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Fact sheet: Preventing osteoporosis

IQWiG

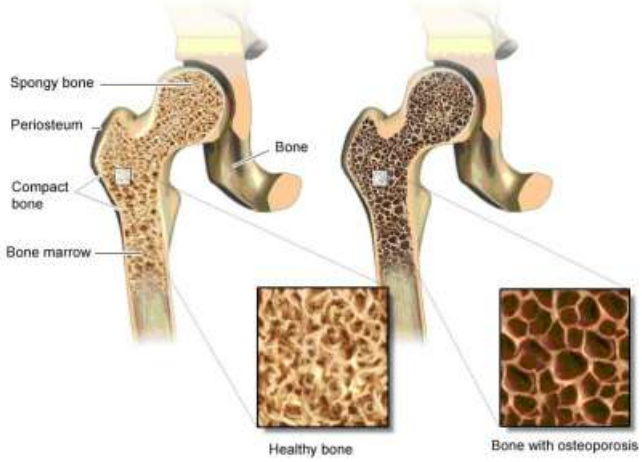
Weakened bones that break too easily are a sign of osteoporosis. Many people are afraid of it, and it is in fact quite a common problem that develops when we live into our 70s, 80s and beyond. But there are several things we can do that can protect and strengthen our bones as we get older.

Preventive strategies are particularly important for women because they are more likely to develop osteoporosis. In Germany, by the time women are 80 years old, around 1 in 5 will have weak, brittle bones. The risk of fractures increases considerably for both women and men above the age of 75. But bone health is important for all adults. Read on to find out what you can do today to start protecting your bones so that you can have a healthier old age.

What is osteoporosis and why do bones break more easily when we get older?

Bones have to withstand a great deal of pressure in everyday life. They take on various strains whenever we stand and move around. The outer layer of our bones is hard and solid. That is called compact or cortical bone. It has a thin but tough coating called the periosteum.

Inside bones there is a supporting structure with interconnecting bony webs and rods called trabeculae. This structure is called trabecular or spongy bone because it looks a bit like sponge or honeycomb. In the spaces between the trabeculae is the bone marrow. The bone marrow produces our blood cells.



The word "osteoporosis" comes from the Greek for bone ("osteo") and porous ("porosis"). Osteoporosis happens when a large amount of the spongy bone tissue breaks down, leaving bigger spaces. This makes the bone more porous. The fine structure of the bones also changes, becoming more brittle and easier to break. Bones can become so weak that they break when the person stumbles or lifts a heavy shopping bag. Bones in the spine can break without the person even realising it has happened. That is called a vertebral fracture and it usually does not cause any noticeable problems. It is one of the most common fractures caused by osteoporosis, along with fractures in the hip, upper arm and wrist.

Osteoporosis is one reason why many older people stoop over and develop what is often called a "dowager's hump" at the top of the spine.

What happens to our bones as we get older?

Bones are living tissue. Our bones are constantly renewed throughout our life. Old bone tissue is continually being replaced by new bone. Cells called osteoblasts produce new bone, while cells called osteoclasts dissolve old bone cells. This process is controlled by hormones and is called "bone turnover".

Bones are full of minerals. Calcium is the most important mineral for our bones. It makes them harder and stronger. The more calcium there is in bones, the denser they are. And the density determines the strength and resistance to fracture or breaking. High bone density helps protect against fractures. But the fine structure of the bone is also very important for bone stability.

In children and young adults, more bone is formed than is broken down. This means that the bones grow. They get heavier and more dense. At about the age of 30 our bones are about as strong as they will ever be. From then on, the rate of bone turnover will change. Slowly, more bone is dissolved than is produced. After we are 50 years old, this process starts to speed up. For women, the hormone oestrogen also helps slow down the rate at which bone is broken down. So after the menopause, when this hormone level drops, bone is lost more quickly.

Getting older does not mean that you will automatically develop osteoporosis. But the risk of osteoporosis increases as you get older, and it is a very common condition in people over the age of 70.

What are the main risk factors for osteoporosis?

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Genetics and our bone health when we are young play a role in how our bones age, and whether we will develop osteoporosis when we get older. The main risk factors for osteoporosis are:

- Age: Being past the menopause for women, and over the age of 65 for men
- Low body weight for our height
- Poor diet that is causing calcium and/or vitamin D deficiency
- Lack of movement
- Having several family members with osteoporosis
- Smoking
- Long-term use of corticosteroids and
- Some illnesses (including rheumatoid arthritis and thyroid problems)

We discuss calcium, diet and exercise below. Along with smoking less, these are the main areas where you can lower your risk of developing osteoporosis.

Middle-aged and older smokers have a higher risk of hip fracture than non-smokers. Researchers have speculated about the possible ways that smoking might damage bone health. The possibilities include toxic effects on bone from nicotine or cadmium in cigarettes. Smoking might interfere with the absorption of calcium in the bones.

It is not clear by how much quitting smoking could decrease your risk of fractures. The results of some studies suggest that quitting smoking might stop the ongoing damage that smoking could do to bones. If you are interested in what quitting strategies have been proven to work, you can read more here (URL: http://www.gesundheitsinformation.de/quit-smoking.311.56.en.htm .

In this fact sheet, we are talking about what is called "primary" osteoporosis. Osteoporosis can also be a second health problem caused by something else. That is called "secondary osteoporosis". Secondary osteoporosis is when the condition is a complication of another illness, or it is caused by long-term use of corticosteroids, for example.

How can I get enough calcium to reduce my risk of osteoporosis? Is extra vitamin D important as well?

Calcium is an important part of our diets throughout our whole lives. It is important for our bones, teeth and nails, among other things. And as we get older, we need even more calcium to help our bodies keep building new bone tissue. You can help your body to do this by eating a calcium-rich diet, although it can be hard to get enough calcium that way. If you are having difficulties with this, calcium supplements could be an option. In our fact sheet (URL: http://www.informedhealthonline.org/index.526.383.en.html) on dietary supplements and complementary medicines, you can read about important things to take into account if you are considering taking a dietary supplement.

The World Health Organization (WHO) recommends the following daily calcium intake for women past the menopause and men over the age of 65: at least 1,300 mg per day but not more than 3,000 mg. The recommendations from other organisations and individual countries vary, ranging from 1,000 mg a day up to the 1,300 mg recommended by the WHO. In , the federal agency responsible for recommendations on safe upper levels recommends not having more than 2,500 mg of calcium in a single day.

You can get your calcium in your diet and also from dietary supplements. Both sources can strengthen your bones and reduce your risk of osteoporosis. The best evidence about what you can expect comes from an analysis of trials in almost 64,000 people testing the effects of calcium dietary supplements. People in the trials who were over 70 years old and regularly took calcium tablets were shown to clearly benefit. However, it was not as clear how much younger people benefit from taking calcium supplements over long periods of time. You can read more about that research here (URL: http://www.informedhealthonline.org/index.526.422.en.html) .

Out of all the people who took the supplements, even if they did not take them very regularly, 1 person out of every 63 was spared a fracture. For people at higher risk of fracture who took the supplements very regularly, 1 out of 30 were spared from broken bones. That effect was shown within less than 4 years: the full benefit of longer-term use is not known. But the message is clear: even if you are already 70, you can reduce your risk of fracture by taking calcium supplements.

One adverse effect that researchers identified from these trials was a small increase in kidney stones (renal calculi or hypercalcaemia). In one very large trial, 4 more women out of every 1,000 got kidney stones while taking

supplements containing both calcium and vitamin D compared to women who took dummy (placebo) supplements. It is not clear why. If you are worried about kidney stones, drinking extra water might help prevent stones forming. According to the WHO, kidney stones could be caused by vitamin D. We do not know if taking calcium supplements without vitamin D removes the small risk of kidney stones. If you are concerned about getting kidney stones, drinking more water could possibly lower the risk.

If you want to get at least 1,300 mg of calcium a day through your diet or using a combination of diet and supplements, we have information on how much calcium is found in common foods here (URL: http://www.informedhealthonline.org/index.526.421.en.html) . And we have also prepared a calcium calculator which you can use here (URL: http://www.informedhealthonline.org/index.526.420.en.html) . If you want to make sure that you are getting at least 1,000 - 1,300 mg but less than 2,500 - 3,000 mg a day, you need to take into account both your diet and the amount you take in supplements.

It is not yet known for certain whether calcium supplements that also include vitamin D are better than calcium tablets alone. Calcium supplements come in ampules and fizzy tablets to dissolve in water too. However, many people are deficient in vitamin D as well and so they may prefer to also have this at the same time. The products used in the trials mentioned above were combinations of calcium and 400 IU of vitamin D (IU = international units; an internationally defined measurement for the amount of a substance). The WHO's recommended daily intake of vitamin D from the diet is 400 IU for people who are 50 years or older and 600 IU for people over 65. The upper safe limit per day for vitamin D in supplements or medication is 800 IU according to the German Federal Institute for Risk Assessment (BfR). The amount in a single tablet is higher than this in some brands of calcium supplements, so check the label carefully if you want to stay under these limits.

Does exercise prevent osteoporosis - and what about the risk of injury?

It might seem as though resting and therefore avoiding doing things that might risk breaking a bone would protect your bones. But, actually, the reverse is true in many ways. One of the risk factors for osteoporosis is being very immobile. Spending a lot of time sitting or lying down increases your risk of developing brittle bones. Weight-bearing activity helps strengthen the bones. A weight-bearing activity is walking, for example, but not swimming.

Injuries are always a possibility when you move around or exercise. On the other hand, some kinds of activity could actually make you more physically confident and increase your physical stability so that you are less likely to fall. There is no conclusive answer from researchers yet on what the best recipe might be for increasing bone health and minimising the risk of injury. However, this is an area that is still being studied - particularly to identify what can be done to reduce people's risk of falling. As more definitive answers emerge, we will update our information.

One of the easiest weight-bearing exercises with a relatively low risk of injury is brisk walking. Most people can keep this up throughout their lives, even in old age.

What else is important to consider - and what if I do develop osteoporosis?

Menopausal hormone therapy can reduce the risk of osteoporosis-related hip fractures in women, but it could also increase the risk of serious problems such as heart attack, stroke and breast cancer. That makes the process of weighing up the possible benefits and harms of using hormone treatment complicated. You can read more about this, and find information that might help you make your decision, here (URL: http://www.gesundheitsinformation.de/menopause.202.56.en.htm .

Osteoporosis is a serious illness and breaking a hip or vertebra in the spine can be distressing and disabling. But fortunately, not all fractures and breaks caused by osteoporosis are as serious as that. Even if you already have osteoporosis, it is still important for you to get enough calcium and vitamin D, either through medication prescribed by your doctor, or through the dietary changes and supplements we have discussed. There are also several drugs that aim to slow down the rate at which bone is broken down and increase the production of new bone tissue. In Germany, statutory health insurance funds cover the cost of these drugs if they are prescribed for the treatment of osteoporosis.

If you are over 65, one of the main issues to consider is reducing your risk of falling - especially if you have

osteoporosis. That could be part of the benefit of exercise, if it makes you more confident and improves your balance. Removing hazards around your house that could increase your chances of slipping or stumbling could also help. These may include loose cables, rugs and doorsteps, for example. You can read more about some of the strategies to prevent falls here (URL: http://www.gesundheitsinformation.de/falls-prevention.282.56.en.html) .

We will evaluate more research for you on osteoporosis treatments and preventing falls in the future. IQWiG, the Institute that produces this website, is also evaluating the evidence about bone density testing. If you would like to keep up-to-date with developments in our information, you can subscribe to our newsletter here (URL: http://www.gesundheitsinformation.de/index.204.69.en.html) .

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Glossary

Calcium

Calcium is an important mineral for human health. It is one of the building blocks for bones and teeth, and it is necessary for blood clotting, the muscles and the nerves. Calcium occurs in milk and milk products, as well as in green leafy vegetables. People can get a calcium deficiency if they have a chronic inflammatory bowel disease, as well as in pregnancy or during breastfeeding.

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Sources

Bruyere O, De Cock C, Mottet C, Neuprez A, Malaise O, Reginster JY. Low dietary calcium in European postmenopausal osteoporotic women. *Public Health Nutr* 2008; 1-4. [PubMed summary (URL: http://www.ncbi.nlm.nih.gov/pubmed/18410703?dopt=Abstract)]

Cranney A, Horsley T, O'Donnell S, Weiler H et al. *Effectiveness and safety of vitamin D in relation to bone health*. Evidence Report/Technology Assessment Number 158. Rockville: Agency for Healthcare Research and Quality (AHRQ). August 2007. [Full text (URL: http://www.ahrq.gov/downloads/pub/evidence/pdf/vitamind/vitad.html)]

Cumming RG, Nevitt MC. Calcium for prevention of osteoporotic fractures in postmenopausal women. *J Bone Miner Res* 1997; 12: 1321-1329. [PubMed summary (URL: http://www.ncbi.nlm.nih.gov/pubmed/9286747?dopt=Abstract)]

German Federal Institute for Risk Assessment (BfR). *The Use of Minerals in Foods*. Berlin: BfR. 2004. [Full text (URL: http://www.bfr.bund.de/cm/238/use_of_minerals_in_foods.html)]

German Federal Institute for Risk Assessment (BfR). *The Use of Vitamins in Foods*. Berlin: BfR. 2004. [Full text (URL: http://www.bfr.bund.de/cm/238/use_of_vitamins_in_foods.html)]

German Institute for Quality and Efficiency in Health Care (IQWiG). *Osteodensitometry in primary and secondary osteoporosis*. Report plan D07-01. Cologne: IQWiG. December 2007. [IQWiG report plan (URL: http://www.iqwig.de/index.550.html) - in German]

Hintzpeter B, Mensink GBM, Thierfelder W, Müller MJ, Scheidt-Nave C. Vitamin D status and health correlates among German adults. *Eur J Clin Nutr* 2007; 1-11. [PubMed summary (URL: http://www.ncbi.nlm.nih.gov/pubmed/17538533?dopt=Abstract)]

Huang HY, Caballero B, Chang S, Alberg A et al. *Multivitamin/mineral supplements and prevention of chronic disease*. Evidence Report/Technology Assessment Number 139. Rockville: Agency for Healthcare Research and Quality (AHRQ). May 2006. [Full text (URL: http://www.ahrq.gov/downloads/pub/evidence/pdf/multivit/multivit.html)]

Qiang W, Ke Z. Water for preventing urinary calculi. *Cochrane Database of Systematic Reviews* 2004, Issue 3. [Cochrane summary (URL: http://www.mrw.interscience.wiley.com/cochrane/clsysrev/articles/CD004292/frame.html)]

Straub M, Hautmann RE. Developments in stone prevention. *Curr Opin Urol* 2005; 15: 119-126. [PubMed summary (URL: http://www.ncbi.nlm.nih.gov/pubmed/15725936?dopt=Abstract)]

Tang BMP, Eslick GD, Nowson C, Smith C, Bensoussan A. Use of calcium or calcium in combination with vitamin D supplementation to prevent fractures and bone loss in people aged 50 years and older: a meta-analysis. *Lancet* 2007; 370: 657-666. [PubMed summary (URL: http://www.ncbi.nlm.nih.gov/pubmed/17720017?dopt=Abstract)]

United States Department of Health and Human Services. *The health consequences of smoking: a report of the Surgeon General*. Atlanta. U.S. GPO 2004. Chapter 6. [Full text (URL: http://www.cdc.gov/tobacco/data_statistics/sgr/sgr_2004/00_pdfs/chapter6.html)]

World Health Organization (WHO) and Food and Agriculture Organization (FAO) of the United Nations. *Vitamin and mineral requirements in human nutrition*. 2nd edition. Geneva: United Nations. 2004. [Full text (URL: http://whqlibdoc.who.int/publications/2004/9241546123.html)]

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The German Institute for Quality and Efficiency in Health Care (IQWiG) was established by legislation to provide evaluations of the effectiveness, quality and efficiency of healthcare services. This includes the assessment of medicines as well as the publication of health information for consumers and patients.

Evidence basis of our health information

Our information is based primarily on systematic reviews of the effects of health care. Systematic reviews are necessary to gain an objective picture of health care. In order to do this, a clear question is formulated. Researchers then find all the relevant studies that could answer this question. They then evaluate those studies.

You can find a list of the evidence and other scientific literature on which this information is based at **www.informedhealthonline.org**

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