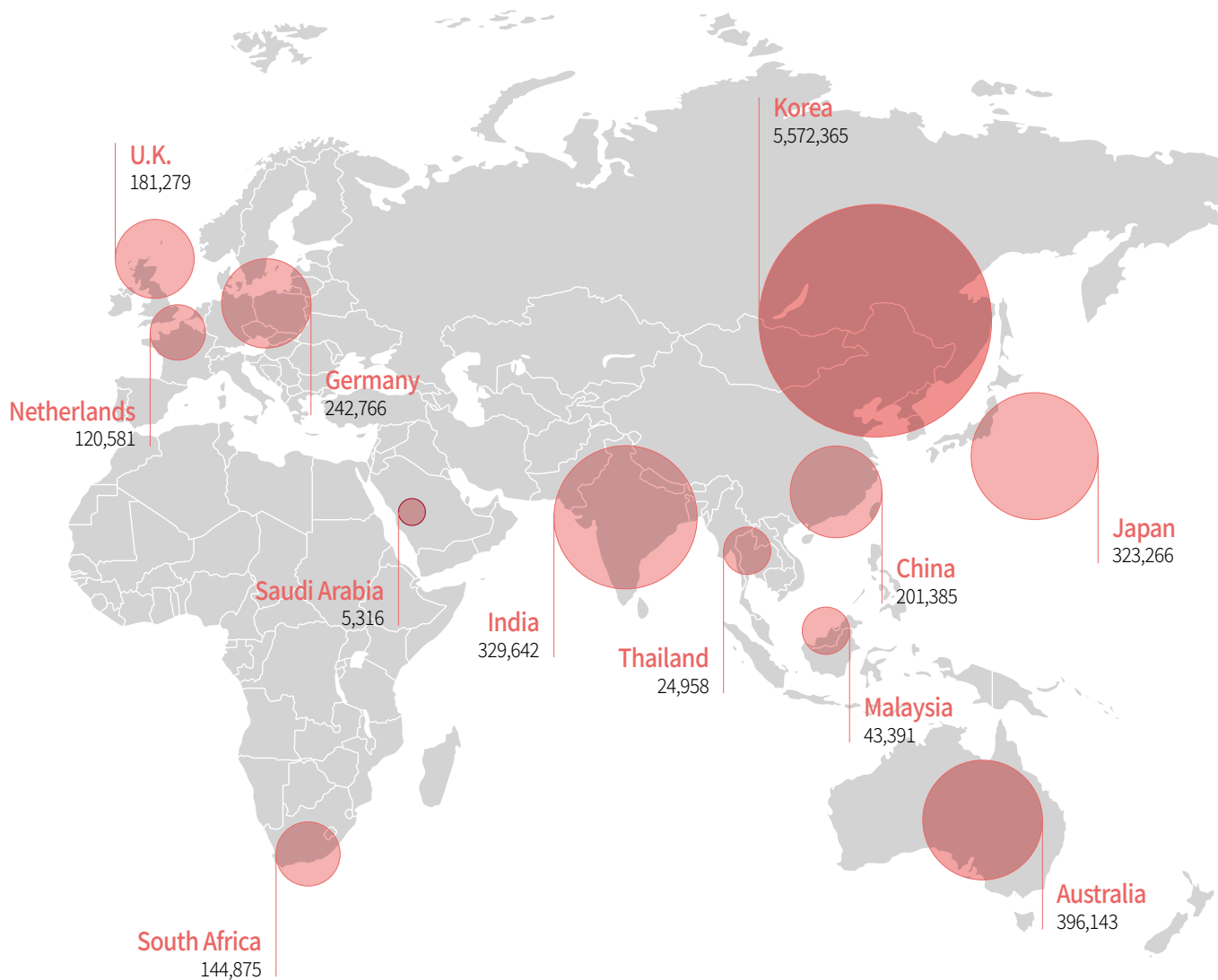
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# 01 INTRO

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The contents of this report were prepared based on InBody measurement data accumulated from around the world, and they cover body composition trends in various countries, gender, and age groups.

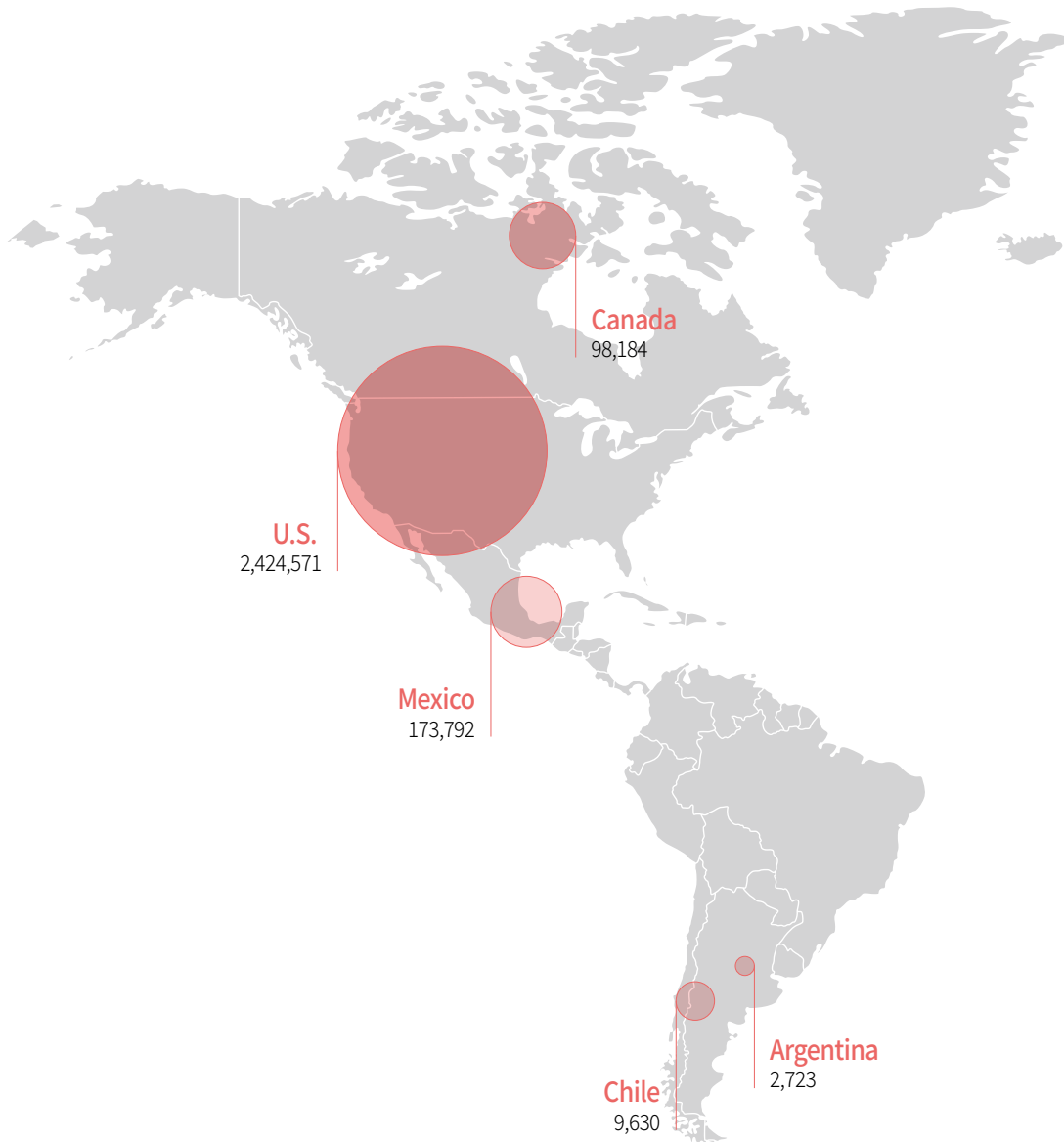
We would like to help all readers around the world who read this report to check and compare where their body composition is currently positioned, and lead a healthy life through more systematic body composition management.



## The 2024 InBody Report: Methods for Data Processing

Data on body composition from individuals worldwide, measured using InBody devices, is currently being accumulated in real-time in the cloud. On August 4, 2023, the total number of data points surpassed 100 million, reaching 109,480,844 by November 2023, and ongoing data collection. For the 2024 InBody report, we analyzed 5 years' worth of data collected worldwide from 2018 to 2022. To provide the most generalized information, statistical processing (based on Mahalanobis distance) was conducted to address input and measurement errors, and other factors. The report is based on data from 17 countries, including South Korea, Japan, China, the U.S., the United Kingdom (UK), and Germany, and focuses on adults aged over 20 years who had taken InBody tests and showed high levels of interest in their health.

\* The data used in this report were used solely for statistical purposes, to provide information, limited to the data for which personal information was agreed upon, and no information that can identify individuals is included in the data.



	Argentina	Australia	Canada	Chile	China	Germany	India	Japan
<b>Male</b>	1,169	140,099	47,768	3,060	87,288	109,161	195,744	133,725
<b>Female</b>	1,554	256,044	50,416	6,570	114,097	133,605	133,898	189,541
<b>Total</b>	2,723	396,143	98,184	9,630	201,385	242,766	329,642	323,266

	Korea	Malaysia	Mexico	Netherlands	Saudi Arabia	South Africa	Thailand	U.K.	U.S.
	2,083,928	17,683	64,934	53,476	2,603	61,784	11,721	81,730	989,151
	3,488,437	25,708	108,858	67,105	2,713	83,091	13,237	99,549	1,435,420
	5,572,365	43,391	173,792	120,581	5,316	144,875	24,958	181,279	2,424,571

\*Data from China is the data after 2019.

\* We selected the 17 countries based on the amount of accumulated body composition data collected by InBody Professional BCA devices in each country.

## What You See Is Not What It Seems. The Limitations of Body Mass Index (BMI)



BMI (Body Mass Index) is a metric used to assess obesity levels based on height and weight, providing a convenient way to roughly gauge overall health. However, in reality, individuals with low BMI values may have high body fat percentages, whereas those with high BMI values may have low body fat percentages. Therefore, caution is advised when interpreting BMI as a measure of overweight and obesity, as individuals with the same BMI may have different body compositions.

BMI measurement considers individuals with the same height and weight as equals, failing to distinguish between those with high or low muscle mass resulting in higher or lower weight, respectively. A BMI value within the normal range does not necessarily correspond to a standard body fat percentage, and actual body fat percentage can be unrelated to BMI values.





Owing to varying health thresholds among individuals, relying solely on BMI for health status assessment is of limited value. Focusing solely on weight loss to reduce BMI can yield negative results. For instance, solely adjusting diet without incorporating exercise may lead to muscle loss and an increase in body fat percentage. This is a classic limitation of using BMI as a health status metric.

To accurately understand current health status, precise measurement of body composition is crucial. By measuring exact muscle mass and body fat percentage, individuals can gain a clear understanding of their current state and chart a course for the future. The 2024 InBody report focuses on muscle mass and body fat percentage to understand global body composition trends. The report reveals trends by country, age, and sex based on muscle mass and body fat percentage, as well as how body composition can be used as medical information and predicts the 2024 health trends.

# A List of Body Composition Terminologies

The human body is composed of various components such as water, fat, protein, and minerals, collectively referred to as the body composition. In this report, we use several terms related to body composition. To help readers understand these terms more easily, we have organized them into related categories.

## 1. Body Mass Index (BMI)

BMI is a measure of body weight relative to height. It is calculated by dividing an individual's weight in kilograms by the square of their height in meters ( $\text{kg}/\text{m}^2$ ). The BMI is commonly used in nutritional science and sports medicine to assess the degree of apparent obesity.

## 2. Percentage Body Fat (PBF) $\text{PBF}(\%) = (\text{Body Fat Mass}(\text{kg}) / \text{Weight}(\text{kg})) \times 100$

PBF measures the amount of fat mass by dividing the body fat mass by weight and multiplying it by 100. Although BMI is determined by weight and height, it cannot accurately diagnose obesity because it fails to reflect changes in both muscle and body fat mass. Therefore, bodybuilders with high muscle mass and low body fat may be diagnosed with obesity. However, PBF is an index that is often used to determine whether someone is overweight as it indicates the amount of body fat present. Owing to different body structures, PBF standards are different for men and women, with the standard range for men being 10–20% and for women being 18–28%.

## 3. Fat-Free Mass (FFM) $\text{FFM}(\text{kg}) = \text{Weight}(\text{kg}) - \text{Body Fat Mass}(\text{kg})$

FFM is also known as lean mass. Despite weighing the same weight, some individuals appear thinner whereas others appear heavier. Body components can be divided into two categories: fat and non-fat. Fat stored in the body is referred to as body fat, whereas the weight remaining after subtracting body fat is known as lean mass. Lean mass consists of elements that comprise the human body, such as the muscles, bones, organs, brain, and water, excluding body fat. Muscle is the most important component of lean mass, as it contributes to a higher basal metabolic rate. Therefore, a higher proportion of lean mass in the body can be beneficial for metabolism and overall health.

## 4. Body Fat Mass (BFM) $\text{BFM}(\text{kg}) = \text{Weight}(\text{kg}) - \text{Fat Free Mass}(\text{kg})$

As mentioned earlier, body weight is the sum of BFM and FFM. A high amount of body fat increases the risk of cardiovascular diseases such as diabetes, high blood pressure, and hyperlipidemia.



## 5. Skeletal Muscle Mass (SMM)

Three types of muscles constitute the body: myocardium, smooth muscle, and skeletal muscle. Myocardium refers to the muscles of the heart, and smooth muscle refers to the muscles present in organs. Myocardium and smooth muscle are involuntary muscles that cannot be controlled at will, whereas skeletal muscle is attached to the bones or tendons and contracts voluntarily to create movement. When we talk about building muscle with exercise, we are usually referring to building skeletal muscle.

## 6. Skeletal Muscle mass Index (SMI) $SMI(kg/m^3) = \text{Appendicular Skeletal Muscle Mass}(kg) / \text{Height}^2(m^2)$

SMI is calculated by dividing the muscle mass of the limbs excluding the trunk by the square of the height ( $m^2$ ) and is an important diagnostic index. In 2016, the World Health Organization classified sarcopenia as a disease, making SMI a key tool in diagnosing the condition. Sarcopenia refers to the gradual loss of muscle mass and strength that occurs with aging. According to the diagnostic criteria of the Asian Working Group on Sarcopenia 2019,<sup>1</sup> SMI  $< 7.0 \text{ kg}/m^2$  for men or  $< 5.7 \text{ kg}/m^2$  for women is considered sarcopenia.

## 7. Whole Body ECW Ratio $\text{Extracellular Water Ratio} = \text{Extracellular Water} / \text{Total Body Water}$

The ECW ratio indicates the balance of water in the body. In healthy individuals, the ratio of intracellular water (ICW) to ECW remains constant at 3:2, and edema can occur when this ratio is disrupted.

The ECW ratio is mainly increased in edematous diseases (kidney failure, heart failure, liver cirrhosis, diabetes, etc.) owing to increased ECW and when ICW is decreased, as in nutritional conditions such as aging and sarcopenia. Therefore, the ECW ratio is widely used as an indicator of edema as well as an indicator of nutritional status and disease severity. The standard range for the ECW ratio is 0.360–0.390, with values  $> 0.400$  generally considered high.

## 8. Whole Body Phase Angle

The phase angle shows the resistance of the cell membrane in degrees, and the higher the structural stability of the cell (cell membrane integrity), the larger the value. It is used as an indicator of the nutritional status of cells, severity assessment of chronic diseases, and life prognosis, as the value is large when the cell is healthy and approaches zero as the cell membrane condition deteriorates.

Typically, the phase angle is the right half of the body in the 50 kHz frequency band, which is called the whole body phase angle.









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## 02

# MAIN

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### I . Global Body Composition Trends by Country/Sex

Within a country, people with different body compositions coexist, and globally, countries exhibit different body compositions owing to racial and cultural differences. In this chapter, we will take a closer look at muscle mass and body fat percentage in 17 countries based on InBody big data.

### II . National Body Composition Trends by Age/Sex

The previous chapter discussed the differential distribution of body compositions within each country. But what are the differences in body composition by age and sex within a country? In this chapter, we will take a closer look at body composition trends by age and sex.

### III. Body Composition as a Medical Marker

The flow of body composition can be a very important indicator for diagnosing disease, tracking whether you are getting better or worse, and prognostication after surgery or recovery. In this chapter, we'll look at body composition by country, with a focus on extracellular water as a medical marker.

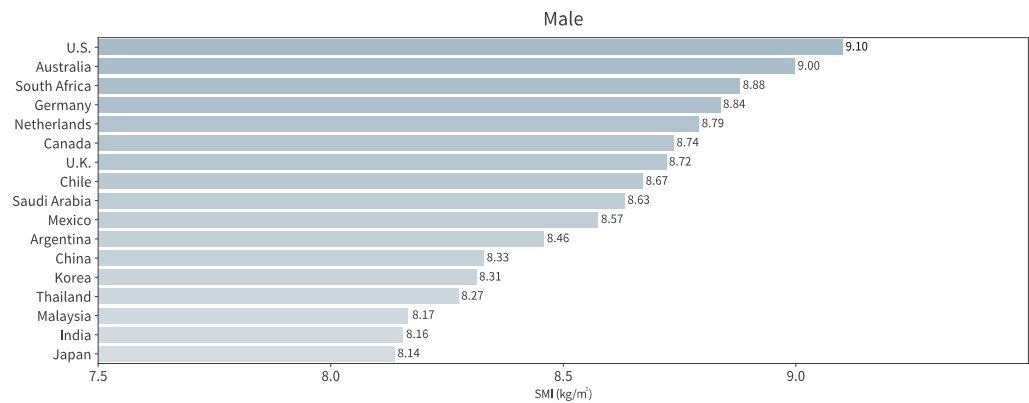
# Country Rankings for Muscle Mass, Body Fat Percentage

Before diving into the InBody report, let us look at the average muscle mass and body fat percentage data for each country, as measured by InBody, in the graph below. The graph also includes South Africa, Chile, Saudi Arabia, Argentina, and Thailand, which were not covered in the 2023 InBody report.

## Muscle Mass by Country

The SMI is a convenient and accurate metric for objectively measuring muscle mass, which naturally increases with height. A higher SMI value indicates greater muscle mass.<sup>2</sup> The graph below in Figure 1 shows that the top 7 of 17 countries with high SMI values, regardless of sex, include the U.S., Australia, South Africa, Germany, the Netherlands, Canada, and the UK. The countries with the lowest SMI values (i.e., lower muscle mass) include Asian countries, with Japan having the lowest SMI values for both men and women. However, in Asian countries, the SMI values do not vary significantly and are almost identical. Overall, Western countries have higher muscle mass, whereas Asian countries have lower muscle mass. Did the country rankings meet your expectations?

SMI #1: United States  
SMI #17: Japan



SMI #1: Australia  
SMI #17: Japan

Skeletal Muscle mass Index (SMI) is generally proportional to muscle mass.

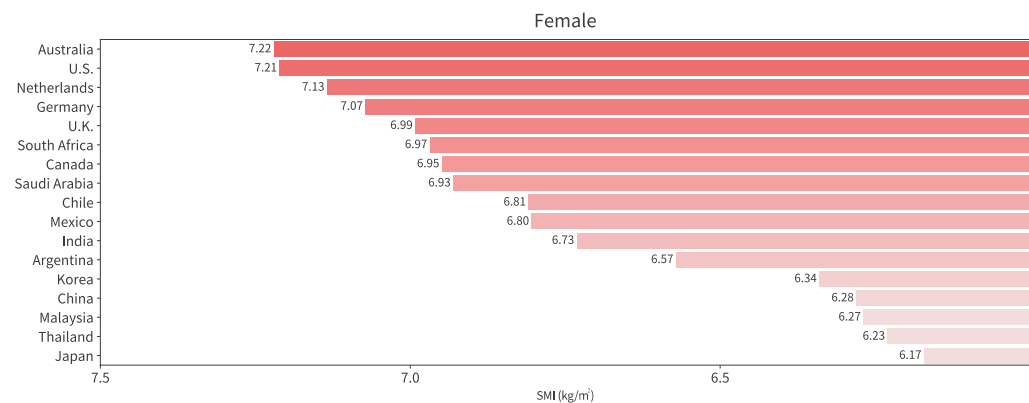


Figure 1: World ranking of the average Skeletal Muscle mass Index (SMI) of male and female

## Body Fat Percentage by Country

Body fat percentage is a value that indicates the proportion of total body weight that is fat, expressed as a percentage. Body fat distribution varies in both non-obese and obese adults. Major environmental factors that influence body fat distribution include alcohol consumption, smoking, and the timing of childhood obesity onset, although strong genetic factors also influence fat gain and loss. Because upper body visceral fat distribution in obesity is strongly associated with metabolic complications, weight loss through diet/exercise is important.<sup>3</sup> However, body fat and adipose tissue have beneficial effects in promoting or protecting current and future bodily functions and play an important role in sexual function. In addition, metabolism, bone health, immune function, and energy balance are also related to body fat and fat distribution.<sup>4</sup> In other words, having very low body fat is also harmful to health.

Therefore, studying the body fat percentage of each country is a valuable way to assess health status. The average body fat percentage for each country in the 2024 InBody report is shown below in Figure 2. Japan, which has the lowest muscle mass, also exhibits a low body fat percentage, which seems to be representative of the general Asian population. Chile, India, and Mexico have the highest levels of body fat, while North American and European countries with the highest SMI values generally maintain lower levels of body fat percentage due to their greater muscle mass. However, American women have high levels of body fat percentage despite having more muscle mass, a topic we shall discuss later.

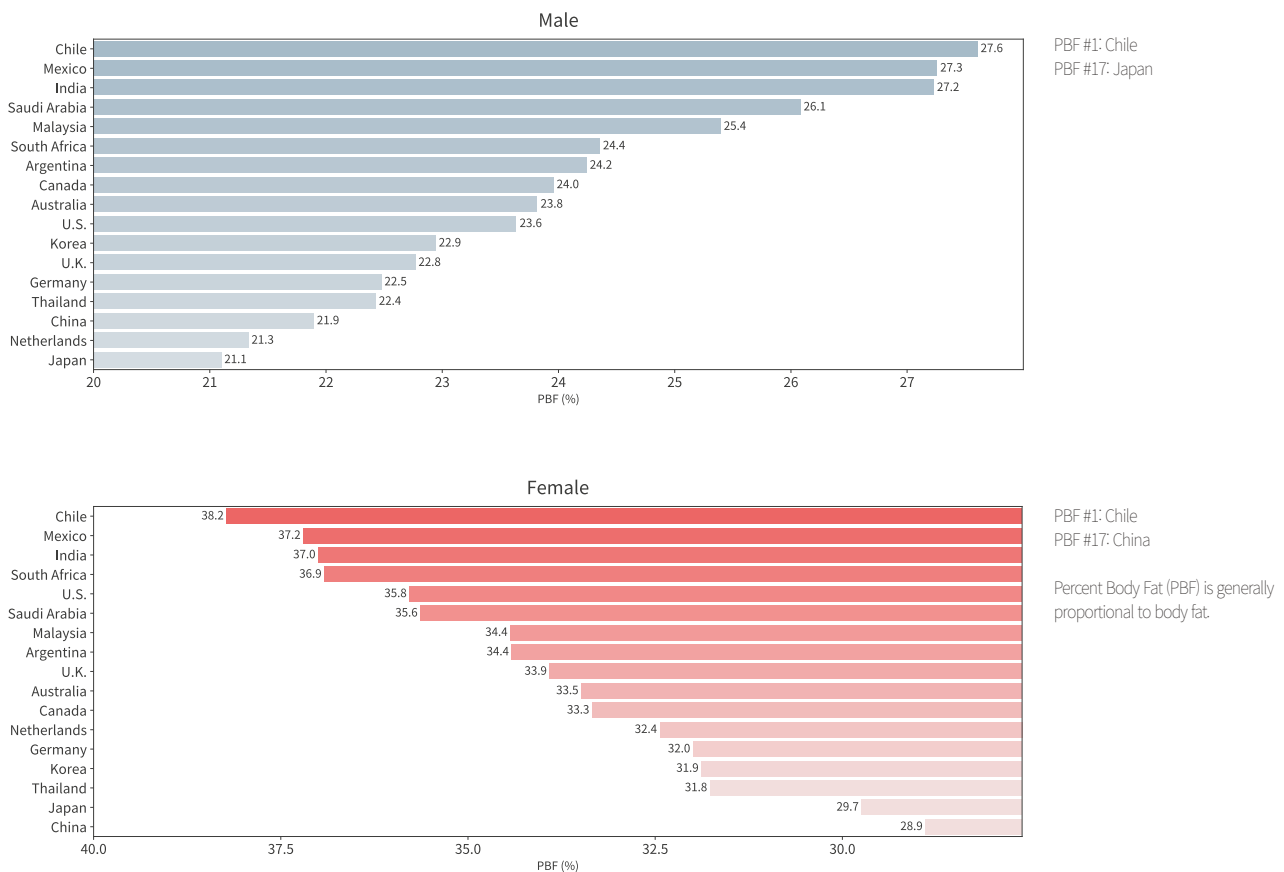


Figure 2: World ranking of the average Percentage Body Fat (PBF) of male and female

## Muscle Mass by Country by Protein Intake

How much protein do you normally consume? Protein is often considered the magic substance in the modern world that builds muscle, but, in reality, muscle mass is influenced by many factors other than protein. Therefore, it is not easy to directly correlate protein intake with muscle mass, as muscle mass is typically determined by many variables other than protein intake, including exercise, genetics, age, sex, and personal health status. Nevertheless, adequate intake of protein, the main building block of muscle, is important for maintaining optimal health during normal growth and aging.<sup>5</sup> The 2024 InBody report compares protein intake<sup>6</sup> and muscle mass across countries, excluding exercise levels, genetics, and personal health conditions.

Figure 3 shows that the U.S. has the highest daily protein intake, averaging over 110 grams per day, and the highest muscle mass for both men and women. Similar to the comparison of SMI values in the previous chapter, countries in North America, Europe, and Oceania continents have high SMI values, indicating

that individuals in these countries consume > 100 grams of protein per day. Although implies that high protein intake can lead to more muscle mass, there is another part of the graph that is interesting to look at. Despite having a relatively low protein intake compared to other countries, South Africa shows a high SMI value, and Asian countries, which have moderate protein intake, have the lowest muscle mass.

From these facts, it appears that, among the many factors that determine muscle mass, once protein intake exceeds a certain level, muscle mass varies depending on genetics, personal health, and cultural practice. What do you do besides eating protein to increase muscle mass?

Countries with high protein intake tend to have higher SMI values.

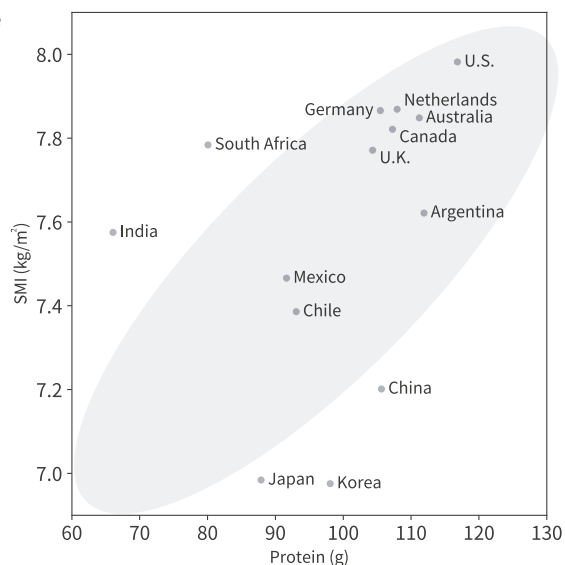


Figure 3: Comparison of daily protein intake and Average SMI values by country.



## How do the U.S. and Europe Compare in terms of Muscle Mass? Which Countries Have More Muscle Mass?

Although the U.S. and Europe are geographically separated, they share the commonality of having populations with diverse cultural and racial backgrounds. Both regions are internationally recognized for their leading advancements in science, technology, and economics, which have led to the concept of the West as a whole. However, the two continents differ in several indicators, including diet, lifestyle, exercise culture, and health systems, and this is reflected in small differences in body composition (Figure 4). In particular, many studies have shown that the health of middle-aged Americans, and health-related indicators such as smoking and obesity, are much worse than in Western European countries.<sup>7</sup>

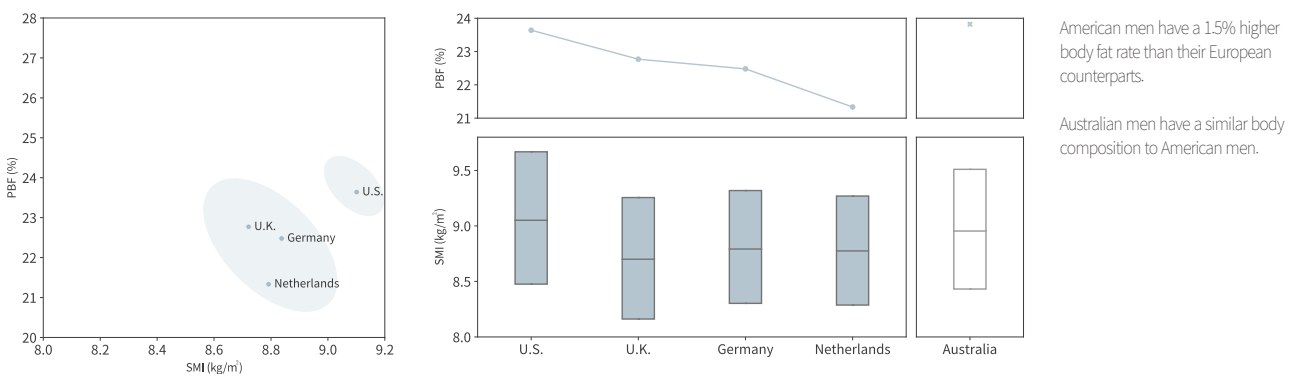


Figure 4: Comparison of SMI and PBF between the United States of America (U.S.) and Europe in male

Men in the U.S. and Europe have relatively large differences in SMI and body fat percentage. Regarding SMI, men in the U.S. have an SMI of approximately 9.1, whereas that for men in the three European countries, the UK, Germany, and the Netherlands, ranges between 8.7 and 8.8. The U.S. has a relatively low body fat percentage owing to high muscle mass, but it still tends to have a higher level of body fat compared to Europe.

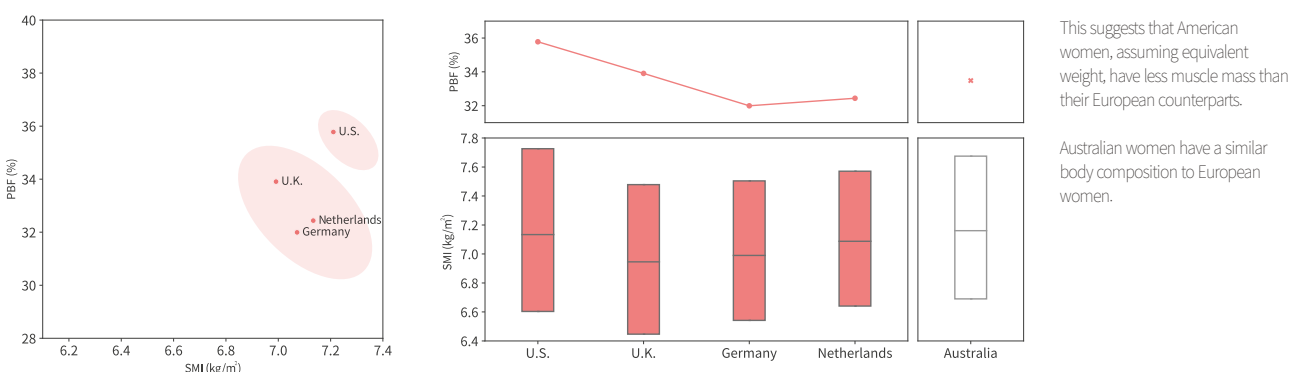


Figure 5: Comparison of SMI and PBF between the United States of America (U.S.) and Europe in female

Women exhibit even more significant differences in body fat percentage (see Fig. 5). Women in the U.S. have an SMI of 7.2, slightly ahead of counterparts in the three European countries by a margin of 0.1 to 0.2. However, they possess a body fat percentage approximately 3% higher than that of European women.

The observed variation in body fat percentage between these two continents, both characterized by high protein intake, is likely attributed to differences in food and exercise culture. What factors do you believe contribute to these distinctions in body fat percentage?

## North America vs. South America, the Continents with Higher Body Fat Percentages

Next, let us look at body composition trends within the Americas. We investigated five countries in the Americas in the 2024 InBody report: the U.S., Canada, and Mexico in the Northern Hemisphere, and Argentina and Chile in the Southern Hemisphere; these countries have different food and exercise cultures. Because the body composition of individuals in Mexico is more similar to that of South American countries than of North America, we used data from the U.S., Canada, Argentina, and Chile to compare North and South American data (Fig. 6).

There are subtle changes in body fat percentage with the seasons. In the summer, body fat tends to be lower, and in the winter, body fat tends to be higher.

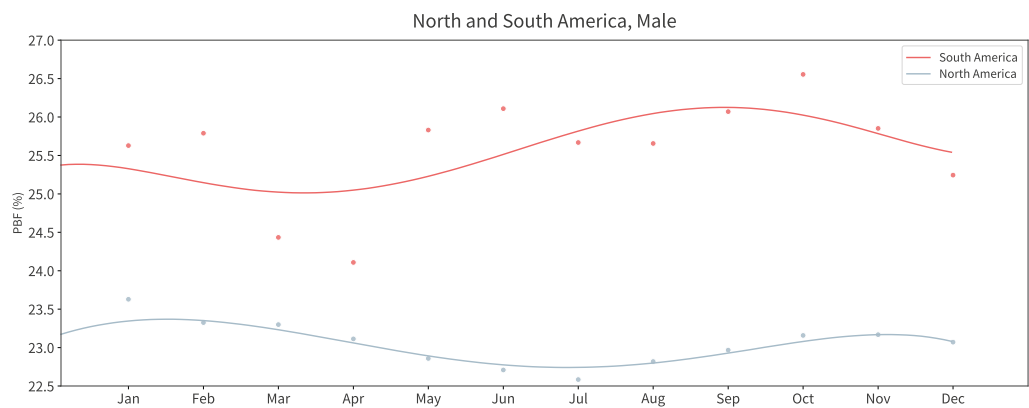
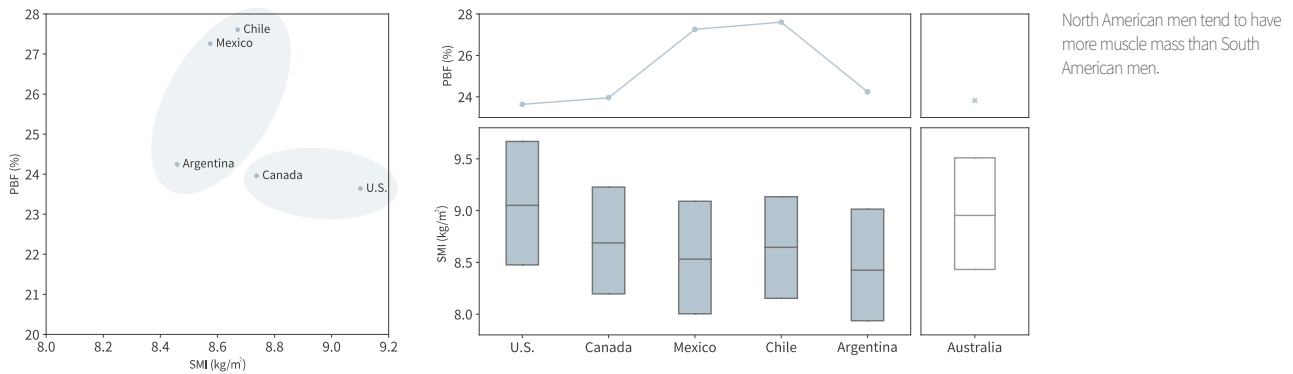


Figure 6: Seasonal changes in Percentage Body Fat (PBF) in North and South American male

In the 2023 InBody report, we examined seasonal changes in body fat percentage in South Korea and Australia. In the 2024 InBody report, we took a similar look at seasonal changes in body fat percentage in North and South America. People in each country have a pattern of lower body fat percentage in the summer and higher body fat percentage in the winter, which can be attributed to increased outdoor activity and sunshine in the summer that results in increased activity and calorie expenditure, and lower body fat percentage. As in the case of South Korea and Australia, we saw similar trends, with lower body fat percentages in their respective countries during the summer months and higher body fat percentages during the winter months. Notably, these patterns were more pronounced in men than in women.

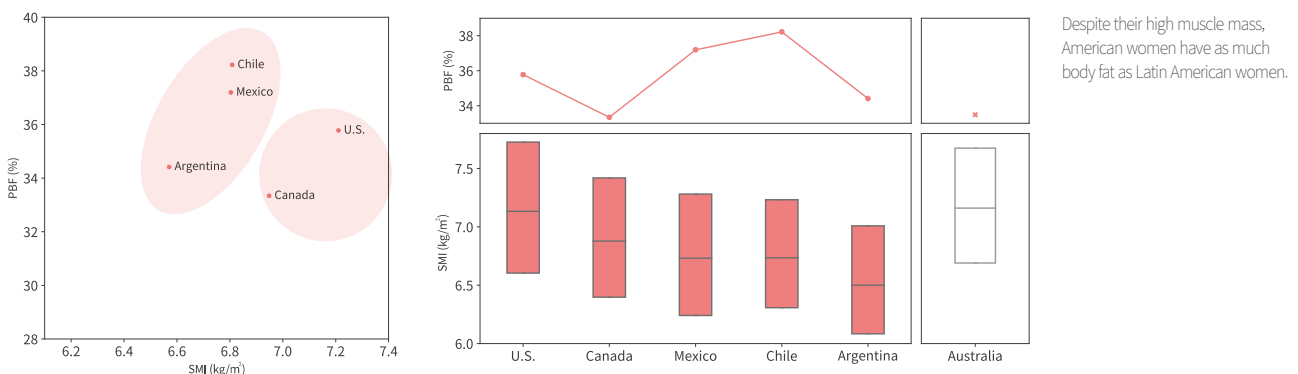




North American men tend to have more muscle mass than South American men.

Figure 7: Comparison of SMI and PBF between North and South American countries in male

In addition to these patterns of seasonal variation in body fat percentage, the North and South American continents show large differences in both muscle mass and body fat percentage. The U.S. and Canada have relatively high muscle mass, and their body fat percentage is intermediate among the 17 countries. Chile, however, has a lower muscle mass and a higher body fat percentage composition. Mexican men have a body composition distribution more similar to that of South America than of North American (Fig. 7). Australian men have a body composition similar to that of American men)



Despite their high muscle mass, American women have as much body fat as Latin American women.

Figure 8: Comparison of SMI and PBF between North and South American countries in female

American women, who have about 3% more body fat percentage than Europeans, have similar body fat percentages as women in South American countries (Fig. 8). American women have relatively higher muscle mass than women in South American countries. Canada's body composition tended to be more similar to that of continental Europe than to that of the U.S.. (Australian women, unlike men, tended to be more similar to that of continental Europe.) Argentina has the lowest muscle mass for both men and women among the countries in the Americas tracked in the 2024 InBody report, which warrants further research and consideration.

The differences between North America and South America appear to be greater than the differences between North America and Europe, suggesting that body composition can be influenced by the dietary and exercise culture of each country, even if they are geographically close.

## Asian Countries' Emphasis on Body Fat Percentage over Muscle Mass



Let us also look at body composition trends within the Asian continent. We considered six countries in Asia: South Korea, Japan, China, Malaysia, Thailand, and India. Except for India, the Asian countries have one thing in common: their BMIs are the lowest among the 17 countries. These countries can be categorized by climate and culture: Korea, Japan, and China in East Asia; Malaysia and Thailand in Southeast Asia; and India in South Asia.

Asian countries have the characteristics of having the lowest SMI values for muscle mass for both men and women. However, body fat percentages show distinct country-specific characteristics.



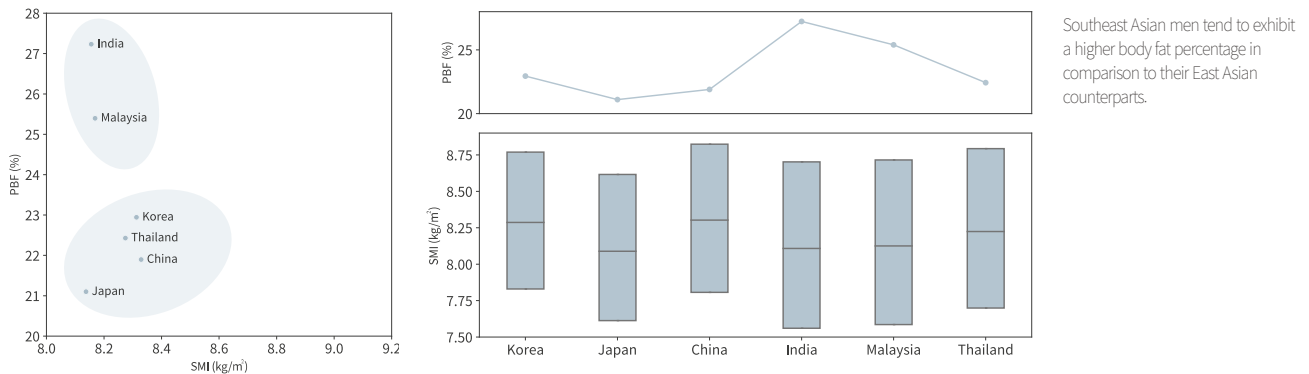


Figure 9: Comparison of SMI and PBF in Asian countries in male

Japan has the lowest muscle mass and body fat percentage. Regarding body composition of countries other than Japan, Figure 9 shows that, overall, men in East Asian countries have higher muscle mass and lower body fat than Southeast Asian countries. Thailand, however, is unique in that it has a composition closer to East Asian countries for both muscle mass and body fat percentage.

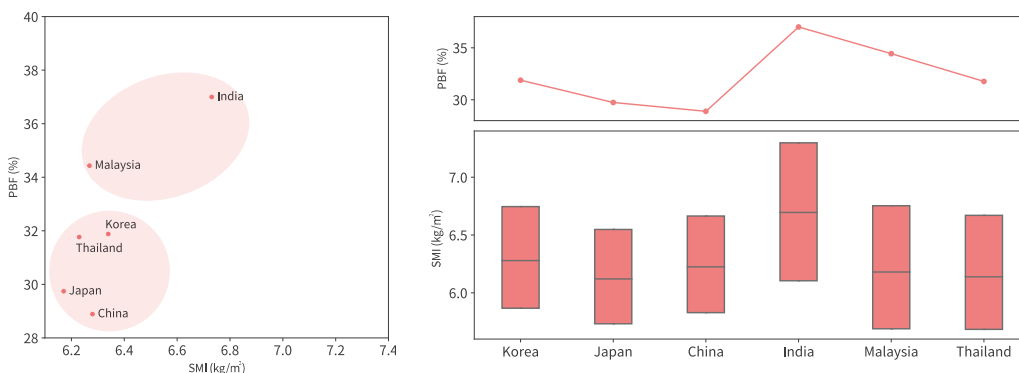


Figure 10: Comparison of SMI and PBF in Asian countries in female

Figure 10 shows that continental differences in muscle mass are not as pronounced for Asian women as they are for men, although Indian women are uniquely high in both muscle mass and body fat percentage. Of course, India has a smaller user base than other countries; however, even considering that, it is still an unusual result. Chinese women have the lowest body fat percentage of all 17 countries. Most uniquely, the body composition of Thai women is closer to that of East Asia than of Southeast Asia. This again shows that although countries may be geographically close, their dietary and exercise cultures can influence their body composition

# Muscle Mass is the Secret to Youth? Countries With a Late Onset of Muscle Loss

One of the most affected elements of aging is the muscle. After 30 years of age, the muscle mass declines by about 3-8% per decade, and the rate of decline accelerates after age 60 years. Furthermore, the loss of muscle mass is directly linked to an increase in body fat, which leads to changes in body composition and is associated with an increase in insulin resistance in older adults.<sup>8</sup>

The 2023 InBody report examined differences in the timing of muscle mass loss in men in the East and West, which showed that because male hormonal changes decline around the age of 35-44 years,<sup>9</sup> muscle mass also declines in a similar pattern, and that the timing varies by country. This was of interest to many because muscle mass loss is often seen as a sign of the onset of aging. In the 2024 InBody report, we studied these differences in Germany and Malaysia along with the U.S. and South Korea.

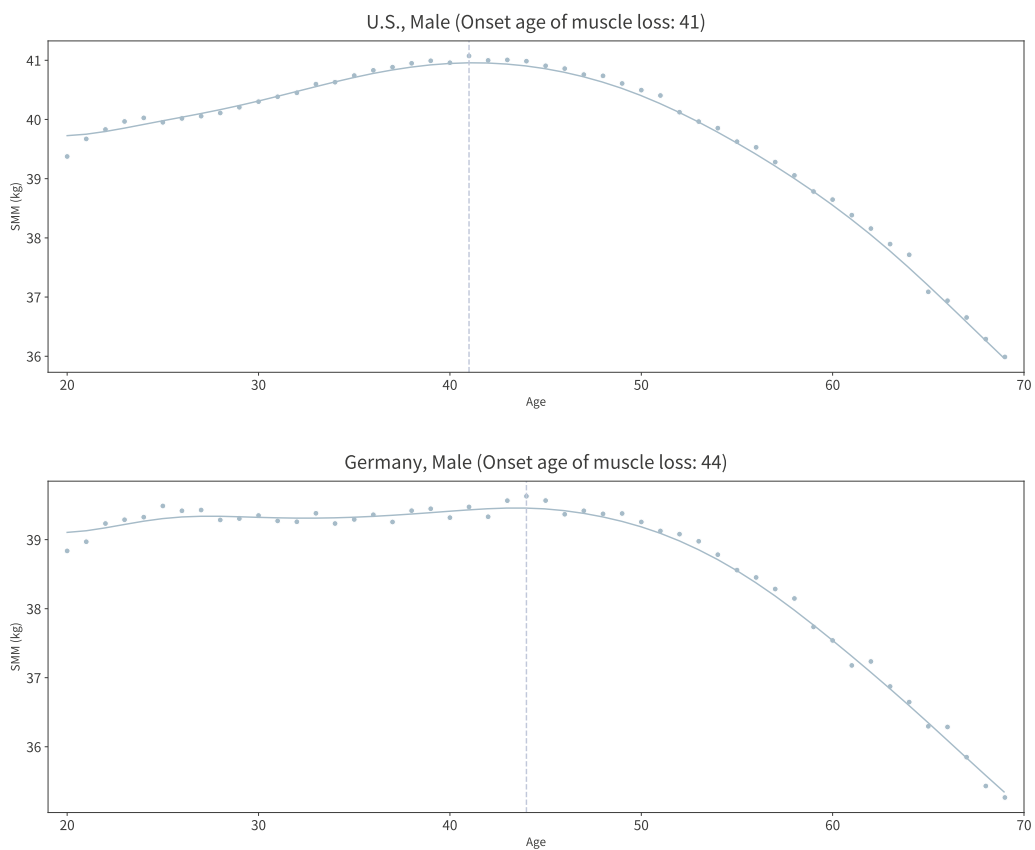


Figure 11: Comparison of the onset of muscle loss in male in the U.S. and Germany

American men with the highest average muscle mass started to lose muscle mass at age 41 years, whereas German men with lower muscle mass started to lose muscle mass a little later at age 44 years (Fig. 11).

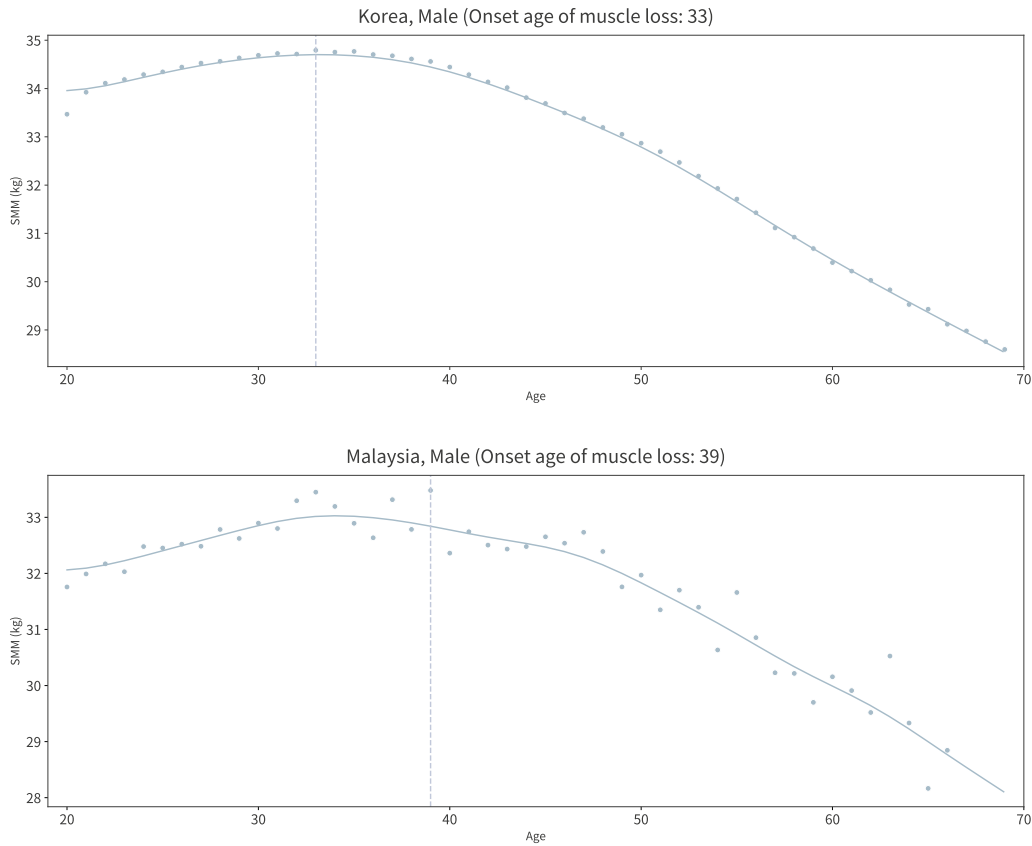


Figure 12: Comparison of the onset of muscle loss in male in Korea and Malaysia

In South Korea, which has a higher average muscle mass than Malaysia, the age of onset of muscle loss is 33 years, which is earlier than the age of 39 years for Malaysian men (Fig. 12). Higher muscle mass does not necessarily lead to later muscle loss. However, countries with high muscle mass have higher levels of muscle mass at the same age, despite muscle loss. Further research is needed to determine whether more or less muscle mass contributes to aging. In general, it is important to build muscle mass during youth to stay healthy longer and delay the onset of muscle loss.



# Changes in the Body Fat Percentage of Women by Country

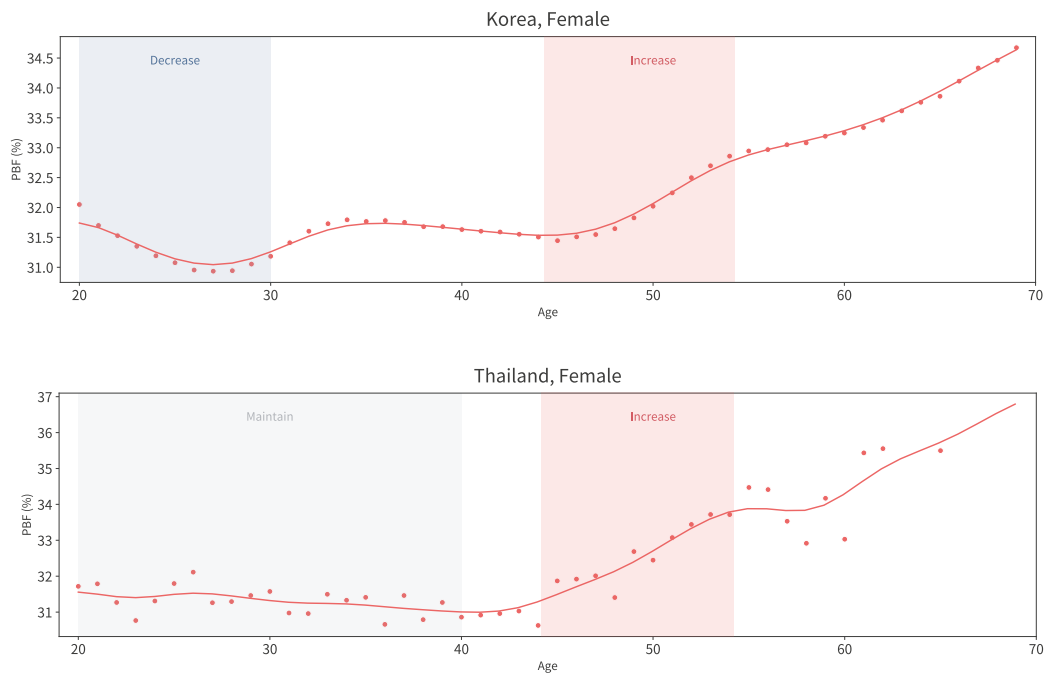
The phenomenon of body fat percentage changing with age is closely related to several physiological factors. In particular, body fat percentage in women tends to increase with age, which provides important information to improve our understanding of women's health and future disease risk.

The 2024 InBody report shows the age-specific body fat percentage of women in 17 countries. The increase in body fat percentage with age is observed in all countries; moreover, the timing of the increase reveals that women show an upward trend in body fat percentage through their mid-40s, followed by a sharp increase in body fat percentage as they enter their 50s. In other words, regardless of the country, there is a common pattern of a sharp increase in body fat percentage in the 40s and 50s as women enter

menopause, followed by a slight decrease in body fat percentage in the mid-50s, followed by a sharp increase as they enter their 60s.

The timing of changes in body fat percentage varies in different countries. Figure 13 shows that in general, Asian women appear to have a later increase in body fat percentage than women in Europe and the Americas. In particular, Asian women's body fat percentage is characterized by a minimal increase in body fat percentage in their 20s and a tendency to decrease or maintain body fat percentage. In Japan, an increase in body fat percentage is observed from the 20s to the 30s, although this increase is lower than the body fat percentage observed in the 20s in other countries; hence, this is not concerning.

In women, a discernible upward trend in body fat percentage often initiates in their mid-40s. Nevertheless, outcomes during the 20s differ across countries.



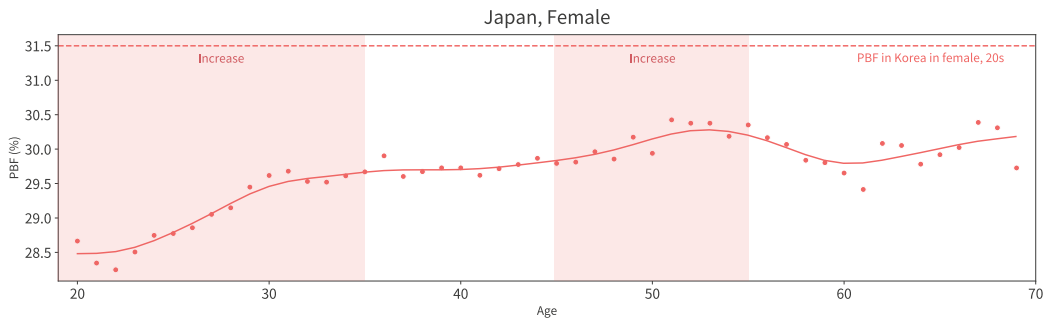


Figure 13: Changes in PBF with age of female in Korea, Thailand, and Japan

Figure 14 shows similar but different patterns for the UK and Germany, with UK women maintaining their body fat percentage in their 20s, whereas German women show an increase with age. However, the body fat percentage of women in their 30s in Germany is lower than the body fat percentage of women in their 20s in the UK, which is similar to the Japanese example mentioned earlier.

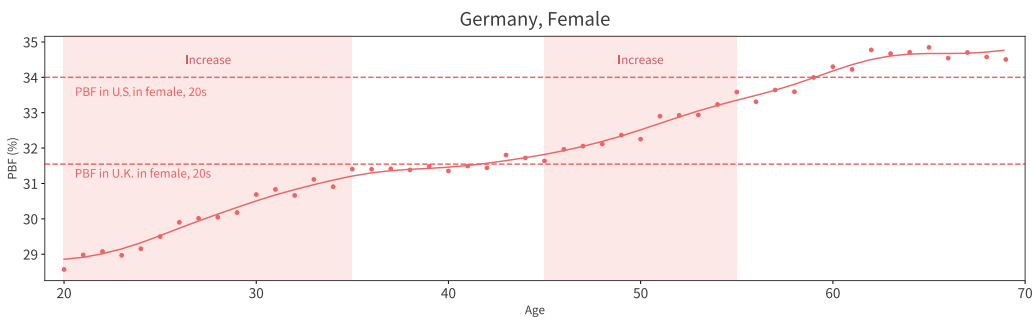
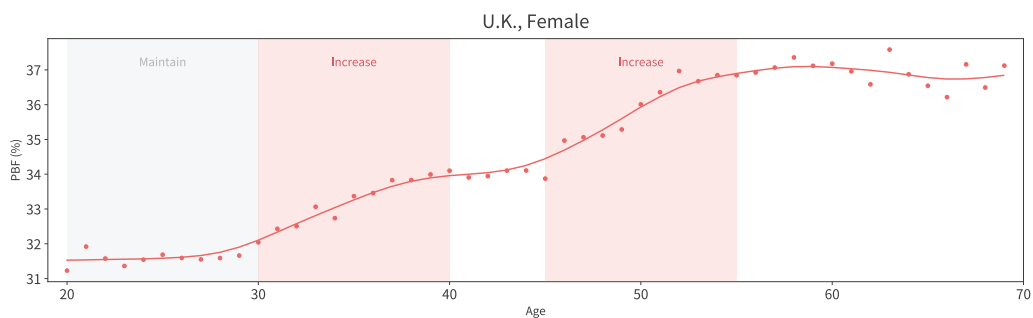
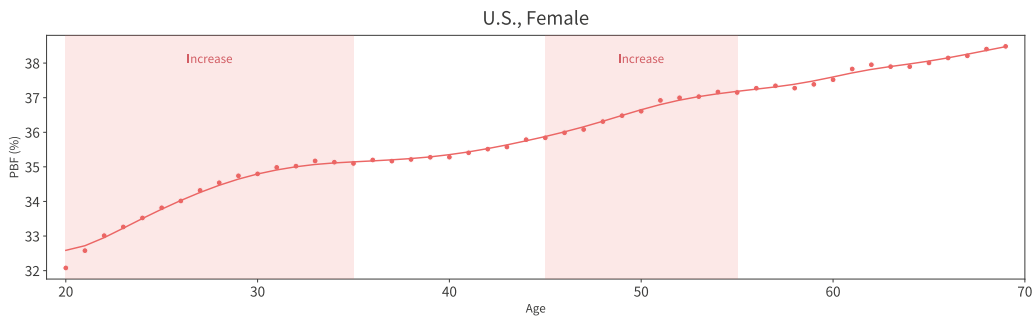


Figure 14: Changes in PBF with age of female in U.S., UK, and Germany

## Countries where BMI is misunderstood

As discussed in the introduction, BMI alone is not a true indicator of body composition, as many individuals have a different body composition than what is visible. Therefore, considering BMI alone may imply a high body fat percentage, whereas the reverse may be true. Let us examine which countries have a lower body fat percentage than they appear to.

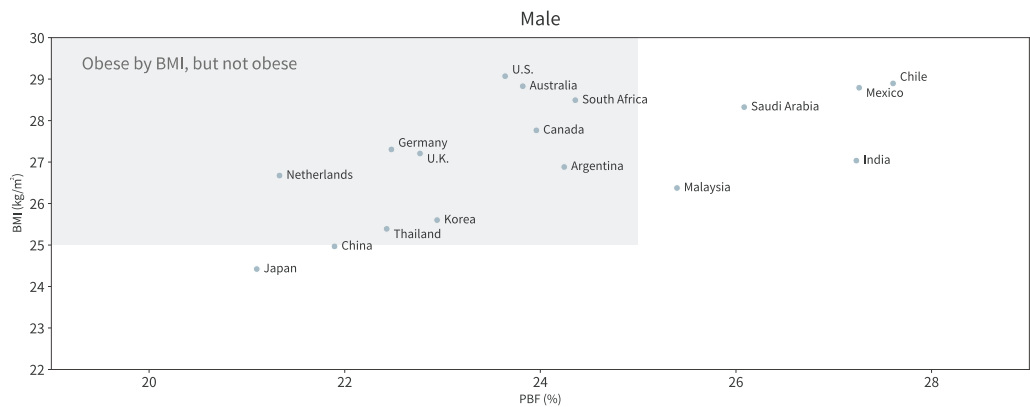
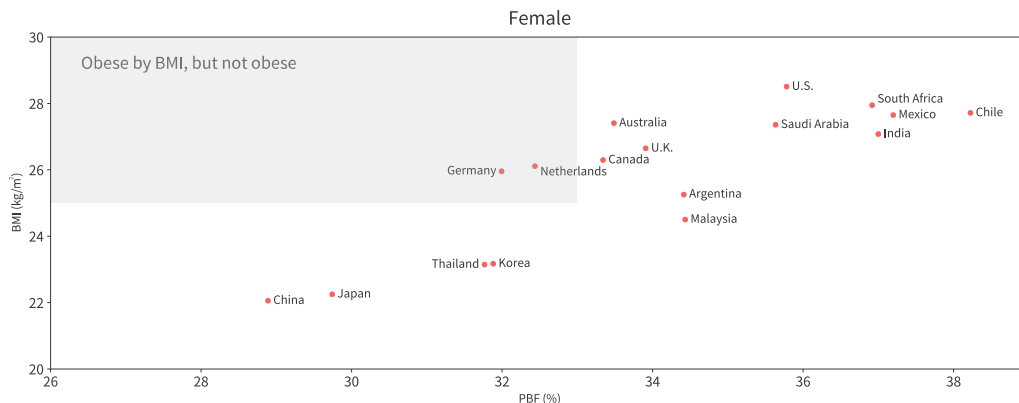


Figure 15: Countries that have a lower percentage body fat (PBF) than indicated by body mass index (BMI) in male

As shown in Figure 15, men in 11 of the 17 countries are obese according to BMI but not obese. For example, American men have high BMI but not high body fat percentage, meaning that people who are classified as obese by BMI may not be obese if they have a lot of muscle. The countries at the bottom of the list relative to the U.S. have a high body fat percentage despite having a lower BMI than the U.S..







Women tend to have higher overall body fat percentages, requiring guidance in exercise and diet for muscle development

Figure 16: Countries that have a lower percentage body fat (PBF) than indicated by body mass index (BMI) in female

Conversely, Malaysian women have low BMI but not body fat percentage, as shown in Figure 16. Women are obese according to BMI in Germany and the Netherlands but not by body fat percentage. This is because they have high muscle mass that results in high BMI. If women were to use their BMI to guide their healthcare, they would be more likely to go down the path of obesity.

An understanding of this concept encourages the habit of checking body composition regularly to determine the gain or loss of weight, muscle, or body fat percentage. Ultimately, it is the body composition that matters not weight.



# Thin Outside, Fat Inside: Females in Their 20s with High Body Fat Percentage

Lean obesity describes a condition in which a person is not outwardly obese but has a high percentage of body fat.<sup>10</sup> In simple terms, it indicates a person of normal weight with a high percentage of body fat. This is usually seen when a person lacks muscle mass, even if their body fat mass is in the normal range. The phenomenon of lean obesity is more prevalent in women than in men and is more prevalent in Asia than

in the Americas and Europe. Interestingly, a pattern of declining rate of lean obesity is observed as individuals move from their 20s to their 40s, which suggests that lean obesity is not resolved by a decrease in body fat percentage, but rather a shift out of the category of lean obesity and into general obesity due to weight gain.

In Asia, many women in their 20s may not be classified as obese by BMI, but rather, they are considered obese due to their high body fat percentage.

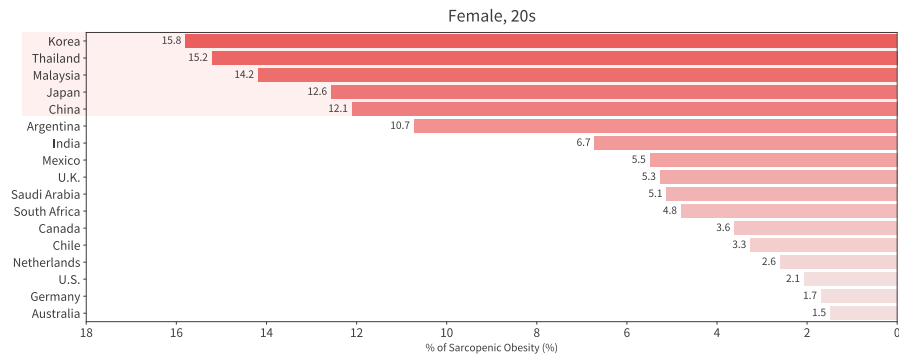


Figure 17: World ranking of lean obesity percentage in female in 20s

Figure 17 shows that the following Asian countries have the highest rates of female lean obesity: South Korea, Thailand, Malaysia, Japan, and China. Women in these five countries have lower BMIs than women in Western countries, with many within the standard BMI range; however, a large proportion lacks muscle mass and has a high body fat percentage. This appears to depend on whether the diet is viewed as weight or body composition. Figure 18 presents the BMI, SMI, and PBF of Korean women in their 20s compared to Australian women in their 20s. Because Korean women have a lower BMI, they naturally have a higher percentage of muscle mass below the cut-off for sarcopenia, even at a similar body fat percentage to Australian women.

A low BMI doesn't always indicate good health; it can also suggest a deficiency in muscle mass, as demonstrated by Korean women in their 20s

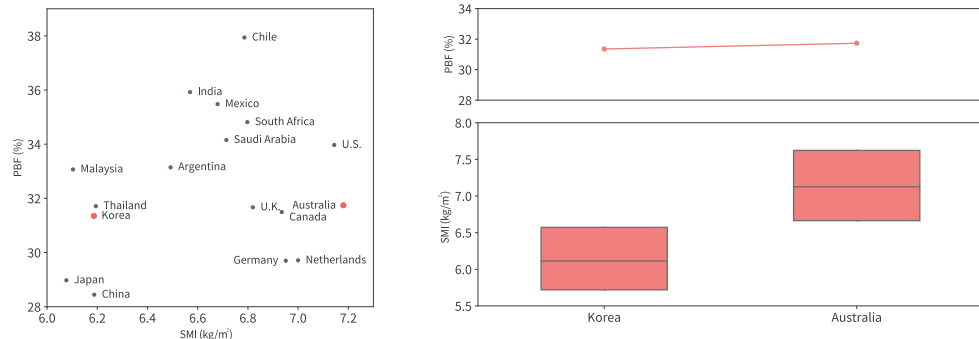


Figure 18: Comparison of SMI and PBF of Korean and Australian in female in 20s

Not monitoring body composition and relying only on BMI at younger ages may delude one into thinking they are healthy, which is dangerously misleading. Individuals with lean obesity have been shown to have high levels of metabolic dysregulation, which is associated with a significantly higher risk of developing metabolic syndrome, cardiometabolic dysfunction, and higher mortality.<sup>10</sup> Therefore, it is important to use muscle mass and body fat percentage instead of weight as health indicators.

## Body Composition and Life Expectancy in Older Adults

The ideal body composition is a balance of high muscle mass with a certain level of body fat percentage. This remains true as we age, with older adults lacking muscle at risk of diseases such as sarcopenia, and older adults with high body fat percentages at risk for diseases such as diabetes and metabolic syndrome. However, a change in body composition with age is well established (even without a change in BMI). Body fat mass increases and muscle mass decreases. This is thought to be partly due to a slowing of long-term metabolic rate as resting metabolic rate decreases with age, which may contribute to changes in body fat percentage and muscle mass.<sup>11</sup> Therefore, maintaining a body composition of high muscle mass and low body fat percentage at an appropriate body weight is critical to healthy older age.

In general, for individuals aged over 50 years, an increase in BMI is associated with a significant decrease in chronic disease-free life expectancy.<sup>12</sup> This is because it is difficult to gain muscle mass at that age; hence, an increase in BMI means an increase in body fat. To determine whether life expectancy was associated with healthy older age, we examined the relationship between the percentage of older adults with body fat percentage in the standard range and muscle mass above the sarcopenia cut-off in each country and life expectancy and found that for both men and women, the higher the percentage, the higher the life expectancy (Fig. 19).

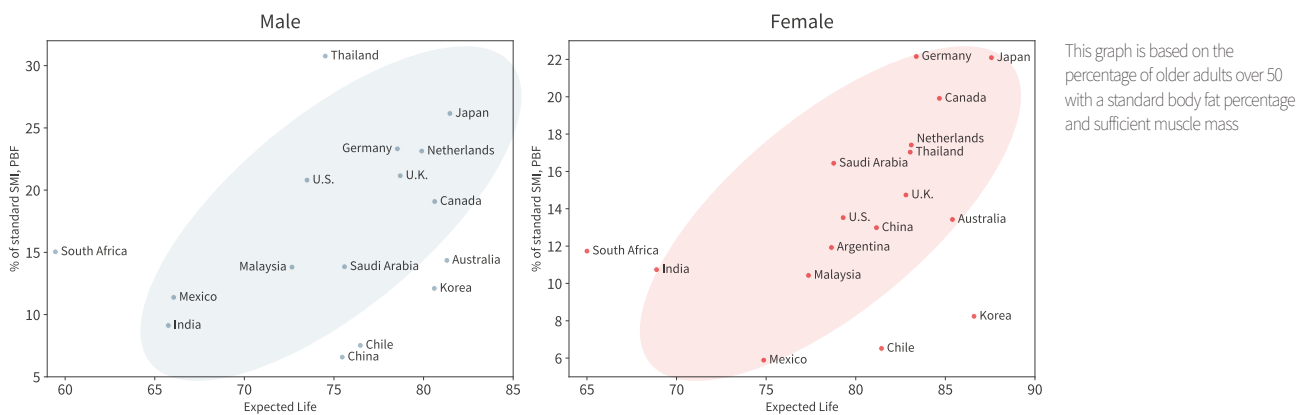


Figure 19: Comparison of Expected life and percentage of healthy older adults in male and female

However, improvements in healthcare and nutrition have led to longer life expectancies and a rapidly aging population has led to an increase in the prevalence of chronic diseases.<sup>13</sup> Because a high life expectancy does not guarantee a healthy life, it is important to prepare for a healthy life through proper body composition management.

## Effects of Aging on Swelling: Examining the Causes of Edema through ECW Ratio

Our bodies seem to swell more often with age, and even when we are not aging, swelling is observed when we are unhealthy. Swelling, also known as edema, is one of the most intuitive indicators of our general health status. What is edema, and why and how does it occur?

As more than 60% of our bodies comprise water, the water balance is the first to be affected by deteriorating health. Intracellular water (ICW) is usually the water in the muscles, whereas Extracellular water (ECW) is the water in the body that causes swelling (Fig. 20). In general, healthy people maintain a constant body-water ratio; however, this is disrupted by disease, toxins, and inflammation, or poor nutrition, making body water a critical metric in the medical field.

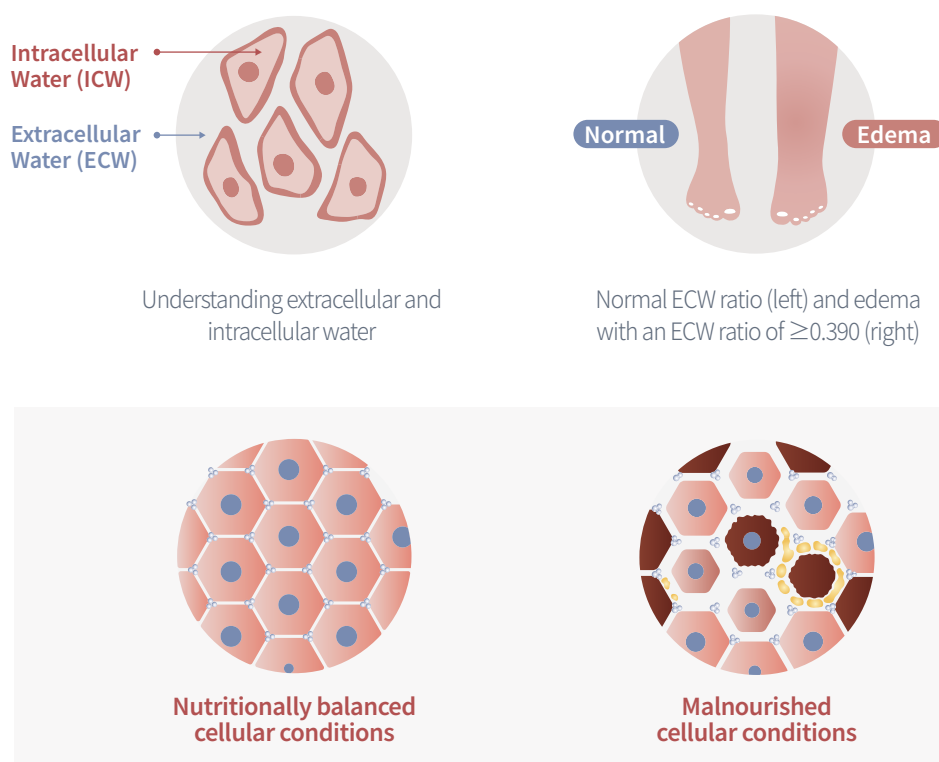
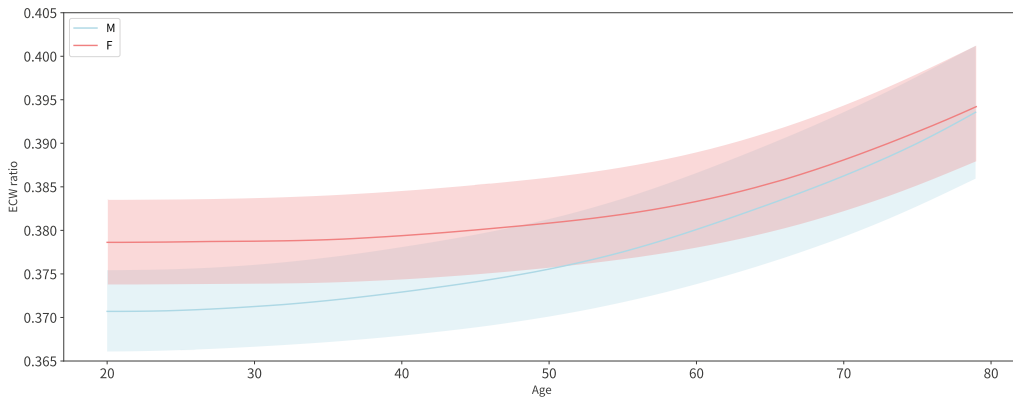


Figure 20: Edema and Cellular health through the lens of Intracellular and Extracellular water

The ECW ratio is calculated as  $ECW / Total\ body\ water$ . The normal range is 0.360–0.390,<sup>14</sup> with 0.390–0.400 indicating mild edema and  $\geq 0.400$  indicating severe edema, which may present as fatigue, obesity, nutritional deficiencies, hypokalemic syndrome, or kidney abnormalities.

When the ECW ratio exceeds a certain range, increased attention is necessary to monitor health. It is also important to distinguish between ICW and ECW water to properly determine the health status.

InBody examined trends in the average ECW ratio for men and women in 17 countries (Fig. 21). In general, women have higher average ECW ratios than men, and both sexes show an increase in the ECW ratio with age.



With aging, the ECW Ratio increases. Women generally have a higher ECW Ratio than men, but the slope of the increase is steeper in men

Figure 21: Changes in the average ECW ratio in male and female by age

There are several reasons for the difference in ECW ratio between men and women, but at its most basic, differences in muscle mass can lead to differences in ECW ratio. Women, who have relatively lower muscle mass compared to men, naturally have higher ECW ratios. Since men have more muscle mass than women, they have lower ECW ratios; however, with increasing age, the rise in the ECW ratio is more pronounced than that in women. One possible reason for this is that muscle mass loss is much greater in men than in women.

ECW retention can increase with age due to continued muscle loss, poor nutrition, and medical conditions. When middle-aged men and women say they feel "swollen" it is often due to the increased ECW ratio. Additionally, inflammation, muscle loss, and other conditions can also contribute to an increase in the ECW ratio.

Tracking body hydration is important for managing several conditions, including kidney disease, lymphedema, diabetes, and cancer. First, patients with kidney disease get edema because their weakened kidney function does not support the removal of enough water, as a result of which they accumulate fluid in their bodies and need to regularly undergo

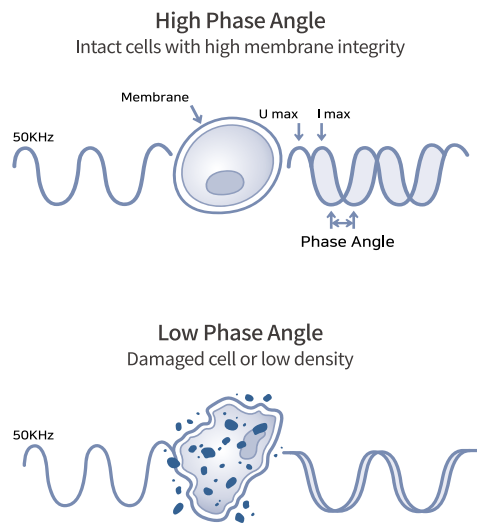
dialysis to get rid of the excess water through dialysis. Second, if the overhydration is more severe than expected, or if dialysis does not remove enough water and the patient is always overhydrated, it can lead to cardiovascular problems such as high blood pressure, edema, and an enlarged heart.

This fluid balance is called the "dry weight" setting, which is an individual's weight at their peak energy level with normal blood pressure and no edema. In hemodialysis, an incorrect dry weight setting can lead to problems such as hypotension and shock.

Lymphedema, a complication following breast cancer surgery, is another case where fluid management is critical. Continuous changes in ECW in the operated arm (ipsilateral arm) and the unoperated arm (contralateral arm) can be used to detect abnormalities,<sup>15</sup> and the difference between the two can be compared to that of a normal person to determine the extent of the disease.<sup>16</sup>

The body's water ratio changes in cancer or inflammation. In diabetes, the blood flow is impaired, causing long-term problems with kidney function. By monitoring changes in body water, disease progression can be monitored.

# Rapidly Declining Health in Countries Observed through the Lens of Cellular Health



We shall explore this topic with "Phase Angle." Phase angle is an indicator of how strong the cell membrane is, or of "cell health."<sup>17</sup>

Phase angle is a measure of the structural integrity of cell membranes and their level of physiological function, helping to predict the health of cell membranes and the function of mitochondria to assess aging and chronic fatigue, immune status, and nutritional status in patients with cancer.

Checking the phase angle marks the beginning of a comprehensive body balance and health assessment. While there is no clear-cut threshold for the phase angle, a sharp drop or significant fluctuations could indicate an underlying health condition. Therefore, regular measurements of the phase angle to monitor cellular health are advisable.

Figure 22: Cellular health through the lens of phase angle

Hundreds of millions of cells constitute the entire body. What better indicator of one's overall health than looking at the health of one's cells? We focused on the "importance of cellular health" and decided to study phase angle by country based on the fact that poor cellular health leads to poor overall body health.

With age, the phase angle decreases; cells progressively lose water, and their shape and condition gradually deteriorate (Fig. 22). Let us first examine the phase angles of women in the East and West.

First, the largest decline in phase angle among women worldwide is in the U.S.. From a phase angle of 5.8 in their 20s, it drops to 4.4 in their 70s. Whereas women in most countries have a phase angle difference of 0.8 to 1.0, women in the U.S. have a difference of 1.4.

The phase angle for women in the US and the Netherlands gradually decreases, starting in their 20s

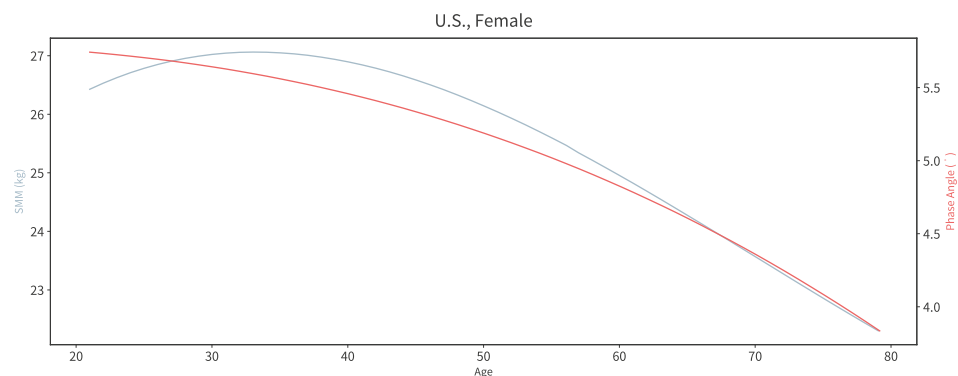
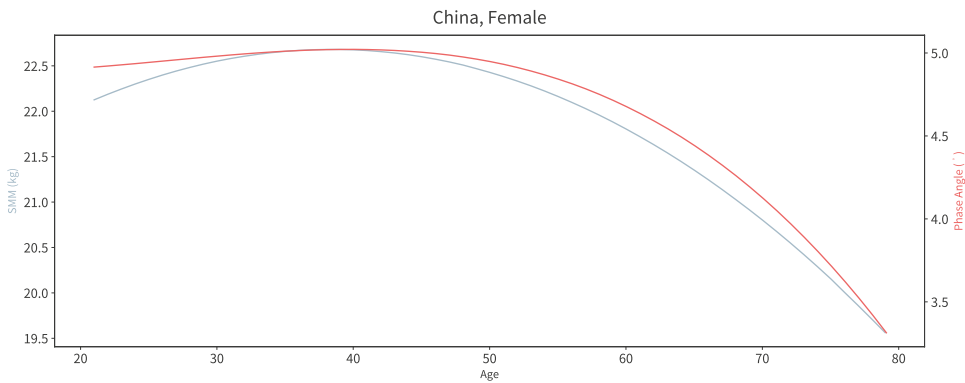


Figure 23: Changes in phase angle and skeletal muscle mass (SMM) by age among female in the U.S.

The phase angle in Chinese women increases from their 20s to their 30s, then begins to decline in their 40s, with a very steep decline from a phase angle of 4.8 in their 60s to a phase angle of 4.2 in their 70s (Fig. 24). This is a slightly different pattern than most other countries, where the phase angle declines more gradually in women. Chinese women are advised to check their overall health through monitoring cellular health twice, once in their 40s and again in their 60s.





The phase angle for Asian women in China (Fig.24) and Korea (Fig.26) increases throughout their 30s but decreases in their 40s.

Figure 24: Changes in phase angle and skeletal muscle mass (SMM) by age among female in China

We analyzed changes in phase angle in conjunction with SMM to understand the correlation between muscle gains and losses and changes in phase angle. Similar patterns were observed across countries and sexes. Either phase angle and SMM start to decrease simultaneously, or phase angle decreases more rapidly to coincide with muscle loss. As Figure 24 shows, in Chinese women, both muscle and phase angle increase in their 20s, and then both metrics decrease in their 40s. Dutch women (Fig. 25) and South Korean women (Fig. 26) exhibit an increase in muscle and a slight decrease in the phase angle starting in their 20s, but the slope of the phase angle decline graph increases sharply with the decrease in muscle starting in their 40s (Fig. 25).

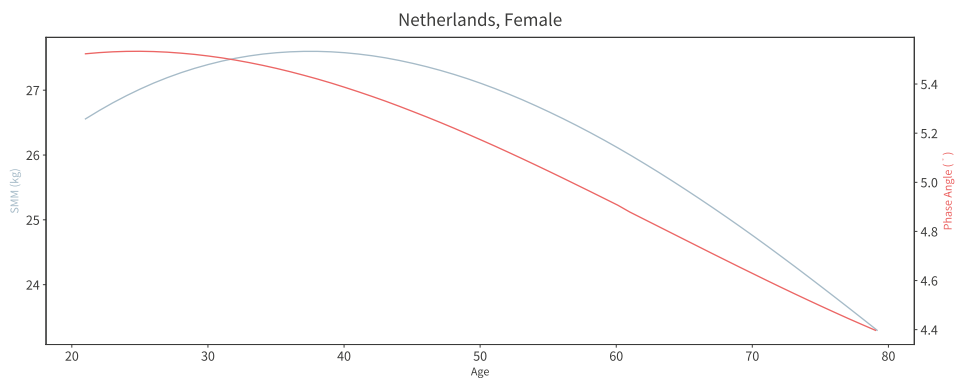


Figure 25: Changes in phase angle and skeletal muscle mass (SMM) by age among female in Netherlands

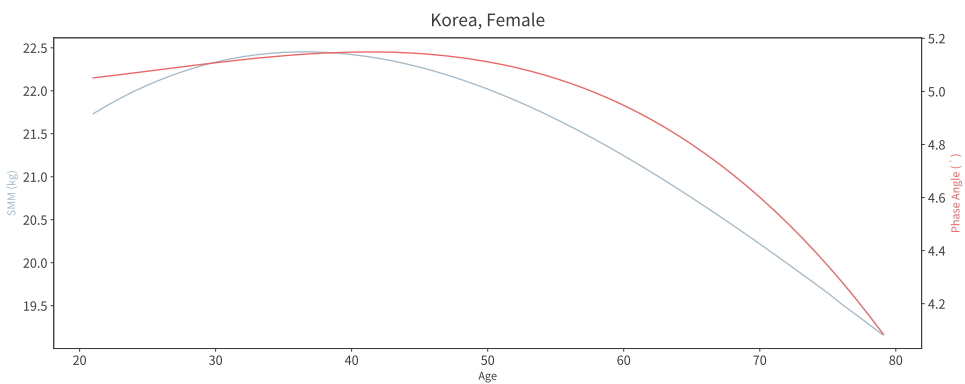


Figure 26: Changes in phase angle and skeletal muscle mass (SMM) by age among female in South Korea

One notable difference was observed between women in the East and West. American and Dutch women have a decreasing phase angle starting in their 20s. Chinese and Korean women, on the other hand, see an increase in phase angle in their 20s and 30s, which starts to decline in their 40s. The phase angle in Western women continues to decrease, whereas that in Eastern women increases and then decreases.

## [Read More] Characteristics of Patients with Lymphedema based on Korean Data

Breast cancer is a condition that extends beyond surgery and treatment, marking the commencement of a journey to "live with cancer." Breast cancer is linked to high recurrence rates and the risk of various complications. Notably, 50% of patients who have undergone breast cancer surgery are diagnosed with "lymphedema," an abnormal swelling of specific areas. More than 60% of these cases fall into the category of early-onset patients who develop lymphedema within 3 years after breast cancer surgery.

Lymphedema arises from damage to the lymphatic system, responsible for moving lymphatic fluid from the body's periphery to the center. A compromised lymphatic system prevents proper fluid drainage,

leading to the accumulation of excess water and protein-laden sticky fluid between cells. This accumulation results in severe swelling of the arms or legs, resembling an elephant's limbs in severe cases.

InBody sought to gain a clearer understanding of the hydration levels of patients with lymphedema by comparing body composition data from patients with lymphedema to those without lymphedema.

Let's examine the difference between the two arms of patients with lymphedema. The contrast between the operated and unoperated arms of these patients is striking. The operated arm exhibits a higher ECW content than the unoperated arm, indicating an imbalance of water between the two arms (Fig. 27).

The operated arm (surgical site) of a patient with lymphedema exhibits a higher ECW ratio than the non-operated arm, resulting in an imbalance between the two arms. (Fig.27)

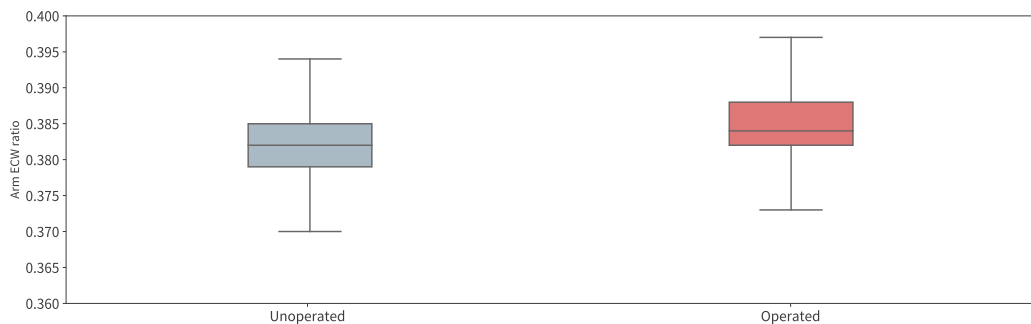


Figure 27: Difference between the operated and unoperated arms of patients with lymphedema

However, there is no difference in the ECW ratio between the two arms of an individual without lymphedema (Fig. 28). Similarly, the body composition is generally harmoniously balanced unless affected by surgery or health problems.

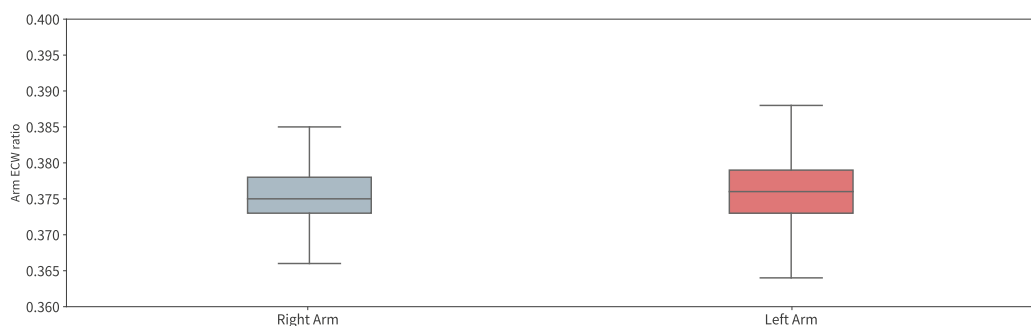


Figure 28: Difference between the right and left arms of individuals without lymphedema

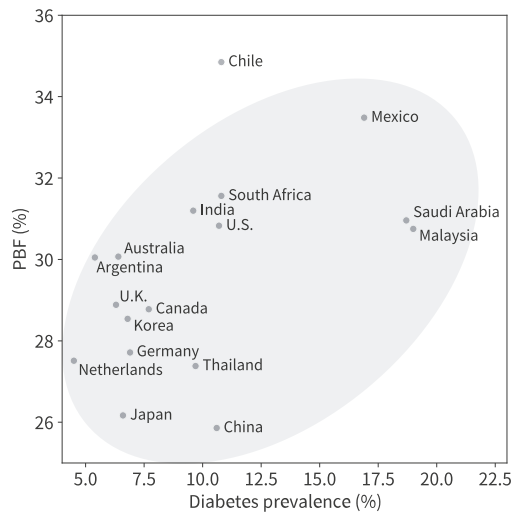
This shows the importance of the balance of our body composition.

## Diabetes Prevalence and Body Fat by Country

Many people have diabetes, but did you know that there is a strong relationship between diabetes and body composition? Of the 17 countries covered in the 2024 InBody report, we compared body composition between Malaysia, the country with the highest prevalence of diabetes, and the Netherlands,<sup>18</sup> the country with the lowest prevalence of diabetes, based on the 2021 global diabetes prevalence data published by the International Diabetes Federation.

First, in Malaysia, the average PBF of men and women is on the higher side, > 30%. They typically have less muscle mass and more body fat mass. Let us study body composition in the Netherlands, a country with one of the lowest prevalence rates of diabetes. The average PBF of men and women in the Netherlands is relatively low, < 28%. This is the complete opposite of Malaysia's body composition.

Data on the global prevalence of diabetes such as in Malaysia and the Netherlands, correlates with body fat percentage, reinforcing various studies that have shown that higher body fat predisposes to diabetes.



This graph indicates a proportional correlation between body fat percentage and diabetes prevalence.

Figure 29: Comparison between diabetes prevalence and percentage body fat by country



## Countries with the Highest Risk of Sarcopenia Based on SMI by Country

Sarcopenia is characterized by a loss of muscle mass and decreased muscle function, manifesting in symptoms such as lower extremity weakness that slows walking and makes it difficult to rise from a seat. While muscle mass and strength naturally decline with age, sarcopenia represents an excessive loss of muscle mass and strength, even after accounting for age and sex, resulting in reduced physical function and increased health risks and mortality.

Sarcopenia can be detected through handgrip strength, physical performance, and SMI measurement. SMI can be measured with InBody, and continental sarcopenia societies have published SMI criteria for determining sarcopenia. We examined countries with the highest percentage of individuals with sarcopenia based on the criteria set by the Asian and European sarcopenia societies.

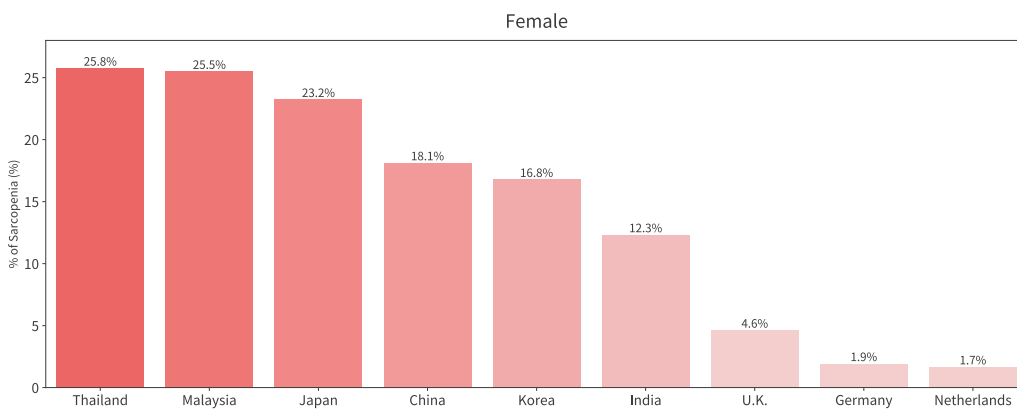
Firstly, the percentage of individuals with sarcopenia is higher among women than among men. The country with the highest rate of sarcopenia in men in the study is India, where 8.5% of Indian men have

an SMI of  $\leq 7.0$ . The country with the highest rate of sarcopenia in women is Thailand, with a rate of 25.8%. This represents more than a threefold difference in percentage.

Next, let us explore the ranking of countries by sex. According to the SMI criteria specified by the Muscular Dystrophy Society for each continent, the countries with the highest proportion of women with sarcopenia are Thailand, Malaysia, Japan, China, South Korea, and India, in this order, with all of the top countries in Asia (Fig. 30).

Men also have higher rates of sarcopenia in Asian countries. China takes the fifth place, followed by India, Malaysia, Japan, and Thailand (Fig. 31). In contrast, European countries such as Germany and the Netherlands have relatively low rates of sarcopenia.

Although the causes of sarcopenia vary among individuals, it is usually attributed to poor protein intake and a lack of exercise. Asian countries with high rates of sarcopenia typically have lower protein intake than Western countries.



This graph represents the percentage of the population identified with having sarcopenia, based on the criteria for determining sarcopenia via Skeletal Muscle mass Index (SMI) for each continent.

EWGSP2(European Working Group on Sarcopenia in Older People 2)<sup>19</sup> criteria: Sarcopenia = SMI < 7.0 kg/m<sup>2</sup> (men), SMI < 5.5 kg/m<sup>2</sup> (women).

AWGS 2019(Asian Working Group for Sarcopenia 2019)<sup>1</sup> criteria: Sarcopenia = SMI < 7.0 kg/m<sup>2</sup> (men), SMI < 5.7 kg/m<sup>2</sup> (women).

Figure 30: Ranking of countries with high rates of sarcopenia in female according to skeletal muscle mass index (SMI) values

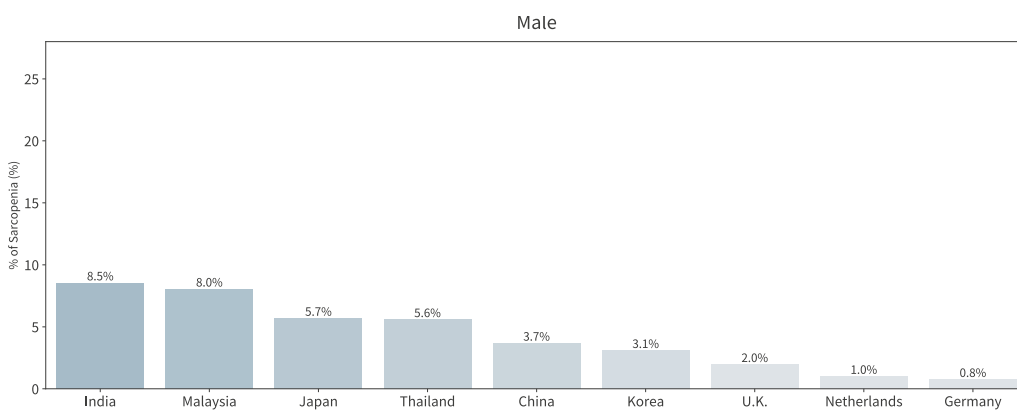


Figure 31: Ranking of countries with high rates of sarcopenia in male according to skeletal muscle mass index (SMI) values



## InBody Body water [InBody970] [Yscope]

**InBody**  
www.inbody.com

ID	Height	Age	Gender	Test Date / Time
Jane Doe	156.9cm	51	Female	2021.03.31. 15:44

### Body Water Composition

	Under	Normal	Over
<b>TBW</b> Total Body Water (L)	40-100	100-140	140-240
27.4	[Progress bar showing 27.4 in the Normal range]		
<b>ICW</b> Intracellular Water (L)	40-100	100-140	140-240
16.5	[Progress bar showing 16.5 in the Normal range]		
<b>ECW</b> Extracellular Water (L)	70-100	100-140	140-170
10.9	[Progress bar showing 10.9 in the Normal range]		

### Body Composition Analysis

Protein	7.1 kg (7.0-8.6)
Minerals	2.64 kg (2.44-2.98)
Body Fat Mass	22.0 kg (10.3-16.5)
Fat Free Mass	37.1 kg (35.8-43.8)
Bone Mineral Content	2.18 kg (2.01-2.45)

### ECW Ratio Analysis

	Under	Normal	Over
<b>ECW Ratio</b>	0.320-0.340	0.360-0.380	0.400-0.420
0.398	[Progress bar showing 0.398 in the Normal range]		

### Segmental Body Water Analysis

	Under	Normal	Over
<b>Right Arm (L)</b>	40-100	100-150	150-200
1.55	[Progress bar showing 1.55 in the Normal range]		
<b>Left Arm (L)</b>	40-100	100-150	150-200
1.49	[Progress bar showing 1.49 in the Normal range]		
<b>Trunk (L)</b>	70-100	100-150	150-180
13.8	[Progress bar showing 13.8 in the Normal range]		
<b>Right Leg (L)</b>	70-100	100-150	150-180
4.12	[Progress bar showing 4.12 in the Normal range]		
<b>Left Leg (L)</b>	70-100	100-150	150-180
4.05	[Progress bar showing 4.05 in the Normal range]		

### Segmental ECW Ratio Analysis

	Under	Normal	Over
<b>Over</b>	0.43	0.41	0.40
<b>Slightly Over</b>	0.39	0.378	0.378
<b>Normal</b>	0.37	0.35	0.33

Right Arm: 0.398, Left Arm: 0.378, Trunk: 0.398, Right Leg: 0.403

### Body Water Composition History

	20.07.21	20.08.27	20.09.20	20.11.23	20.12.21	21.02.19
Weight (kg)	63.3	63.9	62.4	61.8	62.3	60.9
TBW (L)	28.3	28.0	28.0	27.9	27.9	27.6
ICW (L)	17.0	16.9	16.9	16.8	16.8	16.7
ECW (L)	11.3	11.1	11.1	11.0	11.1	10.9
ECW Ratio	0.399	0.398	0.396	0.396	0.397	0.396

## InBody [InBody970] [Yscope]

**InBody**  
www.inbody.com

ID	Height	Age	Gender	Test Date / Time
Jane Doe	156.9cm	51	Female	2021.03.31. 15:44

### Body Composition Analysis

Values	Total Body
Total Body Water (L)	27.4 (26.4-32.0)
Protein (kg)	7.1 (7.0-8.6)
Minerals (kg)	2.64 (2.44-2.98)
Body Fat Mass (kg)	22.0 (10.3-16.5)
Fat Free Mass (kg)	37.1 (35.8-43.8)
Bone Mineral Content (kg)	2.18 (2.01-2.45)

### Obesity Analysis

	Under	Normal	Over
<b>BMI</b> (kg/m <sup>2</sup> )	10.0-15.0	15.0-25.0	25.0-30.0
24.0	[Progress bar showing 24.0 in the Normal range]		
<b>PBF</b> (kg)	8.0-15.0	15.0-25.0	25.0-35.0
37.2	[Progress bar showing 37.2 in the Normal range]		

### Segmental Lean Analysis

	Under	Normal	Over
<b>Right Arm (kg)</b>	55-70	70-115	115-145
101.2	[Progress bar showing 101.2 in the Normal range]		
<b>Left Arm (kg)</b>	55-70	70-115	115-145
97.1	[Progress bar showing 97.1 in the Normal range]		
<b>Trunk (kg)</b>	70-100	100-150	150-180
177.7	[Progress bar showing 177.7 in the Normal range]		
<b>Right Leg (kg)</b>	70-85	85-100	100-130
84.2	[Progress bar showing 84.2 in the Normal range]		
<b>Left Leg (kg)</b>	70-85	85-100	100-130
82.7	[Progress bar showing 82.7 in the Normal range]		

### ECW Ratio Analysis

	Under	Normal	Over
<b>ECW Ratio</b>	0.320-0.340	0.360-0.380	0.400-0.420
0.398	[Progress bar showing 0.398 in the Normal range]		

### Body Composition History

	20.07.21	20.08.27	20.09.20	20.11.23	20.12.21	21.02.19	21.03.31
Weight (kg)	63.3	63.9	62.4	61.8	62.3	60.9	59.1
SMM (kg)	20.1	20.0	19.7	19.7	19.8	19.7	19.5
PBF (kg)	41.3	40.7	39.2	39.0	39.4	38.6	37.2
ECW Ratio	0.399	0.398	0.396	0.396	0.397	0.396	0.398

### Research Parameters

Intracellular Water	10.9 L (10.0-11.5)
Extracellular Water	10.9 L (10.0-11.5)
Basal Metabolic Rate	1171 kcal (1255-1420)
Waist-Hip Ratio	0.94 (0.75-0.85)
Body Cell Mass	23.6 kg (23.4-28.6)
SMI	5.8 kg/m <sup>2</sup>

### Whole Body Phase Angle

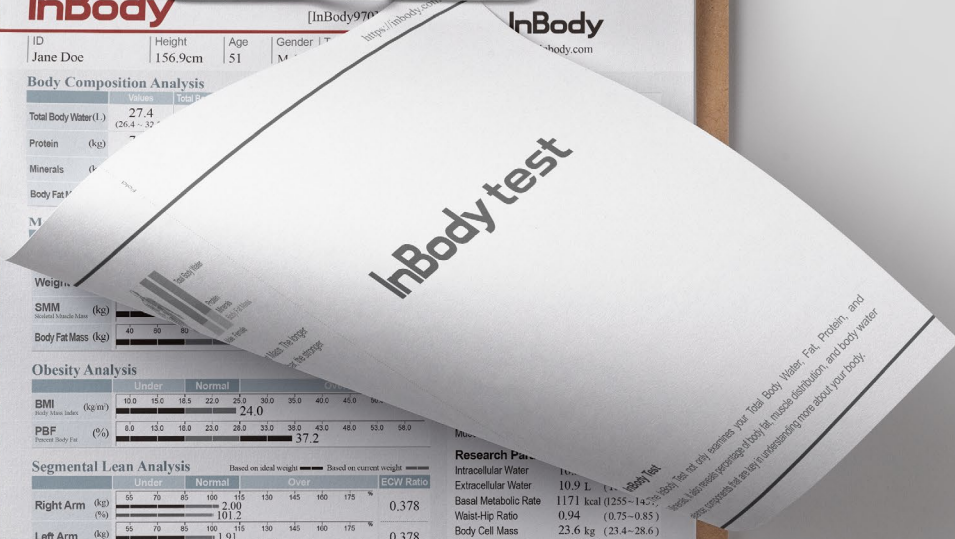
φ (°) 50Hz | 4.0°

### Segmental Body Phase Angle

	RA	LA	TR	RL	LL
φ (°) 50Hz	1.7	4.7	1.7	1.6	4.5
50Hz	4.1	5.7	4.0	3.8	4.3
250Hz	3.8	5.6	2.9	2.9	2.9

### Impedance

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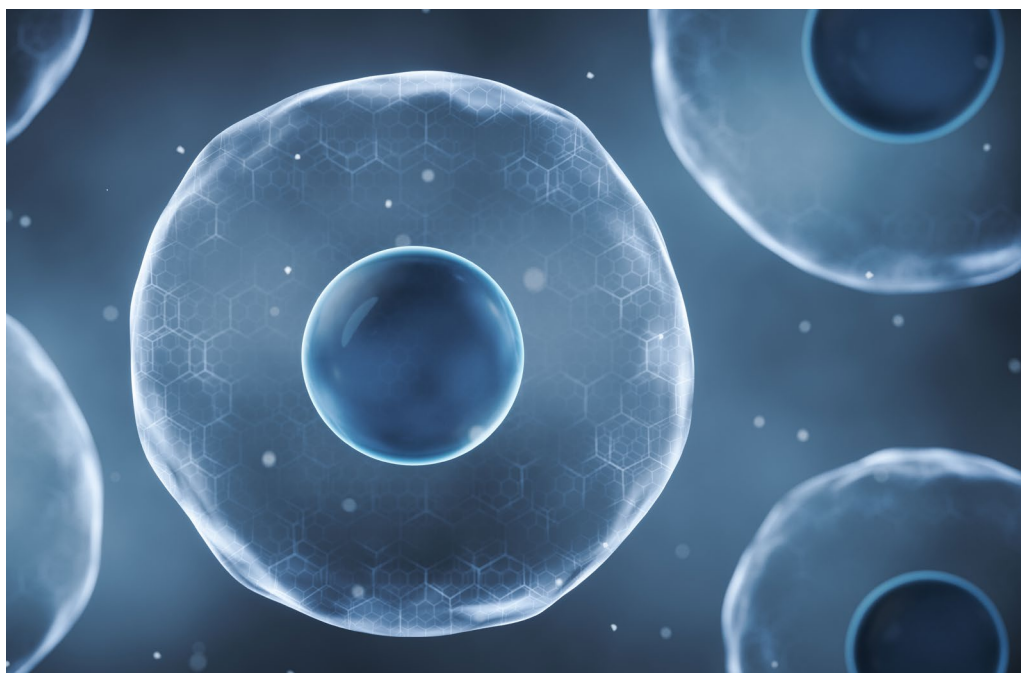
## 03 OUTRO

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The availability of body composition analyzers has significantly altered the way people worldwide view health indicators. Prior to their widespread use, weight and BMI (Body Mass Index) were the primary measures used to assess health.

People's awareness of body composition has increased, and body composition analyzers are becoming more accessible. The changes in our lifestyles require us to explore this field, which is now readily available.

## Future Healthcare Trend for 2024: Cellular Health



Did you know that our bodies are made up of an average of about 30 trillion cells?

Cells are the basic building blocks of our bodies, and throughout our entire life cycle, we live and die by their function. These tiny biological units are responsible for amazing things like converting nutrients into energy, creating new cells, and removing harmful substances. Cells store their genetic information in DNA, which they use to synthesize proteins and other biomolecules to maintain the function of tissues and organs. Our body's health is highly dependent on the number and function of our cells, and their smooth operation is crucial to maintaining proper metabolism and overall physiological balance.

There was a time when weight, BMI, and a superficial healthy look were the only measures of health. InBody has steadily taught the world the importance of balancing body composition—body fat, muscle mass, and water—and people worldwide now choose body composition to assess their health.

InBody's predicted healthcare trend for 2024 is "cellular health." The basis of all body composition starts with the cells. When the cells are healthy, body composition is balanced, and when body composition is balanced, health can be discussed.

Health is increasingly becoming a concern, and the healthcare industry advances at an incredible rate every year. As the pace of progress increases, we need to focus on the basics: strong muscles, moderate body fat to keep our bodies functioning, body hydration as a measure of health, and cellular health as the foundation of all these body components. It all starts with a healthy diet and exercise lifestyle.

It is 2024! So, why not start with a solid eating and exercise plan for a healthy life?

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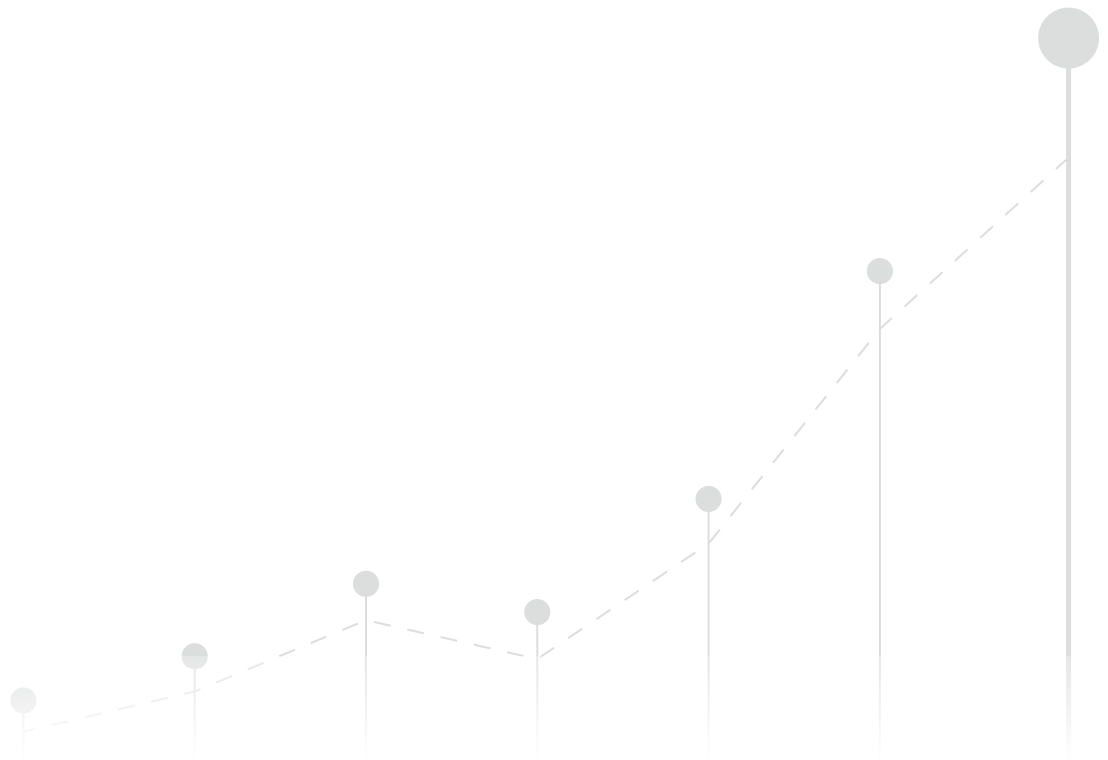
# Appendix

## InBody Report


### Body Composition Index of 17 Countries


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Based on insights derived from InBody big data, we have examine the body composition by country. The 2024 InBody Report includes average body composition index for men and women in 17 countries, which are provided in the appendix.





Male			Country	Female		
Number of data	Mean value of body fat percentage (%)	Mean value of skeletal muscle mass index (kg/m <sup>2</sup> )		Number of data	Mean value of body fat percentage (%)	Mean value of skeletal muscle mass index (kg/m <sup>2</sup> )
1,169	24.2	8.5	Argentina	1,554	34.4	6.6
140,099	23.8	9.0	Australia	256,044	33.5	7.2
47,768	24.0	8.7	Canada	50,416	33.3	6.9
3,060	27.6	8.7	Chile	6,570	38.2	6.8
87,288	21.9	8.3	China	114,097	28.9	6.3
109,161	22.5	8.8	Germany	133,605	32.0	7.1
195,744	27.2	8.2	India	133,898	37.0	6.7
133,725	21.1	8.1	Japan	189,541	29.7	6.2
2,083,928	22.9	8.3	Korea	3,488,437	31.9	6.3
17,683	25.4	8.2	Malaysia	25,708	34.4	6.3
64,934	27.3	8.6	Mexico	108,858	37.2	6.8
53,476	21.3	8.8	Netherlands	67,105	32.4	7.1
2,603	26.1	8.6	Saudi Arabia	2,713	35.6	6.9
61,784	24.4	8.9	South Africa	83,091	36.9	7.0
11,721	22.4	8.3	Thailand	13,237	31.8	6.2
81,730	22.8	8.7	U.K.	99,549	33.9	7.0
989,151	23.6	9.1	U.S.	1,435,420	35.8	7.2


Male			Argentina 	Female		
Number of data	Mean value of body fat percentage (%)	Mean value of skeletal muscle mass index (kg/m <sup>2</sup> )		Number of data	Mean value of body fat percentage (%)	Mean value of skeletal muscle mass index (kg/m <sup>2</sup> )
583	22.6	8.4	20s	429	33.1	6.5
344	25.5	8.5	30s	395	34.4	6.6
157	26.6	8.7	40s	433	34.1	6.8
61	25.6	8.7	50s	227	35.4	6.6
31	26.8	8.5	60s	66	39	6.6
4	25.4	7.8	70s	16	42.6	6.6


Male			Australia 	Female		
Number of data	Mean value of body fat percentage (%)	Mean value of skeletal muscle mass index (kg/m <sup>2</sup> )		Number of data	Mean value of body fat percentage (%)	Mean value of skeletal muscle mass index (kg/m <sup>2</sup> )
45,997	20.7	9.0	20s	95,534	31.7	7.2
48,645	23.5	9.1	30s	82,443	33.1	7.3
28,612	25.6	9.1	40s	51,230	34.2	7.3
13,972	27.9	9.0	50s	25,429	37.0	7.1
5,406	31.0	8.6	60s	8,343	39.7	6.9
1,761	33.1	8.3	70s	1,844	42.6	6.7


\* The data used in this report were used solely for statistical purposes, to provide information, limited to the data for which personal information was agreed upon, and no information that can identify individuals is included in the data.

Male			Canada 	Female		
Number of data	Mean value of body fat percentage (%)	Mean value of skeletal muscle mass index (kg/m <sup>2</sup> )		Number of data	Mean value of body fat percentage (%)	Mean value of skeletal muscle mass index (kg/m <sup>2</sup> )
9,245	19.8	8.7	20s	11,656	31.5	6.9
9,998	23.1	8.8	30s	11,687	32.8	7.0
11,583	24.4	8.8	40s	12,433	33.5	7.1
11,104	25.5	8.8	50s	10,091	34.4	6.9
6,137	26.5	8.6	60s	4,811	35.0	6.7
2,088	28.2	8.2	70s	1,379	36.4	6.4


Male			Chile 	Female		
Number of data	Mean value of body fat percentage (%)	Mean value of skeletal muscle mass index (kg/m <sup>2</sup> )		Number of data	Mean value of body fat percentage (%)	Mean value of skeletal muscle mass index (kg/m <sup>2</sup> )
777	26.2	8.5	20s	1,873	37.9	6.8
1,245	27.7	8.7	30s	2,362	37.8	6.8
749	28.2	8.7	40s	1,577	38.3	6.8
290	29.2	8.7	50s	693	39.1	6.7
50	29.2	8.3	60s	176	41.1	6.7
10	31.5	8.5	70s	17	41.0	6.2


Male			China 	Female		
Number of data	Mean value of body fat percentage (%)	Mean value of skeletal muscle mass index (kg/m <sup>2</sup> )		Number of data	Mean value of body fat percentage (%)	Mean value of skeletal muscle mass index (kg/m <sup>2</sup> )
49,895	20.8	8.3	20s	54,071	28.4	6.2
29,198	23.2	8.4	30s	43,829	29.0	6.3
7,388	24.0	8.4	40s	13,834	29.5	6.5
1,752	25.1	8.2	50s	3,503	31.4	6.5
321	25.4	7.7	60s	443	32.8	6.4
53	29.3	7.7	70s	159	35.8	6.3


Male			Germany 	Female		
Number of data	Mean value of body fat percentage (%)	Mean value of skeletal muscle mass index (kg/m <sup>2</sup> )		Number of data	Mean value of body fat percentage (%)	Mean value of skeletal muscle mass index (kg/m <sup>2</sup> )
31,740	18.7	8.8	20s	34,233	29.7	7.0
25,520	21.9	8.9	30s	28,663	31.2	7.1
18,087	23.8	9.0	40s	25,899	32.0	7.2
20,118	24.7	8.9	50s	29,269	33.4	7.1
12,429	26.1	8.7	60s	15,192	34.8	6.9
4,718	26.9	8.4	70s	4,740	34.9	6.8


Male			India 	Female		
Number of data	Mean value of body fat percentage (%)	Mean value of skeletal muscle mass index (kg/m <sup>2</sup> )		Number of data	Mean value of body fat percentage (%)	Mean value of skeletal muscle mass index (kg/m <sup>2</sup> )
97,347	25.5	8.0	20s	59,295	35.9	6.6
66,575	28.3	8.3	30s	44,011	37.0	6.9
26,628	29.5	8.3	40s	22,220	37.9	6.9
7,246	31.3	8.2	50s	9,132	40.1	6.8
1,044	32.8	8.0	60s	1,692	41.8	6.7
191	34.2	7.5	70s	120	43.2	6.4





Male			Japan 	Female		
Number of data	Mean value of body fat percentage (%)	Mean value of skeletal muscle mass index (kg/m <sup>2</sup> )		Number of data	Mean value of body fat percentage (%)	Mean value of Skeletal muscle mass index (kg/m <sup>2</sup> )
46,861	18.8	8.2	20s	58,938	29.0	6.1
35,235	21.5	8.2	30s	49,572	29.8	6.2
26,444	22.4	8.2	40s	40,013	30.0	6.3
16,313	22.7	8.1	50s	27,870	30.4	6.2
7,777	23.2	7.8	60s	11,222	30.1	6.1
4,372	24.3	7.4	70s	6,395	30.4	5.9


Male			Korea 	Female		
Number of data	Mean value of body fat percentage (%)	Mean value of skeletal muscle mass index (kg/m <sup>2</sup> )		Number of data	Mean value of body fat percentage (%)	Mean value of Skeletal muscle mass index (kg/m <sup>2</sup> )
990,286	21.5	8.3	20s	1,347,141	31.4	6.2
638,623	24.0	8.4	30s	1,005,944	31.7	6.4
305,818	24.3	8.4	40s	676,040	31.7	6.5
168,923	24.2	8.2	50s	443,907	32.8	6.5
54,168	25.0	7.9	60s	166,459	33.8	6.4
13,967	25.9	7.6	70s	29,123	35.3	6.2


Male			Malaysia 	Female		
Number of data	Mean value of body fat percentage (%)	Mean value of skeletal muscle mass index (kg/m <sup>2</sup> )		Number of data	Mean value of body fat percentage (%)	Mean value of Skeletal muscle mass index (kg/m <sup>2</sup> )
6,449	23.3	8.1	20s	8,079	33.1	6.1
6,234	26.2	8.3	30s	9,096	34.7	6.4
3,184	26.8	8.2	40s	5,577	35.0	6.4
1,509	27.4	8.0	50s	2,479	35.8	6.2
452	28.7	7.8	60s	747	36.3	6.1
87	27.0	7.3	70s	114	36.2	5.9


Male			Mexico 	Female		
Number of data	Mean value of body fat percentage (%)	Mean value of skeletal muscle mass index (kg/m <sup>2</sup> )		Number of data	Mean value of body fat percentage (%)	Mean value of Skeletal muscle mass index (kg/m <sup>2</sup> )
21,892	25.1	8.4	20s	34,533	35.5	6.7
22,555	27.2	8.7	30s	35,790	36.7	6.8
12,775	29.0	8.8	40s	21,680	38.0	7.0
5,917	29.8	8.6	50s	12,638	40.0	6.9
2,486	30.2	8.2	60s	5,294	40.7	6.6
661	30.7	7.7	70s	1,232	41.1	6.3


Male			Netherlands 	Female		
Number of data	Mean value of body fat percentage (%)	Mean value of skeletal muscle mass index (kg/m <sup>2</sup> )		Number of data	Mean value of body fat percentage (%)	Mean value of Skeletal muscle mass index (kg/m <sup>2</sup> )
18,003	17.6	8.7	20s	19,247	29.7	7.0
12,707	21.0	8.8	30s	19,247	31.7	7.2
9,529	23.0	8.9	40s	14,162	33.0	7.3
8,681	24.6	8.9	50s	13,561	34.9	7.2
4,547	26.1	8.7	60s	5,568	35.6	7.0
1,375	27.3	8.4	70s	1,397	36.2	6.8

Male			Saudi Arabia 	Female		
Number of data	Mean value of body fat percentage (%)	Mean value of skeletal muscle mass index (kg/m <sup>2</sup> )		Number of data	Mean value of body fat percentage (%)	Mean value of Skeletal muscle mass index (kg/m <sup>2</sup> )
804	24.0	8.4	20s	684	34.2	6.7
916	26.1	8.7	30s	887	35.0	6.9
545	27.6	8.8	40s	605	36.4	7.1
271	27.9	8.8	50s	415	37.0	7.1
105	28.3	8.5	60s	146	38.7	7.0
17	31.5	8.6	70s	22	40.2	6.8

Male			South Africa 	Female		
Number of data	Mean value of body fat percentage (%)	Mean value of skeletal muscle mass index (kg/m <sup>2</sup> )		Number of data	Mean value of body fat percentage (%)	Mean value of skeletal muscle mass index (kg/m <sup>2</sup> )
25,269	20.7	8.8	20s	28,466	34.8	6.8
18,648	25.6	8.9	30s	27,184	37.5	7.0
11,510	27.4	9.0	40s	18,003	37.9	7.1
5,658	28.3	9.0	50s	8,783	38.6	7.1
1,820	29.5	8.7	60s	2,402	39.7	6.9
366	30.8	8.3	70s	335	40.5	6.6

Male			Thailand 	Female		
Number of data	Mean value of body fat percentage (%)	Mean value of skeletal muscle mass index (kg/m <sup>2</sup> )		Number of data	Mean value of body fat percentage (%)	Mean value of skeletal muscle mass index (kg/m <sup>2</sup> )
5,142	21.6	8.2	20s	4,859	31.7	6.2
4,407	22.7	8.4	30s	4,746	31.3	6.3
1,821	23.3	8.3	40s	2,518	31.6	6.3
527	24.8	8.1	50s	1,076	33.4	6.2
107	26.3	7.5	60s	244	34.6	5.9
22	29.6	7.2	70s	30	37.2	5.7

Male			U.K. 	Female		
Number of data	Mean value of body fat percentage (%)	Mean value of skeletal muscle mass index (kg/m <sup>2</sup> )		Number of data	Mean value of body fat percentage (%)	Mean value of skeletal muscle mass index (kg/m <sup>2</sup> )
28,400	20.3	8.6	20s	28,880	31.7	6.8
26,788	22.6	8.8	30s	30,347	33.3	7.1
15,627	24.4	8.9	40s	20,897	34.7	7.2
8,697	26.1	8.9	50s	15,258	37.0	7.1
3,059	27.4	8.6	60s	4,956	37.1	6.8
790	27.7	8.3	70s	1,144	36.9	6.6

Male			U.S. 	Female		
Number of data	Mean value of body fat percentage (%)	Mean value of skeletal muscle mass index (kg/m <sup>2</sup> )		Number of data	Mean value of body fat percentage (%)	Mean value of skeletal muscle mass index (kg/m <sup>2</sup> )
348,426	20.5	9.0	20s	399,306	34.0	7.1
278,137	23.8	9.2	30s	405,674	35.4	7.3
189,881	25.5	9.3	40s	320,999	36.2	7.3
120,091	26.5	9.2	50s	223,962	37.4	7.2
58,810	27.7	8.9	60s	100,257	38.2	6.9
20,283	29.1	8.4	70s	27,619	38.9	6.6

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**InBody®**

**Date of publication :** January 08, 2024

**Publishing :** InBody Co., Ltd.

**Directing :** Kyungwoo Lee

**Editorial :** Suyeon Yang, Heehwan Kim

**Design :** Jiyoo Park

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