

## Section Editors

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# Body mass index in early life and stroke in adult life

## What is the risk?

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**WHAT DID THE AUTHORS STUDY?** The article “BMI increase through puberty and adolescence is associated with risk of adult stroke” by Ohlsson et al.<sup>1</sup> explores the relationship between body mass index (BMI) when a person is young (adolescence) and risk of stroke when the person is older (adults). Previous studies<sup>2,3</sup> have shown that rate of stroke is decreasing in older adults but increasing in younger adults. This finding coincides with an increasing BMI in children and young adults. The researchers wanted to ask: Does an increased BMI during puberty and adolescence increase the risk for stroke later in life? The authors also explored whether the change in BMI throughout puberty and adolescence is associated with increased risk for stroke. Since extensive literature has shown the relationship between elevated weight/BMI and cardiovascular disease, the authors hypothesized that increasing BMI through puberty and adolescence would increase stroke risk.

**HOW WAS THE STUDY DONE?** Until 2008, Sweden has had mandatory military conscription training for all men. The country has collected health data on boys throughout childhood and early adulthood. In addition, Sweden’s National Board of Health and Welfare and Statistics keeps extensive information about public health problems, including hypertension and stroke.<sup>4-6</sup> Using public military conscription records, the authors of this study obtained height and weight data of 37,669 Swedish men from prepubertal childhood and in young adulthood. Using a mathematical (linear regression) model, height and weight were identified for all patients at age 8—before puberty—and age 20. Then, using Swedish public health databases, the researchers identified men who later had high blood pressure (hypertension) or stroke. There are 2 kinds of stroke. Recognizing this, the authors divided the people who had a stroke into 1 of 2 categories: ischemic stroke (clots) and intracerebral hemorrhage (bleeds). Using different mathematical (Cox regression) models, the authors compared (1) childhood BMI and (2) BMI change through puberty and adolescence to the likelihood of having either kind of stroke later in life.

**WHAT DID THE STUDY SHOW?** Dr. Ohlsson et al. found that men whose BMI increased through

puberty and adolescence (from ages 8 to 20) were statistically more likely to have a stroke than were those whose BMI did not increase during the same period. Furthermore, men who either became overweight during puberty or maintained being overweight during childhood and puberty had elevated risk for stroke. Elevated BMI at age 20 was significantly associated with stroke of both types, though it was more strongly associated with intracerebral hemorrhage than ischemic stroke. Not only this, but there was also an association between above-average weight (median BMI) throughout puberty and risk for early death due to stroke. Interestingly, there was no significant association between elevated BMI at age 8 and risk of stroke later in life. Rather, men who were overweight before puberty and returned to normal weight before age 20 did not demonstrate an increased risk for stroke compared to those who were at normal weight at both ages 8 and 20.

Next, Ohlsson et al. examined whether increasing BMI through childhood and puberty was associated with stroke in early (before age 55) or late (after age 55) adult life. In this regard, the authors found that high BMI increase throughout puberty was strongly associated with intracerebral hemorrhage early in adulthood, and was moderately associated with overall risk for stroke and ischemic stroke at any time (i.e., early or late adulthood).

Finally, Ohlsson et al. performed several tests to ensure that other outside variables did not account for these findings. Interestingly, they found a strong association between BMI change through puberty and adolescence and later (adult) diagnosis of high blood pressure (hypertension). They did not find a difference in rate of stroke between those who had high blood pressure and those who did not.

**WHAT DOES THIS MEAN?** Research suggests that a person’s heart and brain health when young correlates with long-term health as an adult. Specifically, risk for stroke is increased by poor overall cardiovascular health. This study suggests that persistently elevated and increasing BMI throughout childhood and adolescence are associated with greater risk for stroke in adulthood. While increasing BMI through puberty was associated with increased overall risk for stroke and ischemic stroke throughout adult life,

increasing BMI was most strongly associated with risk of intracerebral hemorrhage before age 55. Therefore, individuals whose BMIs increased or remained elevated above a normal range throughout puberty and adolescence may be more likely to experience stroke

in adult life. Those who believe they may have elevated risk for stroke should speak with their doctor. There are now many treatments that can decrease the risk for stroke. Prevention is the key in reducing strokes.

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# What is a stroke?

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There are 2 kinds of stroke. In the first type, called ischemic stroke, there is loss of blood flow to a certain part of the brain. About 85% of all strokes are ischemic. Often this is caused by a blockage in a blood vessel. When blocked, blood and oxygen cannot get to the area of brain that the blood vessel supplies. If this goes on long enough, the brain cells begin to die. Ischemic stroke can be caused by narrowing of the large arteries to the brain, also known as atherosclerosis. In other people, a clot can form in arteries of the neck. If a piece of the clot breaks off, it can travel to the brain and block a brain blood vessel. In the same way, clots may also form in the heart, and travel by blood flow to the brain vessels, causing stroke.

In the second type of stroke, bleeding occurs into the brain: this is called a hemorrhagic stroke. Bleeding can occur due to a few reasons. In one type, an aneurysm, which is a weakened blood vessel, breaks open or ruptures. When this happens, the bleeding puts pressure on surrounding brain. The pressure injures and possibly kills the nearby brain cells.

In either type of stroke, the resulting brain damage causes weakness, numbness, and speech problems. If the stroke is severe enough, it can lead to coma, and possibly death. Fortunately, there are effective ways to prevent stroke. If you have a stroke, seeking immediate medical attention can help reduce your chances of death and disability.

**WHAT ARE THE SIGNS OF A STROKE?** There are many ways to identify the signs of stroke. The American Heart Association and the American Stroke Association use the letters F-A-S-T (American Stroke Association website is [strokeassociation.org](http://strokeassociation.org)) to help people remember the signs of a stroke:

**F** = Face droop: Is one side of the face weak or numb?

**A** = Arm weakness: Is one arm weak or numb?

**S** = Speech difficulty: Does the speech sound slurred? Can the person talk? Is he or she able to understand what you are saying?

**T** = Time to call 911. Time is of the essence. The earlier a person can get to medical attention, the better the chance of a full recovery.

**HOW COMMON IS STROKE?** Every year, about 800,000 people in the United States have a stroke. About 160,000 die from stroke. Stroke is our nation's number 3 killer, after heart disease and cancer. Stroke is the number 1 cause of adult disability. Stroke is more common in men until age 75; after age 75, stroke is more common in women.<sup>7</sup> In the United States, African Americans are at greatest risk for stroke compared to other races.<sup>7</sup>

Transient ischemic attacks, or TIAs, have many similarities with strokes. TIAs occur when a clot temporarily blocks a blood vessel, resulting in symptoms much like those of a stroke. However, the symptoms of a TIA last less than 24 hours, and there is no permanent brain damage. TIA can be a warning sign for a later stroke. People who feel they may have experienced a TIA should consult with their physician right away.

**STROKE IS AN EMERGENCY** Call 911 immediately if you or someone you know experiences any of the above warning signs. Even if you are not sure if the person is having a stroke, call 911. Jot down the time the symptoms started: this will be a very important piece of information that the doctor or hospital will need to decide if certain treatments can be given. Sometimes the warning signs last for only a few minutes (TIA), and then stop. Even if the symptoms stop, or if you feel better, call 911 for help.

**TREATMENT OF STROKE** There are many treatments for strokes. These treatments depend on whether the stroke is ischemic or hemorrhagic. A picture of the brain, such as a CT or MRI of the brain, is usually performed to determine the type of stroke. Once a doctor determines whether the stroke is ischemic or hemorrhagic, treatment can begin.

Ischemic stroke is often treated with tissue plasminogen activator (tPA), a medication that breaks down the clot obstructing the blood vessel in the brain. In other words, tPA is a clot buster. tPA can only be given within a short period after the stroke occurs. This is one reason why the time of onset of the stroke is so important to remember. It is also the reason why it is critical to get to medical attention as soon as possible.

Treatment of hemorrhagic stroke is very different from that of ischemic stroke. The treatment of

hemorrhagic stroke depends on the cause of the bleeding. It also depends on how much bleeding has occurred. In hemorrhagic stroke, the physician will attempt to determine the cause of bleeding. If the patient is taking any medications that worsen bleeding, such as warfarin (Coumadin), the physician will likely stop those medications. Some hemorrhagic strokes require a surgeon or the help of an interventional radiologist for treatment. For example, if there is a problem with the blood vessel, such as a weak vessel wall (aneurysm), or abnormal blood flow (arteriovenous malformation), surgery may be needed to stop the bleeding.

**ALTHOUGH TREATMENTS EXIST, PREVENTION OF STROKE IS THE KEY** There are many risk factors for stroke. Some risk factors for stroke cannot be prevented. We cannot change our age, race, or family history of stroke. However, we can work on things like high blood pressure, an irregular heart rate (like atrial fibrillation), diabetes, cigarette smoking, high cholesterol (and fat levels in the bloodstream), alcohol abuse, and obesity. Treatment is available for all of these medical illnesses.

We now realize that we should be talking with our doctor about stroke and heart disease at an early age. In discussing the risks for stroke, you and your doctor can devise a plan to prevent or at least minimize these. For some of these illnesses, a medication is needed. In others situations, a change in lifestyle may have to occur. For instance, a person who smokes cigarettes should quit to reduce the risk of stroke (and heart attack). This person might need help from a doctor to quit. Asking for help may not be easy, but it is the best way to live a full, healthy life.

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