Two recent studies examine obesity and its effect on health, drawing potentially divergent conclusions using the same standard — body mass index — as a means of determining risk for life-threatening cardiovascular disease.

In order to help explain what these two studies might mean for people seeking an understanding of their relative risk in the face of obesity, let’s examine the studies one at a time.

According to the first study, published in November in JACC: Clinical Electrophysiology, women who were overweight at the age of 18 are more likely to die of sudden cardiac arrest at any age, regardless of their current weight.

The results of the study were publicized in The New York Times on Dec. 7, 2015.

What is Body Mass Index (BMI)? What does it tell us?

Body Mass Index (BMI) is a way of categorizing people as underweight, normal weight, overweight, or obese. It is a formula that incorporates a person’s height and weight.

- A BMI of 18.5 to 24.9 is considered normal weight
- A BMI of 25 to 29.9 is considered overweight
- A BMI of 30 to 34.9 is considered obesity, Class I
- A BMI of 35 to 39.9 is considered obesity, Class II
- A BMI of 40 or above is considered obesity, Class III

The categories are somewhat arbitrary and have changed over time. For example, overweight was considered in the past to be a BMI of 27 or higher.

There are limitations to using BMI to determine someone’s obesity status. While BMI may be useful for looking at a whole population, when it comes to a particular individual it may not always be accurate. One common example of an inaccurate BMI would be an athlete with high muscle mass. She may have a BMI of 27, which is considered overweight, but her body fat percentage may be normal because muscle weighs more than fat. Another limitation is that the normal BMI may vary based on race. For example, the BMI recommendation for Asians is lower than for Caucasians: a normal BMI would be lower than 23 for an Asian person.

More important than what BMI does tell us is what it doesn’t tell us. While BMI may indicate obesity, it does not necessarily translate to increased health risk, since the distribution of fat is important in determining health risk. Abdominal obesity (known as visceral fat) is associated with health problems such as diabetes, high blood pressure, high cholesterol, and heart disease, while subcutaneous fat (around the hips and legs for example) is not.

You can calculate your own BMI based on your height and weight at http://www.nhlbi.nih.gov/health/educational/lose_wt/BMI/bmicalc.htm

GAINING MORE THAN 44 POUNDS AS A YOUNG ADULT WAS ASSOCIATED WITH TWICE THE RISK OF SUDDEN CARDIAC DEATH LATER IN LIFE.
What is a heart attack?

This is when one of the arteries on the outside of the heart that supplies blood to the heart muscle (coronary artery) becomes blocked. That part of the heart muscle no longer has a supply of oxygen and can be injured or even die, leaving permanent damage to the heart.

A coronary artery gets blocked slowly over time by a process called atherosclerosis, in which cholesterol plaque builds up, narrowing the canal through which the blood flows. During a heart attack, there is typically a crack or rupture in the cholesterol plaque, and a blood clot forms on the rupture, suddenly cutting off the blood flow to the heart muscle.

What is sudden cardiac death (SCD)? What causes it?

Cardiac arrest is when the heart develops a lethal abnormal heart rhythm which results in the heart no longer pumping blood. Sudden cardiac death is defined as death from cardiac arrest that occurs within one hour of onset of symptoms.

Two of the most common causes of SCD, accounting for 80 percent of cases, are a new myocardial infarction (heart attack), or an old heart attack that has left heart damage or scarring. A heart attack is not the same thing as SCD (most people survive a heart attack), but it can lead to SCD.

Other causes of SCD are an enlarged heart (cardiomyopathy) or disease in one or more of the heart’s four valves that control the direction of blood flowing in and out of the heart. Some people are at increased risk for SCD due to abnormalities in the heart’s electrical circuitry from birth (congenital long QT syndrome), or due to certain medications.

The incidence of SCD in the United States is somewhere between one in 1,000 to one in 2,000 deaths per year. Men die of SCD more often than women by a 2:1 ratio. Incidence varies by race as well, being more common in African Americans than in Hispanics and Caucasians.

It is worth noting that there are other causes of sudden death that could be misdiagnosed as SCD. One example is a pulmonary embolism (PE), a blood clot to the lung. In this first study, a definitive cause of death was often not available (see below).

Where did the researchers find the subjects? Why no men?

The study participants were those enrolled in the Nurses’ Health Study, an observational study of actively willing participants that began in 1976. Initially, 121,700 female nurses in the United States volunteered to participate. The ages ranged from 30 to 55. After exclusions for various criteria, the final analysis for this article included 72,484 women.

The authors did not state why this particular study cohort (which did not include men) was chosen. Most likely it was chosen because it is a rich database of information on a large number of people followed over a long period of time. It is interesting that they chose a study of women only, as heart disease in general has long been considered a disease of men and overlooked in women for decades even though more women than men die of cardiovascular disease every year.

What were the researchers looking for? How were the measurements and endpoints determined?

The authors were looking for an association between BMI and sudden cardiac death (SCD), particularly SCD that was primarily due to a heart rhythm abnormality. They also looked at associations between BMI and fatal or nonfatal heart attacks.

BMI was based on self-reported weight and height. The women self-reported (at ages 30-55) their weight at age 18 by recall.
SCD determination was based on reports from next of kin or postal authorities, searches of the National Death Index, reviews of medical records, autopsy reports, and interviews with family members. If the death was unwitnessed or occurred during sleep when symptom-free during the prior 24 hours, it was considered probable SCD as well and was also included in the study results.

Fatal heart attack was confirmed by autopsy report, hospital records, or death certificate. Probable fatal heart attack was also included if indicated by a death certificate or a family member’s report. Nonfatal heart attack was determined by participants’ questionnaires and confirmed by medical record review when available.

What did the researchers learn? Why is this significant?

The strongest association the researchers found was that women with a higher BMI during early adulthood had a greater risk of SCD.

They also concluded that:

1. Weight gain of >20 kilograms (about 44 pounds) during early-to-mid adulthood was associated with twice the risk of SCD.
2. Obesity may be a stronger risk factor for SCD for middle-aged as opposed to older women.
3. Excess weight or weight gain may have an early and cumulative impact on SCD risk that is not completely reversed by weight loss later in life.
4. Higher BMI was associated with lower risk of SCD in women with known heart disease (see obesity paradox later in this article).
5. Excess body weight likely influences both heart attack and SCD risk through atherosclerotic pathways and adverse effects on blood pressure, cholesterol, and insulin resistance.
6. Women with BMI >35 had a higher risk of SCD even after adjusting for risk factors, so extreme obesity may increase SCD through other (non-atherosclerotic) pathways such as heart muscle enlargement and change in the heart’s electrical conduction.
7. Excess weight in early adulthood/being overweight for a longer period may lead to early changes in heart structure and function which may increase SCD later in life.

What conclusions did the researchers reach in terms of how to apply their results to patient care? What should doctors and patients do with this new information?

The authors recommend strategies for maintenance of healthy weight throughout adulthood as a method of SCD prevention in the general population, particularly among women.

Recommendations for patient management should not change based on this study alone. While an association between BMI and SCD was made, it cannot be said that the higher BMI caused the increase in SCD.

What were the limitations of this study? Do we have any similar data for men? What would be a good next step for researchers to learn more on this subject?

There were several limitations to this study. The researchers were able to draw conclusions about associations but not causality. The fact that weights were obtained by self-report (including recall from many years prior) is a limitation — even being a few pounds off could result in being in a different BMI classification. There were no direct measures of clinical risk factors such as blood pressure, cholesterol levels, and diabetes. All were self-reported. The diagnosis of SCD was very often not definitive, even including reports from “postal authorities.” The population studied was mostly white, educated women involved in health care and not representative of the U.S. population as a whole.

Also, an observational study of this sort involves only those participants who chose to sign up and limits the ability of researchers to extrapolate results to wider populations as in a randomly selected sample.

In previous research (which included men), the data have shown an association between obesity and SCD in some studies but not in others. Age has also played a factor in these studies. A good next step might be to do a retrospective study of women and men who die of confirmed rhythm-related (not due to heart attack) SCD, to determine what risk factors these patients may have had. A prospective study may be difficult to do, as at-risk subjects would have to be followed for decades.

What were the results of this study? Do we have any similar data for men? What would be a good next step for researchers to learn more on this subject?

The results of the study were publicized by UPI on Feb. 6, 2015.
What have previous studies told us about the relationship between BMI and poor health conditions such as diabetes, cardiovascular disease, hypertension, and cancer?

It is well established that being overweight or obese is associated with an increased risk of many health conditions, including diabetes, cardiovascular disease, hypertension, and cancer. While the risk is significantly increased for the population in general, there are many factors that influence the risk of a given individual, and not everyone develops weight-related health problems.

Does weight loss help decrease risk of illness and death?

Perhaps. It was shown in the Diabetes Prevention Program study that making lifestyle changes, including losing weight and exercising, was more effective than medication (and much more effective than no intervention) at preventing the progression from pre-diabetes to type-2 diabetes over time. Type-2 diabetes is a disease that causes the body’s blood sugar levels to rise higher than normal, potentially leading to serious health problems such as life-threatening cardiovascular disease.

However, in people who already have type-2 diabetes, the Look AHEAD study showed that making similar lifestyle changes did not lead to a lower rate of heart attacks, strokes, or death compared to the control group. There has been much discussion about the reasons for this. Possible factors include low rates of events in both groups and very good health management with medication in the control group.

Researchers have identified what they have dubbed the “obesity paradox.” People with known heart disease who are overweight or have Class I obesity have a lower risk of death than those at normal body weight. There have been numerous theories to explain this finding, but none have been proven. Interestingly, when fitness is taken into account (if both the normal weight and overweight people are aerobically fit), the obesity paradox does not seem to apply.

One large study showed that even in the general population, optimal survival occurred in the overweight or Class I obesity category compared to those with a normal BMI. Another study showed no proof that weight loss was beneficial to healthy overweight or obese people (those with no weight-related health problems). Those with more severe obesity (BMI ≥35) have increased rates of disease and early death.

Are there reasons for someone with a BMI classified as overweight or obese not to lose weight?

If in the process of losing weight, a person loses lean mass (muscle) rather than fat, he or she may actually worsen health risk rather than improve it.

A person with an eating disorder or a history of an eating disorder (such as anorexia, bulimia or binge eating disorder) may be negatively affected by weight loss attempts.

Studies have shown that older people (in their 70s and above) have lower death rates if they are in the overweight BMI range than if they are in the normal BMI range. One theory explaining this is that the overweight individuals have more “reserve” if they become ill and are better able to combat the illness.

An individual may also have other priorities for health improvement, such as quitting smoking.

Who did the researchers study? How was the data collected?

They used the NHANES (National Health and Nutrition Examination Survey) database from 2005-2012. NHANES collects data on the health of adult women and men in the United States through interviews and physical exams. A representative sample of 5,000 people each year is collected. Age, race, gender, pregnancy status, and medication use were self-reported. Height, weight, and blood pressure were measured. A blood sample was obtained to test for cholesterol, insulin levels, high-sensitivity C-reactive protein (known as hsCRP, a biomarker for inflammation), and blood sugar.

How did the researchers define metabolic health?

Metabolic health was defined as having none or only one of the following metabolic abnormalities:

1. High blood pressure or pre-high blood pressure (≥130/85 mm Hg or on blood pressure medication)
2. High triglycerides, a type of bad cholesterol (≥150 mg/dL or on medication)
3. Low HDL-cholesterol, a type of good cholesterol (<40 mg/dL in men or <50 mg/dL in women)
4. Fasting glucose (blood sugar) ≥100 mg/dL (or on diabetic medication)
5. Signs of insulin resistance through homeostatic model assessment (HOMA-IR>5.13)
6. hsCRP level >0.1 mg/L (this is a marker of inflammation in the bloodstream)

It is worth noting that the term “metabolic syndrome” (associated with insulin resistance and an increased risk for
adult onset diabetes and heart disease) includes five criteria. The first four are Nos. 1-4 above, the fifth is a waist circumference greater than or equal to 35 inches for women and greater than or equal to 40 inches for men. A person must have three of the five criteria to be diagnosed with metabolic syndrome.

What did the researchers find? What is the significance of these findings?

- 47% of overweight people are metabolically healthy
- 29% of those with Class I obesity are metabolically healthy
- 16% of those with Class II and III obesity are metabolically healthy
- 30% of those with a normal BMI were metabolically unhealthy

Did they discover any differences among races or between genders?

There was no significant difference by race.

There was a difference between genders. Normal weight women were more likely to be metabolically healthy than normal weight men. Women with Class I obesity were not more likely to be metabolically healthy than obese men. In Class II and III obesity (BMI greater than 35), women were again more likely to be metabolically healthy than men.

The authors did not offer any insight to the gender differences. At a given BMI, a woman typically has a higher body fat percentage than a man. However, that body fat may be distributed more evenly under the skin rather than around the mid-section and so would not necessarily have any negative metabolic impact.

The study does not include data on body fat percentage or distribution even though there was a difference between genders in normal weight people and more severely obese people but not those with Class I obesity. Further analysis including body fat percentage and distribution as well as a breakdown of subjects by age (before and after menopause) might be enlightening.

What conclusions did the authors draw about BMI as a measure of health? Are people with a high BMI always unhealthy? Can someone with a low BMI be unhealthy?

Based on the results, the authors estimated that 74,936,678 people in the United States would be misclassified regarding health risk based on BMI alone.

The authors state that focusing on BMI as a proxy for health may lead to:

- misuse of time, patient effort and resources to lose weight when not indicated
- ignoring the needs of the metabolically unhealthy patient with a normal BMI (30 percent in this study)
- worsening the stigma against overweight people

What are some of the problems that might develop if health care providers, insurers or employers rely too heavily on BMI as a measure of cardio and metabolic health?

If health care providers rely solely on BMI, they could recommend weight loss when it is not medically necessary. They could also not intervene or make recommendations for someone who has a normal BMI but is metabolically unhealthy.

Successful weight loss, medically speaking, is considered losing 5-10 percent of body weight and keeping it off. Improvement in weight-related health problems can be seen with this amount of weight loss. Unfortunately, most policies are usually written so that even if a person is indeed successful, they may still be penalized with higher insurance costs. For example, a 250 pound man could lose 25 pounds (10 percent of his body weight) and see significant health improvements but still have a BMI of 32, well above many cutoffs for lower insurance cost.

Do the authors suggest any alternative measurements of health to replace or augment BMI?

Yes, the authors recommend using clinical measures such as blood tests. If not obtainable they suggest using assessment of cardiorespiratory fitness, physical activity, waist circumference, body fat percentage, or some combination.

Does the study have any obvious shortcomings? Do you agree with the conclusions?

There are several shortcomings. The study doesn’t take into account non-metabolic diseases associated with being overweight or obese, such as cancer, osteoarthritis, or sleep apnea. It also doesn’t consider the risk of developing metabolic
diseases as a person ages. I don’t think that a physician would ignore health problems in a person just because of a normal BMI. I don’t agree with substituting body fat percentage for BMI, as it can have the same shortcomings as BMI in many cases.

I do agree with using a fitness assessment as an alternative to BMI for health risk assessment. A different study suggests that aerobic fitness is a much better predictor of risk of death than BMI is. Unfit people have twice the death risk of fit people, regardless of BMI. Those who are overweight or obese (Class I) and are physically fit had similar death rates as normal weight people who were fit. Fitness-based interventions may be a much more effective approach to improving health.

I agree that the problem of weight stigmatization is a real one and should not be compounded further by actions on the part of the U.S. government or employers.

Do you view the previous study on sudden cardiac death in women and BMI differently in light of the study criticizing BMI as a measure of cardio and metabolic health?

I don’t think it is useful to counsel a 20-year-old woman that because she is overweight, she might be at increased risk to drop dead in middle age, and I also don’t think this study proved that to be the case.

The approach with any patient should be individualized. Rather than focusing solely on BMI, the fat distribution should be considered as well as blood pressure, blood sugar, cholesterol, and weight-related symptoms (heartburn, low back pain, daytime sleepiness).

If someone is overweight but in a “pear shaped” distribution, and all metabolic tests are normal, it might not be appropriate for the physician to advise weight loss to decrease risk of high blood pressure, high cholesterol, diabetes, or heart disease.

If the waist circumference is high at a younger age, the patient may be advised that even though he/she appears healthy now, the risk for health problems including heart disease and diabetes may increase with advancing age.

Physicians may be reluctant to address obesity and weight loss with patients, as it is a sensitive issue with no quick or easy solutions. However, if a physician in his or her professional judgment feels that a patient’s health would benefit from weight loss efforts, he or she needs to address it because patients are much more likely to make lifestyle changes if recommended by a physician.

When addressing this topic, the term “weight” is most readily accepted, and is perceived as less offensive than the term obesity or other terms. Asking a patient permission to discuss his or her weight is a good start. It’s important to review the weight history, and notice (and give positive comments) if a patient has lost weight. Physicians can utilize the services of dietitians, exercise physiologists, and behavioral health professionals to offer the guidance and support needed by the patient. Maintaining weight loss is often the biggest challenge, and it is important that the support continues long term.

If a person does decide to lose weight, it should be a personal decision with internal motivation. Stigmatization of overweight and obese people is a significant problem, even on the part of the medical community. Making someone feel ashamed has not been proven effective as a method of encouraging weight loss and may actually have the opposite effect.